PRESIDENCY UNIVERSITY

Presidency University Act, 2013 of the Karnataka Act No. 41 of 2013 | Established under Section 2(f) of UGC Act, 1956
Approved by AICTE, New Delhi | Approved By BCI

PRESIDENCY SCHOOL OF ENGINEERING

DEPARTMENT OF CIVIL ENGINEERING

Program Regulations and Curriculum

2025-2029

BACHELOR OF TECHNOLOGY (B.Tech.) in

CIVIL ENGINEERING

based on Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

Regulations No.: PU/AC-25.10/CIV18/CIV/2025-29

Resolution No.10 of the 24th Meeting of the Academic Council held on 3rd August 2024 and ratified by the Board of Management in its 24th Meeting held on 05th August 2024.

(As amended upto 26th Meeting of the Academic Council held on 25th July 2025, and ratified by the Board of Management in its 27th Meeting held on 28th July 2025.)

JULY-2025

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PART A – PROGRAM REGULATIONS

1. Vision & Mission of the University and the School / Department

1.1 Vision of the University

To be a Value-driven Global University, excelling beyond peers and creating professionals of integrity and character, having concern and care for society.

1.2 Mission of the University

- Commit to be an innovative and inclusive institution by seeking excellence in teaching, research and knowledge-transfer.
- Pursue Research and Development and its dissemination to the community, at large.
- Create, sustain and apply learning in an interdisciplinary environment with consideration for ethical, ecological and economic aspects of nation building.
- Provide knowledge-based technological support and services to the industry in its growth and development.
- To impart globally-applicable skill-sets to students through flexible course offerings and support industry's requirement and inculcate a spirit of new-venture creation.

1.3 Vision of Presidency School of Engineering

To be a value based, practice-driven School of Engineering and Technology, committed to developing globally-competent Engineers, dedicated to transforming Society.

1.4 Mission of Presidency School of Engineering

- Cultivate a practice-driven environment with a contemporary Learning-pedagogy, integrating theory and practice.
- Attract and nurture world-class faculty to excel in Teaching and Research, in the field of Core Engineering.
- Establish state-of-the-art facilities for effective Teaching and Learning-experiences.
- Promote Interdisciplinary Studies to nurture talent and impart relevant skill-sets for global impact.
- Instil Entrepreneurial and Leadership Skills to address Social, Environmental, and Community-needs.

1.5 Vision of Department of Civil Engineering

To emerge as a global leader in civil engineering through excellence in quality education, cutting edge research and innovative practices for sustainable societal development.

1.6 Mission of Department of Civil Engineering

- Impart quality civil engineering education through an experiential, interdisciplinary approach, strengthened by excellent infrastructure, academic rigour, and global academic collaborations.
- Enable academia-industry synergy through research, consultancy, and training.
- Nurture socially responsible civil engineers with strong ethics, leadership skills, and a commitment to lifelong learning and sustainable practices.

2. Preamble to the Program Regulations and Curriculum

This is the subset of Academic Regulations and it is to be followed as a requirement for the award of B.Tech. degree.

The Curriculum is designed to take into the factors listed in the Choice Based Credit System (CBCS) with focus on Social Project Based Learning, Industrial Training, and Internship to enable the students to become eligible and fully equipped for employment in industries, choose higher studies or entrepreneurship.

In exercise of the powers conferred by and in discharge of duties assigned under the relevant provision(s) of the Act, Statutes and Academic Regulations of the University, the Academic Council hereby makes the following Regulations.

3. Short Title and Applicability

a. These Regulations shall be called the Bachelor of Technology Degree Program Regulations and Curriculum 2025-2029.
b. These Regulations are subject to, and pursuant to the Academic Regulations.
c. These Regulations shall be applicable to the ongoing Bachelor of Technology Degree Programs of the 2025-2029 batch, and to all other Bachelor of Technology Degree Programs which may be introduced in future.
d. These Regulations shall supersede all the earlier Bachelor of Technology Degree Program Regulations and Curriculum, along with all the amendments thereto.
e. These Regulations shall come into force from the Academic Year 2025-2026

4. Definitions

In these Regulations, unless the context otherwise requires:

a. "Academic Calendar" means the schedule of academic and miscellaneous events as approved by the Vice Chancellor;

b. "Academic Council" means the Academic Council of the University;

c. "Academic Regulations" means the Academic Regulations, of the University;

d. "Academic Term" means a Semester or Summer Term;

e. "Act" means the Presidency University Act, 2013;

f. "AICTE" means All India Council for Technical Education;

g. "Basket" means a group of courses bundled together based on the nature/type of the course;

h. "BOE" means the Board of Examinations of the University;

i. "BOG" means the Board of Governors of the University;

j. "BOM" means the Board of Management of the University;

k. "BOS" means the Board of Studies of a particular Department/Program of Study of the University;

l. "CGPA" means Cumulative Grade Point Average as defined in the Academic Regulations;

m. "Clause" means the duly numbered Clause, with Sub-Clauses included, if any, of these Regulations;

n. "COE" means the Controller of Examinations of the University;

o. *"Course In Charge" means the teacher/faculty member responsible for developing and organising the delivery of the Course;*

p. *"Course Instructor" means the teacher/faculty member responsible for teaching and evaluation of a Course;*

q. *"Course" means a specific subject usually identified by its Course-code and Course-title, with specified credits and syllabus/course-description, a set of references, taught by some teacher(s)/course-instructor(s) to a specific class (group of students) during a specific Academic Term;*

r. *"Curriculum Structure" means the Curriculum governing a specific Degree Program offered by the University, and, includes the set of Baskets of Courses along with minimum credit requirements to be earned under each basket for a degree/degree with specialization/minor/honours in addition to the relevant details of the Courses and Course catalogues (which describes the Course content and other important information about the Course). Any specific requirements for a particular program may be brought into the Curriculum structure of the specific program and relevant approvals should be taken from the BOS and Academic Council at that time.*

s. *"DAC" means the Departmental Academic Committee of a concerned Department/Program of Study of the University;*

t. *"Dean" means the Dean / Director of the concerned School;*

u. *"Degree Program" includes all Degree Programs;*

v. *"Department" means the Department offering the degree Program(s) / Course(s) / School offering the concerned Degree Programs / other Administrative Offices;*

w. *"Discipline" means specialization or branch of B.Tech. Degree Program;*

x. *"HOD" means the Head of the concerned Department;*

y. *"L-T-P-C" means Lecture-Tutorial-Practical-Credit – refers to the teaching – learning periods and the credit associated;*

z. *"MOOC" means Massive Open Online Courses;*

aa. *"MOU" means the Memorandum of Understanding;*

bb. *"NPTEL" means National Program on Technology Enhanced Learning;*

cc. *"Parent Department" means the department that offers the Degree Program that a student undergoes;*

dd. *"Program Head" means the administrative head of a particular Degree Program/s;*

ee. *"Program Regulations" means the Bachelor of Technology Degree Program Regulations and Curriculum, 2025-2029;*

ff. *"Program" means the Bachelor of Technology (B.Tech.) Degree Program;*

gg. *"PSOE" means the Presidency School of Engineering;*

hh. *"Registrar" means the Registrar of the University;*

ii. *"School" means a constituent institution of the University established for monitoring, supervising and guiding, teaching, training and research activities in broadly related fields of studies;*

jj. *"Section" means the duly numbered Section, with Clauses included in that Section, of these Regulations;*

kk. *"SGPA" means the Semester Grade Point Average as defined in the Academic Regulations;*

ll. *"Statutes" means the Statutes of Presidency University;*

mm. "Sub-Clause" means the duly numbered Sub-Clause of these Program Regulations;

nn. "Summer Term" means an additional Academic Term conducted during the summer break (typically in June-July) for a duration of about eight (08) calendar weeks, with a minimum of thirty (30) University teaching days;

oo. "SWAYAM" means Study Webs of Active Learning for Young Aspiring Minds.

pp. "UGC" means University Grant Commission;

qq. "University" means Presidency University, Bengaluru; and

rr. "Vice Chancellor" means the Vice Chancellor of the University.

5. Program Description

The Bachelor of Technology Degree Program Regulations and Curriculum 2025-2029 are subject to, and, pursuant to the Academic Regulations. These Program Regulations shall be applicable to the following ongoing Bachelor of Technology (B.Tech.) Degree Programs of 2025-2029 offered by the Presidency School of Engineering (PSOE):

1. Bachelor of Technology in Civil Engineering, abbreviated as B.Tech. (Civil Engineering)
2. Bachelor of Technology in Electronics and Communication Engineering, abbreviated as B.Tech. (Electronics and Communication Engineering)
3. Bachelor of Technology in VLSI, abbreviated as B.Tech. (VLSI)
4. Bachelor of Technology in Electrical and Electronics Engineering, abbreviated as B.Tech. (Electrical and Electronics Engineering)
5. Bachelor of Technology in Mechanical Engineering, abbreviated as B.Tech. (Mechanical Engineering); and
6. Bachelor of Technology in Petroleum Engineering, abbreviated as B.Tech. (Petroleum Engineering)

5.1 These Program Regulations shall be applicable to other similar programs, which may be introduced in future.

5.2 These Regulations may evolve and get amended or modified or changed through appropriate approvals from the Academic Council, from time to time, and shall be binding on all concerned.

5.3 The effect of periodic amendments or changes in the Program Regulations, on the students admitted in earlier years, shall be dealt with appropriately and carefully, so as to ensure that those students are not subjected to any unfair situation whatsoever, although they are required to conform to these revised Program Regulations, without any undue favour or considerations.

6. Minimum and Maximum Duration

6.1 Bachelor of Technology Degree Program is a Four-Year, Full-Time Semester based program. The minimum duration of the B.Tech. Program is four (04) years and each year comprises of two academic Semesters (Odd and Even Semesters) and hence the duration of the B.Tech. program is eight (08) Semesters.

6.2 A student who for whatever reason is not able to complete the Program within the normal period or the minimum duration (number of years) prescribed for the Program, may be allowed a period of two years beyond the normal period to complete the mandatory minimum credits requirement as prescribed by the concerned Program Regulations and Curriculum. In general, the permissible maximum duration

(number of years) for completion of Program is 'N' + 2 years, where 'N' stands for the normal or minimum duration (number of years) for completion of the concerned Program as prescribed by the concerned Program Regulations and Curriculum.

6.3 The time taken by the student to improve Grades/CGPA, and in case of temporary withdrawal/re-joining (Refer to Clause 18.1 of Academic Regulations), shall be counted in the permissible maximum duration for completion of a Program.

6.4 In exceptional circumstances, such as temporary withdrawal for medical exigencies where there is a prolonged hospitalization and/or treatment, as certified through hospital/medical records, women students requiring extended maternity break (certified by registered medical practitioner), and, outstanding sportspersons representing the University/State/India requiring extended time to participate in National/International sports events, a further extension of one (01) year may be granted on the approval of the Academic Council.

6.5 The enrolment of the student who fails to complete the mandatory requirements for the award of the concerned Degree (refer Section 19.2 of Academic Regulations) in the prescribed maximum duration (Sub-Clauses 18.1 and 18.2 of Academic Regulations), shall stand terminated and no Degree shall be awarded.

7. Programme Educational Objectives (PEO)

After four years of successful completion of the program, the graduates shall be:

PEO1. Graduates will apply their core competence in civil engineering to perform effectively in professional practice, demonstrating problem-solving and technical capabilities in real-world scenarios.

PEO2. Graduates will engage in lifelong learning and enhance their civil engineering expertise along with industry-relevant skills through a multidisciplinary approach.

PEO3. Graduates will exhibit a responsible attitude toward societal and environmental needs, upholding ethics and professional integrity while promoting sustainable development.

8. Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

8.1 Programme Outcomes (PO)

On successful completion of the Program, the students shall be able to:

PO1. **Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop solutions to complex engineering problems.

PO2. **Problem Analysis:** Identify, formulate, review research literature and analyse complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO3. **Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for public health and safety, whole-life cost, net zero carbon, culture, society, and environment as required. (WK5)

PO4. **Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8)

PO5. **Engineering Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering & IT tools, including prediction and modelling, recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO6. **The Engineer and The World:** Analyse and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture, and environment. (WK1, WK5, and WK7)

PO7. **Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO8. **Individual and Collaborative Team Work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9. **Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

PO10. **Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects in multidisciplinary environments.

PO11. **Life-Long Learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

8.2 Program Specific Outcomes (PSOs):

On successful completion of the Program, the students shall be able to:

PSO1. Demonstrate integrity and motivation to pursue professional practice, higher education, or research in civil engineering, with opportunities to specialize through electives in Structural Engineering, Environmental and Water Resources, or Geotechnical and Transportation Engineering.

PSO2. Apply civil engineering knowledge to develop sustainable and ethical solutions enhanced through practical exposure in BIM, drone surveying, and Geospatial technologies.

PSO3. Demonstrate a lifelong learning mindset with readiness to explore emerging fields and integrate interdisciplinary developments in civil engineering.

9. Admission Criteria (as per the concerned Statutory Body)

The University admissions shall be open to all persons irrespective of caste, class, creed, gender or nation. All admissions shall be made on the basis of merit in the qualifying examinations; provided that forty percent of the admissions in all Programs of the University shall be reserved for the students of Karnataka State and admissions shall be

made through a Common Entrance Examination conducted by the State Government or its agency and seats shall be allotted as per the merit and reservation policy of the State Government from time to time**.** The admission criteria to the B.Tech. Program is listed in the following Sub-Clauses:

9.1 An applicant who has successfully completed Pre-University course or Senior Secondary School course (+2) or equivalent such as (11+1), 'A' level in Senior School Leaving Certificate Course from a recognized university of India or outside or from Senior Secondary Board or equivalent, constituted or recognized by the Union or by the State Government of that Country for the purpose of issue of qualifying certificate on successful completion of the course, may apply for and be admitted into the Program.

9.2 Provided further, the applicant must have taken Physics and Mathematics as compulsory subjects in the Pre-University / Higher Secondary / (10+2) / (11+1) examination, along with either Chemistry / Biology / Electronics / Computer Science / Biotechnology subject, and, the applicant must have obtained a minimum of 45% of the total marks (40% in case of candidates belonging to the Reserved Category as classified by the Government of Karnataka) in these subjects taken together.

9.3 The applicant must have appeared for Joint Entrance Examinations (JEE) Main / JEE (Advanced) / Karnataka CET / COMED-K, or any other State-level Engineering Entrance Examinations.

9.4 Reservation for the SC / ST and other backward classes shall be made in accordance with the directives issued by the Government of Karnataka from time to time.

9.5 Admissions are offered to Foreign Nationals and Indians living abroad in accordance with the rules applicable for such admission, issued from time to time, by the Government of India.

9.6 Candidates must fulfil the medical standards required for admission as prescribed by the University.

9.7 If, at any time after admission, it is found that a candidate had not in fact fulfilled all the requirements stipulated in the offer of admission, in any form whatsoever, including possible misinformation and any other falsification, the Registrar shall report the matter to the Board of Management (BOM), recommending revoking the admission of the candidate.

9.8 The decision of the BOM regarding the admissions is final and binding.

10. Lateral Entry / Transfer Students requirements

10.1 Lateral Entry

The University admits students directly to the second year (3rd Semester) of the B.Tech. Degree program as per the provisions and/or regulations of the Government of Karnataka pertaining to the "Lateral Entry" scheme announced by the Government from time to time. Further, the general conditions and rules governing the provision of Lateral Entry to the B.Tech. Program of the University are listed in the following Sub-Clauses:

10.1.1 Admission to 2nd year (3rd Semester) of the B.Tech. Degree program shall be open to the candidates who are holders of a 3-year Diploma in Engineering (or equivalent qualification as recognized by the University), who have

secured not less than forty-five percentage (45%) marks in the final year examination (5th and 6th Semesters of the Diploma Program) in the appropriate branch of Engineering. Provided that, in case of SC / ST and OBC candidates from Karnataka the minimum marks for eligibility shall be forty percent (40%).

10.1.2 Provided further that, candidates seeking Lateral Entry may be required to complete specified bridge Courses as prescribed by the University. Such bridge Courses, if any, shall not be included in the CGPA computations.

10.1.3 All the existing Regulations and Policies of the University shall be binding on all the students admitted to the Program through the provision of Lateral Entry.

10.1.4 The Course requirements prescribed for the 1st Year of the B.Tech. Program shall be waived for the student(s) admitted through Lateral Entry and the duration of the B.Tech. Program for such students is three (03) years, commencing from the 3rd Semester (commencement of the 2nd Year) of the B.Tech. Program and culminating with the 8th Semester (end of the 4th Year) of the B.Tech. Program.

10.1.5 Provided that, if a Lateral Entry student misses any mandatory program specific courses that are typically offered in the 1st year (1st or 2nd semesters), then those courses must be cleared by the students as soon as possible, preferably during the Summer Term.

10.1.6 The existing Program Regulations of the concerned Program to which the student is admitted through the provision of Lateral Entry shall be binding on the student with effect from the 3rd Semester of the Program. i.e., the Program Structure and Curriculum from the 3rd to 8th Semesters of the Program concerned shall be binding on the student admitted through Lateral Entry. Further, any revisions / amendments made to the Program Regulations thereafter, shall be binding on all the students of the concerned Program.

10.1.7 All the Courses (and the corresponding number of Credits) prescribed for the 1st Year of the concerned B.Tech. Program shall be waived for the student(s) admitted to the concerned B.Tech. Program through Lateral Entry. Further, the *Minimum Credit Requirements* for the award of the B.Tech. Degree in the concerned Program shall be prescribed / calculated as follows:

The ***Minimum Credit Requirements*** for the award of the Bachelor of Technology (B.Tech.) Degree prescribed by the concerned Bachelor of Technology Degree Program Regulations and Curriculum, 2025-2029, minus the number of Credits prescribed / accepted by the Equivalence Committee for the 1st Year (1st and 2nd Semesters) of the B.Tech. Program.

For instance, if the *Minimum Credit Requirements* for the award of the Bachelor of Technology (B.Tech.) Degree as prescribed by the Regulations for B.Tech. (Civil Engineering) is "N" Credits, and, if the total credits prescribed in the 1st Year (total credits of the 1st and 2nd Semesters) of the Program concerned is "M" Credits, then the *Minimum Credit Requirements* for the award of the B.Tech. in Civil Engineering for a student who joins the Program through the provision of the Lateral Entry, shall be "N – M" Credits.

10.1.8 Further, no other waiver except the Courses prescribed for the 1st year of the B.Tech. Program of the University shall be permissible for students joining the B.Tech. Program through the provision of Lateral Entry.

10.2 Transfer of student(s) from another recognized University to the 2nd year (3rd Semester) of the B.Tech. Program of the University

A student who has completed the 1st Year (i.e., passed in all the Courses / Subjects prescribed for the 1st Year) of the B.Tech. / B.E. / B.S., Four-Year Degree Program from another recognized University, may be permitted to transfer to the 2nd Year (3rd Semester) of the B.Tech. Program of the University as per the rules and guidelines prescribed in the following Sub-Clauses:

10.2.1 The concerned student fulfils the criteria specified in Sub-Clauses 10.1.1, 10.1.2 and 10.1.3.

10.2.2 The student shall submit the Application for Transfer along with a non-refundable Application Fee (as prescribed by the University from time to time) to the University no later than July 10 of the concerned year for admission to the 2nd Year (3rd Semester) B.Tech. Program commencing on August 1 on the year concerned.

10.2.3 The student shall submit copies of the respective Marks Cards/ Grade Sheets/ Certificates along with the Application for Transfer.

10.2.4 The transfer may be provided on the condition that the Courses and Credits completed by the concerned student in the 1st Year of the B.Tech. / B.E. / B.S. Four Degree Program from the concerned University, are declared equivalent and acceptable by the Equivalence Committee constituted by the Vice Chancellor for this purpose. Further, the Equivalence Committee may also prescribe the Courses and Credits the concerned students shall have to mandatorily complete, if admitted to the 2nd Year of the B.Tech. Program of the University.

10.2.5 The Branch / Discipline allotted to the student concerned shall be the decision of the University and binding on the student.

11. Change of Branch / Discipline / Specialization

A student admitted to a particular Branch of the B.Tech. Program will normally continue studying in that Branch till the completion of the program. However, the University reserves the right to provide the option for a change of Branch, or not to provide the option for a change of Branch, at the end of 1st Year of the B.Tech. Program to eligible students in accordance with the following rules and guidelines: framed by the University from time to time.

11.1 Normally, only those students, who have passed all the Courses prescribed for the 1st Year of the B.Tech. Program and obtained a CGPA of not less than 6.50 at the end of the 2nd Semester, shall be eligible for consideration for a change of Branch.

11.2 Change of Branch, if provided, shall be made effective from the commencement of the 3rd Semester of the B.Tech. Program. There shall be no provision for change of Branch thereafter under any circumstances whatsoever.

11.3 The student provided with the change of Branch shall fully adhere to and comply with the Program Regulations of the concerned Branch of the B.Tech. Program, the Fee Policy pertaining to that Branch of the B.Tech. Program, and, all other rules pertaining to the changed Branch existing at the time.

11.4 Change of Branch once made shall be final and binding on the student. No student shall be permitted, under any circumstances, to refuse the change of Branch offered.

11.5 The eligible student may be allowed a change in Branch, strictly in order of *inter se* merit, subject to the conditions given below:

11.5.1 The actual number of students in the 3rd Semester in any particular Branch to which the transfer is to be made, should not exceed the intake fixed by the University for the concerned Branch;

11.5.2 The actual number of students in any Branch from which transfer is being sought does not fall below 75% of the total intake fixed by the University for the concerned Branch.

The process of change of Branch shall be completed within the first five days of Registration for the 3rd Semester of the B.Tech. Program.

12. Specific Regulations regarding Assessment and Evaluation (including the Assessment Details of NTCC Courses, Weightages of Continuous Assessment and End Term Examination for various Course Categories)

12.1 The academic performance evaluation of a student in a Course shall be according to the University Letter Grading System based on the class performance distribution in the Course.

12.2 Academic performance evaluation of every registered student in every Course registered by the student is carried out through various components of Assessments spread across the Semester. The nature of components of Continuous Assessments and the weightage given to each component of Continuous Assessments (refer Clause 8.8 of Academic Regulations) shall be clearly defined in the Course Plan for every Course, and approved by the DAC.

12.3 Format of the End-Term examination shall be specified in the Course Plan.

12.4 Grading is the process of rewarding the students for their overall performance in each Course. The University follows the system of Relative Grading with statistical approach to classify the students based on the relative performance of the students registered in the concerned Course except in the following cases:

- Non-Teaching Credit Courses (NTCC)
- Courses with a class strength less than 30

Absolute grading method may be adopted, where necessary with prior approval of concerned DAC.

Grading shall be done at the end of the Academic Term by considering the aggregate performance of the student in all components of Assessments prescribed for the Course. Letter Grades (Clause 8.10 of Academic Regulations) shall be awarded to a student based on her/his overall performance relative to the class performance distribution in the concerned Course. These Letter Grades not only indicate a qualitative assessment of the student's performance but also carry a quantitative (numeric) equivalent called the Grade Point.

12.5 Assessment Components and Weightage

Table 1: Assessment Components and Weightage for different category of Courses

Nature of Course and Structure	Evaluation Component	Weightage
Lecture-based Course	Continuous Assessments	50%

L component in the L-T-P Structure is predominant (more than 1) (Examples: 3-0-0; 3-0-2; 2-1-0; 2-0-2, 2-0-4 etc.)	End Term Examination	50%
Lab/Practice-based Course P component in the L-T-P Structure is predominant (Examples: 0-0-4; 1-0-4; 1-0-2; etc.)	Continuous Assessments	75%
	End Term Examination	25%
Skill based Courses like Industry Internship, Capstone project, Research Dissertation, Integrative Studio, Interdisciplinary Project, Summer / Short Internship, Social Engagement / Field Projects, Portfolio, and such similar Non-Teaching Credit Courses, where the pedagogy does not lend itself to a typical L-T-P structure	Guidelines for the assessment components for the various types of Courses, with recommended weightages, shall be specified in the concerned Program Regulations and Curriculum / Course Plans, as applicable.	

The exact weightages of Evaluation Components shall be clearly specified in the respective Course Plan.

Normally, for Practice/Skill based Courses, without a defined credit structure (L–T–P) [NTCC], but with assigned Credits (as defined in Clause 5.2 of the Academic Regulations), the method of evaluation shall be based only on Continuous Assessments. The various components of Continuous Assessments, the distribution of weightage among such components, and the method of evaluation/assessment, shall be as decided and indicated in the Course Plan. The same shall be approved by the respective DAC.

12.6 Minimum Performance Criteria:

12.6.1 **Theory only Course and Lab/Practice Embedded Theory Course**
A student shall satisfy the following minimum performance criteria to be eligible to earn the credits towards the concerned Course:

a. A student must obtain a minimum of 30% of the total marks/weightage assigned to the End Term Examinations in the concerned Course.

b. The student must obtain a minimum of 40% of the AGGREGATE of the marks/weightage of the components of Continuous Assessments, Mid Term Examinations and End Term Examinations in the concerned Course.

12.6.2 **Lab/Practice only Course and Project Based Courses**
The student must obtain a minimum of 40% of the AGGREGATE of the marks/weightage of all assessment components in the concerned Course.

12.6.3 A student who fails to meet the minimum performance criteria listed above in a Course shall be declared as "Fail" and given "F" Grade in the concerned Course. For theory Courses, the student shall have to re-appear in the "Make-Up Examinations" as scheduled by the University in any subsequent semester, or, re-appear in the End Term Examinations of the same Course when it is scheduled at the end of the following Semester or Summer Term, if offered. The marks obtained in the Continuous Assessments (other than the End Term Examination) shall be carried forward and be included in

computing the final grade, if the student secures the minimum requirements (as per Sub-Clauses 8.9.1 and 8.9.2 of Academic Regulations) in the "Make-Up Examinations" of the concerned Course. Further, the student has an option to re-register for the Course and clear the same in the summer term/ subsequent semester if he/she wishes to do so, provided the Course is offered.

13. Additional clarifications - Rules and Guidelines for Transfer of Credits from MOOC, etc. – Note: These are covered in Academic Regulations

The University allows students to acquire credits from other Indian or foreign institutions and/or Massive Open Online Course (MOOC) platforms, subject to prior approval. These credits may be transferred and counted toward fulfilling the minimum credit requirements for the award of a degree. The process of transfer of credits is governed by the following rules and guidelines:

13.1 The transfer of credits shall be examined and recommended by the Equivalence Committee (Refer Annexure B of Academic Regulations) and approved by the Dean - Academics.

13.2 Students may earn credits from other Indian or foreign Universities/Institutions with which the University has an MOU, and that MOU shall have specific provisions, rules and guidelines for transfer of credits. These transferred credits shall be counted towards the minimum credit requirements for the award of the degree.

13.3 Students may earn credits by registering for Online Courses offered by *Study Web of Active Learning by Young and Aspiring Minds* (SWAYAM) and *National Program on Technology Enhanced Learning* (NPTEL), or other such recognized Bodies/ Universities/Institutions as approved by the concerned BOS and Academic Council from time to time. The concerned School/Parent Department shall publish/include the approved list of Courses and the rules and guidelines governing such transfer of credits of the concerned Program from time to time. The Rules and Guidelines for the transfer of credits specifically from the Online Courses conducted by SWAYAM/ NPTEL/ other approved MOOCs are as stated in the following Sub-Clauses:

13.3.1 A student may complete SWAYAM/NPTEL/other approved MOOCs as mentioned in Clause 17.3 (as per Academic Regulations) and transfer equivalent credits to partially or fully complete the mandatory credit requirements of Professional Elective Courses and/or the mandatory credit requirements of Open Elective Courses as prescribed in the concerned Curriculum Structure. However, it is the sole responsibility of the student to complete the mandatory credit requirements of the Professional Elective Courses and the Open Elective Courses as prescribed by the Curriculum Structure of the concerned Program.

13.3.2 SWAYAM/NPTEL/ other approved MOOCs as mentioned in Clause 17.3(as per Academic Regulations) shall be approved by the concerned Board of Studies and placed (as Annexures) in the concerned PRC.

13.3.3 Parent Departments may release a list of SWAYAM/NPTEL/other approved MOOCs for Pre-Registration as per schedule in the Academic Calendar or through University Notification to this effect.

13.3.4 Students may Pre-Register for the SWAYAM/NPTEL/other approved MOOCs in the respective Departments and register for the same Courses as per the schedule announced by respective Online Course Offering body/institute/ university.

13.3.5 A student shall request for transfer of credits only from such approved Courses as mentioned in Sub-Clause 13.3.2 above.

13.3.6 SWAYAM/NPTEL/other approved MOOCs Courses are considered for transfer of credits only if the concerned student has successfully completed the SWAYAM/NPTEL/other approved MOOCs and obtained a certificate of successful/satisfactory completion.

13.3.7 A student who has successfully completed the approved SWAYAM/NPTEL/ other approved MOOCs and wants to avail the provision of transfer of equivalent credits, must submit the original Certificate of Completion, or such similar authorized documents to the HOD concerned, with a written request for the transfer of the equivalent credits. On verification of the Certificates/Documents and approval by the HOD concerned, the Course(s) and equivalent Credits shall forwarded to the COE for processing of results of the concerned Academic Term.

13.3.8 The credit equivalence of the SWAYAM/NPTEL/other approved MOOCs are based on Course durations and/or as recommended by the Course offering body/institute/university. The Credit Equivalence mapped to SWAYAM/ NPTEL approved Courses based on Course durations for transfer of credits is summarised in Table shown below. The Grade will be calculated from the marks received by the Absolute Grading Table 8.11 in Academic Regulations, 2025.

Table 2: Durations and Credit Equivalence for Transfer of Credits from SWAYAM-NPTEL/ other approved MOOC Courses

Sl. No.	Course Duration	Credit Equivalence
1	4 Weeks	1 Credit
2	8 Weeks	2 Credits
3	12 Weeks	3 Credits

13.3.9 The maximum permissible number of credits that a student may request for credit transfer from MOOCs shall not exceed 20% of the mandatory minimum credit requirements specified by the concerned Program Regulations and Curriculum for the award of the concerned Degree.

13.3.10 The University shall not reimburse any fees/expense; a student may incur for the SWAYAM/NPTEL/other approved MOOCs.

13.4 The maximum number of credits that can be transferred by a student shall be limited to forty percent (40%) of the mandatory minimum credit requirements specified by the concerned Program Regulations and Curriculum for the award of the concerned Degree. However, the grades obtained in the Courses transferred from other Institutions/MOOCs, as mentioned in this Section (13.1), shall not be included in the calculation of the CGPA.

13.5 Mandatory Non-Credit Course Completion Requirements: All mandatory non-credit courses shall be satisfactorily completed by the student as part of the degree requirements. These courses will be evaluated and awarded letter grades based on the following criteria:

- S (Satisfactorily Completed): Awarded when the student successfully completes all prescribed course requirements.
- NC (Not Completed): Awarded when the student fails to meet the prescribed course requirements.

A student receiving an NC grade must reappear for and complete the course in accordance with the guidelines prescribed by the University.

In the case of non-taught and non-credited mandatory courses—where students are advised to undertake learning through MOOC platforms—there shall be a clearly defined Course Catalogue and a corresponding Course Plan. The Course Plan shall outline the assessment components, which will form the basis for evaluation.

14. Structure / Component with Credit Requirements Course Baskets & Minimum Basket wise Credit Requirements

The B.Tech. (Civil Engineering) Program Structure (2025-2029) totalling 160 credits. Table 3 summarizes the type of baskets, under each basket and the associated credits that are mandatorily required for the completion of the Degree.

Table 3: B.Tech. (Civil Engineering) 2025-2029: Summary of Mandatory Courses and Minimum Credit Contribution from various Baskets

Sl. No.	Baskets	Credit Contribution
1	Humanities and Social Sciences including Management Courses (HSMC)	10
2	Basic Science Courses (BSC)	24
3	Engineering Science Courses (ESC)	22
4	Professional Core Courses (PCC)	64
5	Professional Elective Courses (PEC)	18
6	Open Elective Courses (OEC)	06
7	Project Work (PRW)	16
8	Mandatory Courses (MAC)*	0
	Total Credits	**160**

* Please refer to Table 3.8

In the entire Program, the practical and skill based course component contribute to an extent of approximately 57% out of the total credits of 160 for B.Tech. (Civil Engineering) program of four years' duration.

15. Minimum Total Credit Requirements of Award of Degree

As per the AICTE guidelines, a minimum of 160 credits is required for the award of a B.Tech. degree.

16. Other Specific Requirements for Award of Degree, if any, as prescribed by the Statutory Bodies

16.1 The award of the Degree shall be recommended by the Board of Examinations and approved by the Academic Council and Board of Management of the University.

16.2 A student shall be declared to be eligible for the award of the concerned Degree if she/he:

a. Fulfilled the Minimum Credit Requirements and the Minimum Credits requirements under various baskets.

b. Secure a minimum CGPA of 4.50 in the concerned Program at the end of the Semester/Academic Term in which she/he completes all the requirements for the award of the Degree as specified in Sub-Clause a of Academic Regulations**;**

c. No dues to the University, Departments, Hostels, Library, and any other such Centers/ Departments of the University; and

d. No disciplinary action is pending against her/him.

17. Curriculum Structure – Basket Wise Course List

List of Courses Tabled – aligned to the Program Structure

Table 3.1: List of Humanities and Social Sciences including Management Courses (HSMC)

Sl. No.	Course Code	Course Name	L	T	P	C
1	ENG1900	English for Technical Communication	2	0	0	2
2	ENG2501	Advanced English	2	0	0	2
3	APT4005	Aptitude for Employability	0	0	2	1
4	PPS3018	Preparedness for Interview	0	0	2	1
5	DES1146	Introduction to Design Thinking	1	0	0	1
6	FIN1002	Essentials of Finance	3	0	0	3
		Total No. of Credits				**10**

Table 3.2: List of Basic Science Courses (BSC)

Sl. No.	Course Code	Course Name	L	T	P	C
1	MAT2301	Calculus and Differential Equations	3	1	0	4
2	MAT2302	Transform Techniques, Partial Differential Equations and Complex Variables	3	1	0	4

3	MAT2303	Linear Algebra and Vector Calculus	3	1	0	4
4	MAT2304	Numerical Methods, Probability Distributions and Sampling Techniques	3	1	0	4
5	PHY2503	Fundamentals of Materials Physics	3	0	0	3
6	PHY2506	Fundamentals of Materials Physics Lab	0	0	2	1
7	CHE2505	Materials Chemistry for Engineers	3	0	0	3
8	CHE2506	Materials Chemistry Lab	0	0	2	1
Total No. of Credits						**24**

Table 3.3: List of Engineering Science Courses (ESC)

Sl. No.	Course Code	Course Name	L	T	P	C
1	CIV1200	Foundations of Integrated Engineering	2	0	0	2
2	MEC1006	Engineering Graphics	2	0	0	2
3	EEE1200	Basics of Electrical and Electronics Engineering	3	0	0	3
4	EEE1250	Basics of Electrical and Electronics Engineering Lab	0	0	2	1
5	CSE2282	Computational Thinking and AI Programming	3	0	0	3
6	CSE2283	Computational Thinking and AI Programming Lab	0	0	2	1
7	CIV1501	Elements of Engineering Mechanics	3	0	0	3
8	CIV1201	Engineering Geology Lab	0	0	2	1
9	CIV2500	Strength of Materials	3	1	0	4
10	ECE1511	Design Workshop	1	0	2	2
Total No. of Credits						**22**

Table 3.4: List of Professional Core Courses (PCC)

Sl. No.	Course Code	Course Name	L	T	P	C
1	CIV2100	Building Materials and Concrete Technology	3	0	0	3
2	CIV2101	Surveying	3	0	0	3
3	CIV2102	Surveying Lab	0	0	2	1
4	CIV2103	Building Planning and Drawing	0	0	2	1
5	CIV2501	Transportation Engineering	3	0	0	3
6	CIV2502	Infrastructure Materials Testing Lab	0	0	2	1
7	CIV2503	Fluid Mechanics	3	1	0	4
8	CIV2504	Fluid Mechanics Lab	0	0	2	1
9	CIV2505	Hydrology and Irrigation Systems	3	0	0	3
10	CIV2506	Analysis of Determinate Structures	3	0	0	3
11	CIV2507	Analysis of Indeterminate Structures	3	0	0	3
12	CIV2508	Design of RCC Structural Elements	3	1	0	4
13	CIV2509	Analysis and Design of Pre-Stressed Concrete Elements	3	0	0	3
14	CIV2510	Design of Structural Steel Elements	3	0	0	3
15	CIV2511	Construction Materials Testing Lab	0	0	2	1
16	CIV2512	Geotechnical Engineering	3	0	0	3

Table 3.4: List of Professional Core Courses (PCC)						
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
17	CIV2513	Geotechnical Engineering Lab	0	0	2	1
18	CIV2514	Foundation Engineering	3	0	0	3
19	CIV2515	Water Infrastructure Systems	3	0	0	3
20	CIV2516	Waste Water Treatment and Disposal Systems	3	0	0	3
21	CIV2517	Environmental Engineering Lab	0	0	2	1
22	CIV2518	Quantity Surveying, Cost Estimation and Valuation	3	1	0	4
23	CIV2519	Construction Project Management	3	0	0	3
24	CIV2520	Construction Project Management Lab	0	0	2	1
25	CIV2521	Building Information Modelling Lab	0	0	2	1
26	CIV2522	Computer Aided Analysis and Detailing Lab	0	0	2	1
27	CIV2523	Design of Irrigation Water Resources Systems	3	0	0	3
					Total No. of Credits	**64**

Table 3.7: List of course in Project Work basket (PRW)						
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1	CIV7000	Internship	-	-	-	2
2	CIV7100	Minor Project (Extensive Survey Project)	-	-	-	4
3	CIV7300	Capstone Project	-	-	-	10
					Total No. of Credits	**16**

Table 3.8: List of Mandatory Courses (MAC)						
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1	CHE7601	Environmental Studies	-	-	-	0
2	LAW7601	Indian Constitution	-	-	-	0
3	CIV7601	Universal Human Values and Ethics	-	-	-	0
4	PPS1025	Industry Readiness Program – I	0	0	2	0
5	PPS1026	Industry Readiness Program – II	0	0	2	0
6	APT4002	Introduction to Aptitude	0	0	2	0
7	APT4004	Aptitude Training - Intermediate	0	0	2	0
8	APT4006	Logical and Critical Thinking	0	0	2	0
					Total No. of Credits	**0**

18. Practical / Skill based Courses – Internships / Thesis / Dissertation / Capstone Project Work / Portfolio / Mini project

Practical / Skill based Courses like internship, project work, capstone project, research project / dissertation, and such similar courses, where the pedagogy does not lend itself to a typical L-T-P-C Structure as defined in Clause 5.1 of the Academic Regulations, are simply assigned the number of Credits based on the quantum of work / effort required to fulfill the learning objectives and outcomes prescribed for the concerned Courses. Such courses are referred to as Non-Teaching Credit Courses (NTCC). These Courses are designed to provide students with hands-on experience and skills essential for their professional development. These courses aim to equip students with abilities in problem

identification, root cause analysis, problem-solving, innovation, and design thinking through industry exposure and project-based learning. The expected outcomes are first level proficiency in problem solving and design thinking skills to better equip B.Tech. graduates for their professional careers. The method of evaluation and grading for the Practical / Skill based Courses shall be prescribed and approved by the concerned Departmental Academic Committee (refer Annexure A of the Academic Regulations). The same shall be prescribed in the Course Plan.

18.1 Internship

A student may undergo an Internship for a period of 4-6 weeks in an industry / company or academic / research institution during the Semester Break between 4th and 5th Semesters or 6th and 7th Semesters, subject to the following conditions:

18.1.1 The Internship shall be in conducted in accordance with the Internship Policy prescribed by the University from time to time.

18.1.2 The selection criteria (minimum CGPA, pass in all Courses as on date, and any other qualifying criteria) as applicable / stipulated by the concerned Industry / Company or academic / research institution for award of the Internship to a student;

18.1.3 The number of Internships available for the concerned Academic Term. Further, the available number of internships shall be awarded to the students by the University on the basis of merit using the CGPA secured by the student. Provided further, the student fulfils the criteria, as applicable, specified by the Industry / Company or academic / research institution providing the Internship, as stated in Sub-Clause 18.1.2 above.

18.1.4 A student may opt for Internship in an Industry / Company or academic / research institution of her / his choice, subject to the condition that the concerned student takes the responsibility to arrange the Internship on her / his own. Provided further, that the Industry / Company or academic / research institution offering such Internship confirms to the University that the Internship shall be conducted in accordance with the Program Regulations and Internship Policy of the University.

18.1.5 A student selected for an Internship in an industry / company or academic / research institution shall adhere to all the rules and guidelines prescribed in the Internship Policy of the University.

18.2 Project Work

A student may opt to do a Project Work for a period of 4-6 weeks in an Industry / Company or academic / research institution or the University Department(s) as an equivalence of Internship during the Semester Break between 4th and 5th Semesters or 6th and 7th Semesters or during the 5th / 6th / 7th Semester as applicable, subject to the following conditions:

18.2.1 The Project Work shall be approved by the concerned HOD and be carried out under the guidance of a faculty member.

18.2.2 The student may do the project work in an Industry / Company or academic / research institution of her / his choice subject to the above mentioned condition (Sub-Clause 18.2.1). Provided further, that the Industry / Company or academic / research institution offering such project work confirms to the University that the project work will be conducted in

accordance with the Program Regulations and requirements of the University.

18.3 Capstone Project

A student may undergo a Capstone Project for a period of 12-14 weeks in an industry / company or academic / research institution in the 7th / 8th Semester as applicable, subject to the following conditions:

18.3.1 The Capstone Project shall be in conducted in accordance with the Capstone Project Policy prescribed by the University from time to time.

18.3.2 The selection criteria (minimum CGPA, pass in all Courses as on date, and any other qualifying criteria) as applicable / stipulated by the concerned Industry / Company or academic / research institution for award of the Capstone Project to a student;

18.3.3 The number of Capstone Project available for the concerned Academic Term. Further, the available number of Capstone Project shall be awarded to the students by the University on the basis of merit using the CGPA secured by the student. Provided further, the student fulfils the criteria, as applicable, specified by the Industry / Company or academic / research institution providing the Capstone Project, as stated in Sub-Clause 2.6.3.2 above.

18.3.4 A student may opt for Capstone Project in an Industry / Company or academic / research institution of her / his choice, subject to the condition that the concerned student takes the responsibility to arrange the I Capstone Project on her / his own. Provided further, that the Industry / Company or academic / research institution offering such Capstone Project confirms to the University that the Capstone Project shall be conducted in accordance with the Program Regulations and Internship Policy of the University.

18.3.5 A student selected for a Capstone Project in an industry / company or academic / research institution shall adhere to all the rules and guidelines prescribed in the Capstone Project Policy of the University.

18.4 Research Project / Dissertation

A student may opt to do a Research Project / Dissertation for a period of 12-14 weeks in an Industry / Company or academic / research institution or the University Department(s) as an equivalence of Capstone Project, subject to the following conditions:

18.4.1 The Research Project / Dissertation shall be approved by the concerned HOD and be carried out under the guidance of a faculty member.

18.4.2 The student may do the Research Project / Dissertation in an Industry / Company or academic / research institution of her / his choice subject to the above mentioned condition (Sub-Clause 18.4.1). Provided further, that the Industry / Company or academic / research institution offering such Research Project / Dissertation confirms to the University that the Research Project / Dissertation work will be conducted in accordance with the Program Regulations and requirements of the University.

19. List of Elective Courses under various Specialisations / Stream Basket

Table 3.5: Professional Electives Courses/Specialization Tracks							
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Pre-requisites**
Track 1 – General							
1	CIV3109	Remote Sensing and Geographical Information System	2	0	2	3	-
2	CIV3110	Construction Technology and Processes	3	0	0	3	-
3	CIV3111	Advanced Concrete Technology	3	0	0	3	CIV2100
4	CIV3112	Alternative Building Materials	3	0	0	3	CIV2100
5	CIV3113	Design Concepts of Building Services	3	0	0	3	-
6	CIV3114	Integration of SDGs in Civil Engineering	3	0	0	3	-
7	CIV3115	Optimization methods for Civil Engineering	3	0	0	3	MAT2503
8	CIV3116	Development and Applications of Special Concretes	3	0	0	3	CIV2100
9	CIV3117	Advanced Geomatics	2	0	2	3	-
Track 2 – Structural Engineering							
1	CIV3400	Matrix methods of structural analysis	3	0	0	3	CIV2507
2	CIV3401	Theory of Elasticity	3	0	0	3	CIV2507
3	CIV3402	Structural Dynamics	3	0	0	3	CIV2507
4	CIV3403	Finite Element Method	3	0	0	3	CIV3413
5	CIV3404	Masonry structures	3	0	0	3	-
6	CIV3405	Advanced RCC structures	3	0	0	3	CIV2508
7	CIV3406	Design of Retaining Structures	3	0	0	3	CIV2508
8	CIV3407	Repair and rehabilitation of structures	3	0	0	3	CIV2508
9	CIV3408	Structural Health Monitoring	3	0	0	3	CIV2508
10	CIV3409	Advanced Design of Steel Structures	3	0	0	3	CIV2510
11	CIV3410	Earthquake resistant Design of Structures	3	0	0	3	CIV3408
12	CIV3411	Advanced Prestressed Concrete Design	3	0	0	3	CIV2509
13	CIV3412	Bridge Design	3	0	0	3	CIV2508
14	CIV3413	Design of Industrial structures	3	0	0	3	CIV2510
Track 3 - Transportation and Geotechnical Engineering							
1	CIV3414	Railway Engineering and Tunnelling	3	0	0	3	CIV2101 CIV2501
2	CIV3415	Airport Engineering and Harbour	3	0	0	3	CIV2101 CIV2501
3	CIV3416	Urban Transport Planning	3	0	0	3	CIV2101 CIV2501
4	CIV3417	Traffic Engineering	3	0	0	3	CIV2101 CIV2501
5	CIV3418	Highway Geometric Design	3	0	0	3	CIV2101 CIV2501
6	CIV3419	Pavement Design	3	0	0	3	CIV2101

Table 3.5: Professional Electives Courses/Specialization Tracks							
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Pre-requisites**
7	CIV3420	Highway Construction and Maintenance	3	0	0	3	CIV2101 CIV2501
8	CIV3421	Advanced Soil Mechanics	3	0	0	3	CIV2512
9	CIV3422	Stability of Slopes	3	0	0	3	CIV2514
10	CIV3423	Ground Improvement Techniques	3	0	0	3	CIV2512
11	CIV3424	Reinforced Earth Structures	3	0	0	3	CIV2514
12	CIV3425	Advanced Foundation Design	3	0	0	3	CIV2508 CIV2514
13	CIV3426	Earth and Earth Retaining Structures	3	0	0	3	CIV2508 CIV2514
14	CIV3427	Design of soil structures with Geosynthetics	3	0	0	3	CIV2514
Track 4 - Water Resources and Environmental Engineering							
1	CIV3428	Environmental Pollution and Control	3	0	0	3	-
3	CIV3429	Ground Water Hydrology	3	0	0	3	CIV2505
4	CIV3430	Climate Change and Sustainable Development	3	0	0	3	-
5	CIV3431	Urban Waste Management	3	0	0	3	-
6	CIV3432	Urban Flooding: Analysis and Control	3	0	0	3	CIV2505
7	CIV3433	Integrated Watershed Management	3	0	0	3	CIV2505
8	CIV3434	Environmental Hydraulics	3	0	0	3	CIV2515
9	CIV3435	Industrial wastewater treatment	3	0	0	3	CIV2516
10	CIV3436	Open Channel Flow	3	0	0	3	CIV2505
11	CIV3437	Water Resource Management	3	0	0	3	CIV2505
12	CIV3438	Advanced Fluid Mechanics	3	0	0	3	CIV2503
13	CIV3439	Statistics in Hydrology	3	0	0	3	CIV2505
Track 5 - Infrastructure Development							
1	CIV3441	Introduction to Infrastructure System and Planning	3	0	0	3	-
2	CIV3442	Urban Planning and Design	3	0	0	3	-
3	CIV3443	Construction Equipment and Machinery	3	0	0	3	-
4	CIV3444	Construction Quality and Safety	3	0	0	3	-
5	CIV3445	Project Management in Infrastructure Development	3	0	0	3	CIV2519
6	CIV3446	Construction Practices and Challenges in Infrastructure Projects	3	0	0	3	-
7	CIV3447	Applications of Remote Sensing and GIS in Infrastructure Development	3	0	0	3	CIV2101
8	CIV3448	Environmental Impact Assessment for Infrastructure Projects	3	0	0	3	-
9	CIV3449	Geospatial Analysis in Urban Planning	2	0	2	3	CIV2101

Table 3.5: Professional Electives Courses/Specialization Tracks							
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Pre-requisites**
10	CIV3800	Construction Economics and Finance	3	0	0	3	-
11	CIV3801	Infrastructure Projects Financing	3	0	0	3	-
Track 6 – Smart Cities							
1	CIV3450	Built Environment Design	3	0	0	3	-
2	CIV3451	Fundamentals of Smart City	3	0	0	3	-
3	CIV3452	Urban Mobility	3	0	0	3	CIV2501
4	CIV3453	Urban sanitation and hygiene	3	0	0	3	CIV2516
5	CIV3454	Smart Materials and Structures	3	0	0	3	CIV2100 CIV2500
6	CIV3455	Urban Air Pollution and Control	3	0	0	3	-
7	CIV3456	Intelligent Transportation Systems	3	0	0	3	CIV2501
8	CIV3802	Smart City Energy systems and Management	3	0	0	3	EEE1200
9	CIV3803	IoT in Construction	3	0	0	3	ECE1511
10	CIV3804	Construction Economics and Financing for Smart Cities	3	0	0	3	-
11	CIV3805	Big Data Analytics for Civil Engineers	2	0	2	3	CSE1700 CSE1701

20. List of Open Electives to be offered by the School / Department

Table 3.6: Open Elective Courses Baskets: *Minimum Credits to be earned from this Basket is 06*							
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Anti-requisites**
Chemistry Basket							
1	CHE3001	Smart Materials and 3D Printing	3	0	0	3	-
2	CHE3002	Energy and Sustainability	3	0	0	3	-
3	CHE3003	Nano technology and its applications	3	0	0	3	-
4	CHE3004	Corrosion and control	3	0	0	3	-
5	CHE3005	Green Chemistry and Sustainable Technology	3	0	0	3	-
6	CHE3006	Food Technology	3	0	0	3	-
Civil Engineering Basket (not to be offered for Civil Engineering Department students)							
1	CIV3100	Disaster mitigation and management	3	0	0	3	-
2	CIV3101	Sustainability Concepts in Engineering	3	0	0	3	-
3	CIV3102	Occupational Health and Safety	3	0	0	3	-
4	CIV3103	Sustainable Materials and Green Buildings	3	0	0	3	-
5	CIV3104	Integrated Project Management	3	0	0	3	-
6	CIV3105	Environmental Impact Assessment	3	0	0	3	-

Table 3.6: Open Elective Courses Baskets: *Minimum Credits to be earned from this Basket is 06*							
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Anti-requisites**
7	CIV3106	Infrastructure Systems for Smart Cities	3	0	0	3	-
8	CIV3107	Geospatial Applications for Engineers	2	0	2	3	-
9	CIV3108	Environmental Meteorology	3	0	0	3	-
Commerce Basket							
1	COM1020	Business Accounting & Financial Analysis	2	1	0	3	-
Design Basket							
1	DES2001	Design Thinking	3	0	0	3	-
Electrical and Electronics Engineering Basket							
1	EEE3100	IoT based Smart Building Technology	3	0	0	3	-
2	EEE3101	Basic Circuit Analysis	3	0	0	3	-
3	EEE3102	Fundamentals of Industrial Automation	3	0	0	3	-
4	EEE3103	Electric Vehicles & Battery technology	3	0	0	3	-
5	EEE3104	Smart Sensors for Engineering Applications	3	0	0	3	-
Electronics and Communication Engineering Basket							
1	ECE3800	Fundamentals of Electronics	3	0	0	3	-
2	ECE3801	Microprocessor based systems	3	0	0	3	-
3	ECE3802	Artificial Neural Networks	3	0	0	3	-
4	ECE3803	Smart Electronics in Agriculture	3	0	0	3	-
5	ECE3804	Environment Monitoring Systems	3	0	0	3	-
6	ECE3805	Consumer Electronics	3	0	0	3	-
7	ECE3806	Product Design of Electronic Equipment	3	0	0	3	-
8	ECE3807	Introduction to Data Analytics	3	0	0	3	-
9	ECE3808	Machine Vision for Robotics	3	0	0	3	-
English Basket							
1	ENG1906	Law and Crime in Popular Imagination	3	0	0	3	-
2	ENG1909	Exploring Gender: Narratives from Campus to Community	3	0	0	3	-
3	ENG1910	Trauma Narratives: From Page to Pixel	3	0	0	3	-
4	ENG1911	'Nonsense' Across Media	3	0	0	3	-
5	ENG1912	Language and Interpretation	3	0	0	3	-
Foreign Language Basket							
1	FRL1003	French for Beginners	3	0	0	3	-
2	GER1001	German for Beginners	3	0	0	3	
Law Basket							
1	LAW2015	Cyber Law	3	0	0	3	-
Management Basket							
1	MGT2015	Engineering Economics	3	0	0	3	-
2	MGT2020	Marketing Fundamentals for Engineers	3	0	0	3	-
3	MGT2021	Finance for Engineers	3	0	0	3	-
4	MGT2007	Digital Entrepreneurship	3	0	0	3	-
5	BBA2088	Management and Behavioural Practices	3	0	0	3	-
Mathematics Basket							
1	MAT3030	Optimization Techniques for Engineers	3	0	0	3	CIV3115
2	MAT3031	Basic Statistics & Data Analysis	3	0	0	3	-

Table 3.6: Open Elective Courses Baskets: *Minimum Credits to be earned from this Basket is 06*							
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Anti-requisites**
3	MAT3032	Mathematics for Machine Learning	3	0	0	3	-
4	MAT3033	Bioinformatics & Computational Biology	3	0	0	3	-
5	MAT3034	Time-Frequency Transforms for Signal Analysis	3	0	0	3	-
6	MAT3035	Mathematical Modelling	3	0	0	3	-
7	MAT3036	Bio-Statistics and Bio-Modelling	3	0	0	3	-
8	MAT3037	Linear Algebra & Matrix Theory	3	0	0	3	-
9	MAT3038	Financial Mathematics	3	0	0	3	-
10	MAT3039	Fuzzy Logic & Neural Networks	3	0	0	3	-
11	MAT3040	Discrete Mathematics	3	0	0	3	-
12	MAT3041	Statistical Reasoning & Data Analysis	3	0	0	3	-
13	MAT3042	Actuarial Mathematics	3	0	0	3	-
14	MAT3043	Financial Mathematics	3	0	0	3	-
15	MAT3044	Mathematical Modelling	3	0	0	3	-
Mechanical Basket							
1	MEC3250	Engineering Drawing	1	0	4	3	-
2	MEC3251	Supply Chain Management	3	0	0	3	-
3	MEC3252	Six Sigma for Professionals	3	0	0	3	-
4	MEC3253	Fundamentals of Aerospace Engineering	3	0	0	3	-
5	MEC3254	Safety Engineering	3	0	0	3	-
6	MEC3255	Additive Manufacturing	3	0	0	3	-
7	MEC3256	Sustainable Technologies and Practices	3	0	0	3	-
8	MEC3257	Industry 4.0	3	0	0	3	-
Media Studies Basket							
1	BAJ 1024	Media Psychology	3	0	0	3	-
2	BAJ 1025	Creative Writing for Media	3	0	0	3	-
3	BAJ 1026	Multimedia Storytelling	3	0	0	3	-
4	BAJ 1027	Digital Advertising & Branding	3	0	0	3	-
5	BAJ 1028	Content Creation for Social Media	3	0	0	3	-
Petroleum Basket							
1	PET3301	Energy Industry Dynamics	3	0	0	3	-
2	PET3302	Energy Sustainability Practices	3	0	0	3	-

21. List of MOOC (NPTEL) Courses

21.1. NPTEL - Professional Elective Courses for B.Tech. (Civil Engineering)

Sl. No.	Course ID	Course Name	Duration
1	noc25-ce06	Applied Seismology for Engineers	12 Weeks
2	noc25-ce19	Environmental Remediation of Contaminated Sites	12 Weeks
3	noc25-ce22	Free Surface Flows	12 Weeks
4	noc25-ce27	Geophysical Exploration Methods	12 Weeks
5	noc25-ce41	Modern Construction Materials	12 Weeks
6	noc25-ce51	Soil Dynamics	12 Weeks
7	noc25-ce52	Soil Structure Interaction	12 Weeks
8	noc25-ce57	Surface Water Hydrology	12 Weeks
9	noc25-ce61	Unsaturated Soil Mechanics	12 Weeks
10	noc25-ch24	Environmental Quality Monitoring & Analysis	12 Weeks
11	noc25-ce28	Geosynthetics and Reinforced Soil Structures	12 Weeks

21.2. NPTEL - Open Elective Courses for B.Tech. (Civil Engineering)

Sl. No.	Course ID	Course Name	Duration
1	noc25-ce59	The Evolution of the Earth and Life	12 Weeks
2	noc25-ce71	Tectonics and Geodynamics	12 Weeks
3	noc25-cs43	Introduction To Industry 4.0 And Industrial Internet of Things	12 Weeks
4	noc25-de04	Strategies for Sustainable Design	12 Weeks
5	noc25-de07	Understanding Incubation and Entrepreneurship	12 Weeks
6	noc25-de08	Usability Engineering	12 Weeks
7	noc25-ge31	Rural Water Resources Management	12 Weeks
8	noc25-hs12	Education for Sustainable Development	12 Weeks
9	noc25-hs19	English language for competitive exams	12 Weeks
10	noc25-hs42	Introduction to Environmental Economics	12 Weeks
11	noc25-hs43	Introduction to Japanese Language and Culture	12 Weeks
12	noc25-hs59	Online Communication in the Digital Age	12 Weeks
13	noc25-hs61	Patent Law for Engineers and Scientists	12 Weeks
14	noc25-hs68	Psychology Of Stress, Health and Well-Being	12 Weeks
15	noc25-hs81	United Nations Sustainable Development Goals (UN SDGs)	12 Weeks
16	noc25-mg38	Leadership and Team Effectiveness	12 Weeks
17	noc25-mg51	Organizational Design Change and Transformation	12 Weeks
18	noc25-mg57	Safety and Risk Analytics	12 Weeks
19	noc25-mm04	Bulk Material Transport and Handling Systems	12 Weeks
20	noc25-mm18	Material Characterization	12 Weeks
21	noc25-ch92	Engineering Aspects of Biofuels and Biomass Conversion Technologies	12 Weeks

Note: The NPTEL courses listed above are subjected to change based on the offering of NPTEL. The updated list of NPTEL courses shall be notified before the commencement of the

semester after the same is approved by BoS and the same shall also be updated in the table above.

22. Recommended Semester Wise Course Structure / Flow including the Programme / Professional Elective Paths / Options

Semester 1 – Chemistry Cycle										
Sl. No.	**Course Code**	**Course Name**	**Credit Structure**					**Basket**	**Type of Skill**	**Course Addresses to**
			L	**T**	**P**	**C**	**Contact Hours**			
1	ENG1900	English for Technical Communication	2	0	0	2	2	HSMC	S	HP
2	MAT2301	Calculus and Differential Equations	3	1	0	4	4	BSC	S	
3	CHE2505	Materials Chemistry for Engineers	3	0	0	3	3	BSC	S	
4	EEE1200	Basics of Electrical and Electronics Engineering	3	0	0	3	3	ESC	S	
5	CIV1200	Foundations of Integrated Engineering	2	0	0	2	2	ESC	S	
6	CIV1501	Elements of Engineering Mechanics	3	0	0	3	3	ESC	S	
7	CHE2506	Materials Chemistry Lab	0	0	2	1	2	BSC	S	
8	EEE1250	Basics of Electrical and Electronics Engineering Lab	0	0	2	1	2	ESC	S	
9	LAW7601	Indian Constitution	-	-	-	0	0	MAC		HP
10	PPS1025	Industry Readiness Program - I	0	0	2	0	2	MAC	EM	HP
Total			**16**	**1**	**6**	**19**	**23**			

Semester 2 – Physics Cycle										
Sl. No.	**Course Code**	**Course Name**	**Credit Structure**					**Basket**	**Type of Skill**	**Course Addresses to**
			L	**T**	**P**	**C**	**Contact Hours**			
1	ENG2501	Advanced English	2	0	0	2	2	HSMC	S	HP
2	DES1146	Introduction to Design Thinking	1	0	0	1	1	HSMC	S	HP
3	MAT2302	Transform Techniques, Partial Differential Equations and Complex Variables	3	1	0	4	4	BSC	S	
4	PHY2503	Fundamentals of Materials Physics	3	0	0	3	3	BSC	S	
5	MEC1006	Engineering Graphics	2	0	0	2	2	ESC	S	
6	CIV2100	Building Materials and Concrete Technology	3	0	0	3	3	PCC	S	HP
7	PHY2506	Fundamentals of Materials Physics Lab	0	0	2	1	2	BSC	S	
8	ECE1511	Design Workshop	1	0	2	2	3	ESC	S	

9	CHE7601	Environmental Studies	-	-	-	0	0	MAC	S	ES
10	PPS1026	Industry Readiness Program – II	0	0	2	0	2	MAC	S	HP
Total			**15**	**1**	**6**	**18**	**22**			

Semester 3										
Sl. No.	**Course Code**	**Course Name**	**Credit Structure**					**Basket**	**Type of Skill**	**Course Addresses to**
			L	**T**	**P**	**C**	**Contact Hours**			
1	FIN1002	Essentials of Finance	3	0	0	3	3	HSMC	EM	
2	MAT2303	Linear Algebra and Vector Calculus	3	1	0	4	4	BSC	S	
3	CIV2500	Strength of Materials	3	1	0	4	4	ESC	S	
4	CIV2501	Transportation Engineering	3	0	0	3	3	PCC	S	
5	CIV2503	Fluid Mechanics	3	1	0	4	4	PCC	S	
6	CIV2101	Surveying	3	0	0	3	3	PCC	S	
7	CIV2102	Surveying Lab	0	0	2	1	2	PCC	S	
8	CIV1201	Engineering Geology Lab	0	0	2	1	2	ESC	S	
9	APT4002	Introduction to Aptitude	0	0	2	0	2	MAC	S	
10	CIV7601	Universal Human Values and Ethics	-	-	-	0	0	MAC	S	HP
Total			**18**	**3**	**6**	**23**	**27**			

Semester 4										
Sl. No.	**Course Code**	**Course Name**	**Credit Structure**					**Basket**	**Type of Skill**	**Course Addresses to**
			L	**T**	**P**	**C**	**Contact Hours**			
1	MAT2304	Numerical Methods, Probability Distributions and Sampling Techniques	3	1	0	4	4	BSC	S	
2	CSE2282	Computational Thinking and AI Programming	3	0	0	3	3	ESC	S	
3	CIV2506	Analysis of Determinate Structures	3	0	0	3	3	PCC	S	
4	CIV2512	Geotechnical Engineering	3	0	0	3	3	PCC	S	
5	CIV2505	Hydrology and Irrigation Systems	3	0	0	3	3	PCC	S	
6	CIV2515	Water Infrastructure Systems	3	0	0	3	3	PCC	S	ES
7	CSE2283	Computational Thinking and AI Programming Lab	0	0	2	1	2	ESC	S	
8	CIV2511	Construction Materials Testing Lab	0	0	2	1	2	PCC	S	

9	CIV2504	Fluid Mechanics Lab	0	0	2	1	2	PCC	S	
10	APT4004	Aptitude Training - Intermediate	0	0	2	0	2	MAC	S	
Total			**18**	**1**	**8**	**22**	**27**			

Semester 5										
Sl. No.	**Course Code**	**Course Name**	**Credit Structure**					**Basket**	**Type of Skill**	**Course Addresses to**
			L	**T**	**P**	**C**	**Contact Hours**			
1	CIV2507	Analysis of Indeterminate Structures	3	0	0	3	3	PCC	S	
2	CIV2508	Design of RCC Structural Elements	3	1	0	4	4	PCC	S	HP
3	CIV2514	Foundation Engineering	3	0	0	3	3	PCC	S	
4	CIV2516	Waste Water Treatment and Disposal Systems	3	0	0	3	3	PCC	S	ES
5	CIV3XXX	Professional Elective - I	3	0	0	3	3	PEC	EM	
6	CIV3XXX	Professional Elective - II	3	0	0	3	3	PEC	EM	
7	CIV2513	Geotechnical Engineering Lab	0	0	2	1	2	PCC	S	
8	CIV2103	Building Planning and Drawing	0	0	2	1	2	PCC	S	
9	APT4006	Logical and Critical Thinking	0	0	2	0	2	HSMC	EM	
10	CIV7100	Minor Project [#] (Extensive Survey Project)	-	-	-	4	0	PRW	EM	HP/ ES
Total			**18**	**1**	**6**	**25**	**25**			

[#] Note: Students will undergo Minor Project during the summer break between the fourth and fifth semesters and the credits earned will be accounted for in the fifth semester.

Semester 6										
Sl. No.	**Course Code**	**Course Name**	**Credit Structure**					**Basket**	**Type of Skill**	**Course Addresses to**
			L	**T**	**P**	**C**	**Contact Hours**			
1	CIV2510	Design of Structural Steel Elements	3	0	0	3	3	PCC	S	HP
2	CIV2518	Quantity Surveying, Cost Estimation and Valuation	3	1	0	4	4	PCC	S	
3	CIV2509	Analysis and Design of Pre-Stressed Concrete Elements	3	0	0	3	3	PCC	S	HP
4	CIV3XXX	Professional Elective - III	3	0	0	3	3	PEC	EM	
5	CIV3XXX	Professional Elective - IV	3	0	0	3	3	PEC	EM	
6	XXXXXXX	Open Elective - I	3	0	0	3	3	OEC	S	
7	CIV2517	Environmental Engineering Lab	0	0	2	1	2	PCC	S	ES
8	CIV2502	Infrastructure Materials Testing Lab	0	0	2	1	2	PCC	S	HP

9	CIV2521	Building Information Modelling Lab	0	0	2	1	2	PCC	S	
10	APT4005	Aptitude for Employability	0	0	2	1	2	HSMC	EM	
Total			**18**	**1**	**8**	**23**	**27**			

Semester 7										
Sl. No.	**Course Code**	**Course Name**	**Credit Structure**					**Basket**	**Type of Skill**	**Course Addresses to**
			L	**T**	**P**	**C**	**Contact Hours**			
1	CIV2523	Design of Irrigation Water Resources Systems	3	0	0	3	3	PCC	S	ES
2	CIV2519	Construction Project Management	3	0	0	3	3	PCC	S	
3	CIV3XXX	Professional Elective - V	3	0	0	3	3	PEC	EM	
4	CIV3XXX	Professional Elective - VI	3	0	0	3	3	PEC	EM	
5	XXXXXXX	Open Elective - II	3	0	0	3	3	OEC	S	
6	CIV2520	Construction Project Management Lab	0	0	2	1	2	PCC	S	
7	CIV2522	Computer Aided Analysis and Detailing Lab	0	0	2	1	2	PCC	S	HP
8	PPS3018	Preparedness for Interview	0	0	2	1	2	HSMC	EM	HP
9	CIV7000	Internship	-	-	-	2	0	PRW	EM	
Total			**15**	**0**	**6**	**20**	**21**			

##Note: Students will undergo Internship during the summer break between the sixth and seventh semesters and the credits earned will be accounted for in the seventh semester.

Semester 8										
Sl. No.	**Course Code**	**Course Name**	**Credit Structure**					**Basket**	**Type of Skill**	**Course Addresses to**
			L	**T**	**P**	**C**	**Contact Hours**			
1	CIV7300	Capstone Project	-	-	-	10	0	PRW	EM	HP/ ES
Total			**-**	**-**	**-**	**10**	**0**			

23. Course Catalogue

<table>
<tr><td>Course Code: ENG1900</td><td>Course Title: English for Technical Communication
Type of Course: Humanities and Social Sciences including Management Courses (HSMC) and
Theory Only</td><td>L-T-P-C</td><td>2</td><td>0</td><td>0</td><td>2</td></tr>
<tr><td>Version No.</td><td colspan="6">1.0</td></tr>
<tr><td>Course Pre- requisites</td><td colspan="6">+2 Level</td></tr>
<tr><td>Anti-requisites</td><td colspan="6">NIL</td></tr>
<tr><td>Course Description</td><td colspan="6">This course enhances the technical communication skills of BTech students, focusing on clarity, precision, and conciseness in academic and professional settings. Students will learn to differentiate between general and technical communication, analyze technical content, develop structured writing skills, and deliver effective presentations. Through interactive activities such as TED Talk analyses, report writing, and presentation practice, the course provides hands-on experience for real-world applications. By the end, students will be equipped to communicate complex technical information effectively in various professional contexts.</td></tr>
<tr><td>Course Outcomes</td><td colspan="6">On successful completion of the course the students shall be able to:
1. Differentiate between general and technical communication.
2. Explain key reading comprehension techniques to enhance understanding of technical texts.
3. Write clear, concise, and well-structured technical reports and documents.
4. Deliver technical presentations and implement peer feedback for continuous improvement.
5. Explain ethical practices in digital communication for professional use.</td></tr>
<tr><td colspan="7">Course Content: Theory</td></tr>
<tr><td>Module 1</td><td colspan="2">Technical communication</td><td>Quiz</td><td colspan="2">Listening</td><td>9 Sessions</td></tr>
<tr><td colspan="7">Introduction to Communication
Technical vs. General Communication
Characteristics of technical communication
Importance of clarity, precision, and objectivity

Activity:
Watching TED Talks/videos to identify differences in technical and general vocabulary</td></tr>
<tr><td>Module 2</td><td colspan="2">Technical Reading</td><td>Assignment</td><td colspan="2">Reading</td><td>12 Sessions</td></tr>
<tr><td colspan="7">Reading Comprehension
Note making & Notetaking
Content Analysis
Activity:
• Reading technical articles and answering comprehension questions
• Note making techniques</td></tr>
</table>

Module 3	**Technical Writing**	**Assignment**	**Writing**	**12 Sessions**
Paragraph Writing Structure of a paragraph (topic sentence, supporting details, coherence) Report Writing Structure of technical and project reports (Introduction, Methods, Results, Discussion) **Activity:** • Writing a structured paragraph on a technical topic • Writing project reports				
Module 4	**Professional Presentation**	**Presentation**	**Speaking**	**12 Sessions**
Introduction to Presentation Skills Preparing a Presentation • Structuring content (Introduction, Body, Conclusion) • Designing effective slides (Text. visual aids, readability, and impact) Delivering a Presentation • Engagement techniques, Storytelling, narration, pitching ideas handling Q&A • Conviction, commitment, generating interest through enthusiasm Demonstration & Practice • Giving presentations on topics based on their academic interest • Evaluating and providing peer feedback **Activity:** • Analyze a real-world engineering issue and present solutions using a structured approach.				
Targeted Application & Tools that can be used: YouTube, Instagram, Quill Bot, Grammarly, & Padlet.				
References: Text books: 1. Gupta, R.C. *Technical Communication.* 2nd ed., Cambridge University Press, 2021. 2. Lannon, John M., and Laura J. Gurak. *Technical Communication.* 15th ed., Pearson, 2022. Reference Books: 1. Gerson, Sharon J., and Steven M. Gerson. Technical Communication: Process and Product. 9th ed., Pearson, 2020. 2. Lannon, John M., and Laura J. Gurak. Technical Communication. 15th ed., Pearson, 2022. 3. Markel, Mike, and Stuart A. Selber. Technical Communication. 13th ed., Bedford/St. Martin's, 2020. Web Resources: 1. https://owl.purdue.edu/owl/subject_specific_writing/technical_writing. 2. https://journals.ieeeauthorcenter.ieee.org/. 3. https://www.stc.org/. 4. https://ocw.mit.edu/.https://www.ted.com/talks. https://owl.purdue.edu/owl/subject_specific_writing/professional_technical_writing/digital_writing.html				
Topics Relevant to "employability": Teamwork and Collaboration, Critical Thinking and Problem- Solving Topics Relevant to "Human Values and Professional Ethics": Critical reasoning, Inclusivity and Fairness				
Catalogue prepared by	Dr. Vinodhini Chinnaswamy & Dr. T. Naresh Naidu			
Recommended by the Board of Studies on				

Date of Approval by the Academic Council	

<table>
<tr><td>Course Code:
ENG2501</td><td colspan="3">Course Title: Advanced English
Type of Course: Humanities and Social Sciences including Management Courses (HSMC) and Theory Only</td><td>L-T-P-C</td><td>2</td><td>0</td><td>0</td><td>2</td></tr>
<tr><td>Version No.</td><td colspan="8">2.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="8">ENG1002 Technical English</td></tr>
<tr><td>Anti-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Course Description</td><td colspan="8">This course is designed to equip students to enhance their communication abilities in Listening, Speaking, Reading, and Writing. The curriculum covers interpersonal communication principles, the art of speech writing and delivery (including impromptu speaking), strategic approaches to critical reading, the identification of logical fallacies, and persuasive writing. Furthermore, the course will introduce students to the potential of AI tools and the techniques of prompt engineering to elevate their communication skills in the digital age. Upon course completion, students will be well-prepared to communicate effectively and critically in both academic and professional environments.</td></tr>
<tr><td>Course Outcomes</td><td colspan="8">On successful completion of the course the students shall be able to:
1. Recognize the elements of interpersonal and cross-cultural communication to address communication challenges effectively.
2. Demonstrate the ability to deliver structured and impromptu speeches using effective speaking techniques.
3. Interpret textual and visual materials using critical reading strategies to evaluate arguments, logic, and persuasion.
4. Produce persuasive and analytical essays using effective argumentation techniques and structured writing strategies.</td></tr>
<tr><td colspan="9">Course Content: Theory</td></tr>
<tr><td>Module 1</td><td colspan="2">Foundations of Effective Communication</td><td>Case Studies/ Role play</td><td colspan="2">Cross-Cultural Competency</td><td colspan="3">4 Classes</td></tr>
<tr><td colspan="9">Topics:
• Fundamentals of Interpersonal Communication
• Verbal, Non-verbal, and Paraverbal communication.
• Cultural dimensions theory (Hofstede’s Cultural Dimensions).
• Active Listening Techniques
• Common Errors in Communication</td></tr>
<tr><td>Module 2</td><td colspan="2">Mastering Speech Delivery</td><td>JAM</td><td colspan="2">Public Speaking Confidence</td><td colspan="3">4 Classes</td></tr>
<tr><td colspan="9">Topics:
• Introduction to Prompt Engineering
• Speech Preparation and Organization
• Techniques for Effective Impromptu Speaking
• Practice Speech Delivery</td></tr>
<tr><td>Module 3</td><td colspan="2">Critical Reading and Logical Analysis</td><td>Worksheet</td><td colspan="2">Critical Thinking and Analysis</td><td colspan="3">4 Classes</td></tr>
</table>

Topics:

- Critical Reading Strategies: Contextualizing, Figurative Language, Evaluating Logic of an Argument, Recognizing Emotional Manipulation, Analysing Visuals
- Recognizing Logical Fallacies: Slippery Slope, False Dilemma, Post Hoc, Hasty Generalization, Ad Hominem, Straw Man, Bandwagon, No True Scotsman, Red Herring, Appeal to Authority, Sunk Cost, Appeal to ignorance

Module 4	Writing Effective Arguments	Assignment	Clear and Coherent Writing	3 Classes

Topics:

- Understanding Critical Writing
- Building Arguments (Pathos, Ethos, Logos)
- Techniques for Persuasion

Course Content: Practical Sessions

Module 1	Foundations of Effective Communication	8 Classes

1. Interpersonal Communication
   Charades with a Twist/Tone and Emotion Experiment/Mixed Messages Challenge/Role Reversal Conversations/Observation Exercise
2. Cross-cultural Communication
   Cultural Iceberg Analysis/Role-Play: Cross- Cultural Scenarios/Stereotypes vs Realities/Cross- /Cultural Negotiation Exercise/Cultural Sensitivity Case Studies
3. Active Listening
   Bingo TEDx/Story Building/Listening for Key Details/Interactive Podcast Listening/Fact or Opinion
4. Instagram/YouTube Vocabulary Activity

Module 2	Mastering Speech Delivery	8 Classes

5. Speech Writing
6. Impromptu Speech
   JAM /"Would You Rather" Explainer/Picture Prompt Speech/Reverse Speech Crafting

Module 3	Critical Reading and Logical Analysis	8 Classes

7. Critical Reading Strategies
   Critical Reading Worksheet/Identifying Bias in News Articles
8. Recognizing Logical Fallacies
   Debate Challenge with Fallacy Detection/ Fallacy Investigation with Podcasts or Social Media

Module 4	Writing Effective Arguments	6 Classes

9. Building Arguments
   Causes or Effects/Appeal Mash-Up/Debates on Controversial Topics
10. Persuasive Writing
    Creative Persuasive Writing/Opinion Writing

Targeted Application & Tools that can be used: Quizziz, Chatgpt, Gemini, Youtube, Instagram, Quillbot, Grammarly, Padlet

References

1. Adler, R. B., Rodman, G., & DuPré, A. (2019). *Understanding human communication (14th ed.)*. Oxford University Press.
2. Moore, B. N., & Parker, R. (2020). *Critical thinking* (13th ed.). McGraw-Hill Education.
3. DeVito, J. A. (2019). The interpersonal communication book (15th ed.). Pearson.
4. Ting-Toomey, S., & Dorjee, T. (2018). Intercultural competence: A model for teaching and assessing cross-cultural communication. *Journal of Intercultural Communication, 47*(2), 213–229. https://doi.org/10.1016/j.jicc.2018.03.004
5. https://www.ted.com/

Topics Relevant to "employability": Teamwork and Collaboration, Critical Thinking and Problem-Solving

Topics Relevant to "Human Values and Professional Ethics": Critical reasoning, Inclusivity and Fairness

Catalogue prepared by	Dr. Tychicus David, Dr. Jayalakshmi E
Recommended by the Board of Studies on	8th January 2025
Date of Approval by the Academic Council	

<table>
<tr><td>Course Code: APT4005</td><td colspan="2">Course Title: Aptitude For Employability Type of Course: Practical Only</td><td>L- T-P- C</td><td>0</td><td>0</td><td>2</td><td>1</td></tr>
<tr><td>Version No.</td><td colspan="7">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="7">Students should have the basic concepts of Quantitative aptitude, Verbal ability along with its applications in real life problems.</td></tr>
<tr><td>Anti-requisites</td><td colspan="7">Nil</td></tr>
<tr><td>Course Description</td><td colspan="7">This course is designed to enable the students to enhance their skills in quantitative aptitude and verbal ability skills.</td></tr>
<tr><td>Course Objective</td><td colspan="7">The objective of the course is to familiarize the learners with concepts in Quantitative Aptitude and Verbal ability through problem solving techniques suitable for their career development.</td></tr>
<tr><td>Course Outcomes</td><td colspan="7">On successful completion of the course the students shall be able to: CO1]
Recall all the basic mathematical concepts
CO2] Identify the principle concept needed in a question
CO3] Solve the quantitative and logical ability questions with the appropriate concept.</td></tr>
<tr><td colspan="8">Course Content:</td></tr>
<tr><td>Module 1</td><td colspan="2">Quantitative Ability</td><td>Lab-10hrs</td><td></td><td colspan="2">Platform Assessment-10hrs</td><td>20 Hours</td></tr>
<tr><td colspan="8">Topics:
Number System, Percentage, Ratio and Proportion, Average, Mixture and Allegation, Time and Work, Profit and Loss, Time Speed and Distance, Simple Interest and Compound Interest, Probability, Permutation and Combination.</td></tr>
<tr><td>Module 2</td><td colspan="2">Verbal Ability</td><td>Lab-5hrs</td><td></td><td colspan="2">Platform Assessment-5hrs</td><td>10 Hours</td></tr>
<tr><td colspan="8">Topics: - Parts of Speech, Subject Verb Agreement, Spotting Error, Cloze Test, Verbal Analogies,
Reading Comprehension, Idioms & Phrases, Para Jumbles</td></tr>
<tr><td colspan="8">Targeted Application & Tools that can be used:
Application area: Placement activities and Competitive examinations.
Tools: LMS</td></tr>
<tr><td>Evaluation</td><td colspan="7">Continuous Evaluation
• Topic wise evaluation</td></tr>
<tr><td colspan="8">Text Book
1. Fast track objective by Rajesh Verma
2. R S Aggarwal
3. S.P Bakshi</td></tr>
</table>

References 1. www.indiabix.com 2. www.testbook.com www.youtube.com/c/TheAptitudeGuy/videos	
Topics relevant to Skill development: Quantitative and reasoning aptitude for Skill Development through Problem solving Techniques. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Faculty of L&D
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	

Course Code: PPS3018	**Course Title:** Preparedness for Interview Type of Course: Practical Only Course	L- T- P- C	0	0	2	1
Version No.	1.0					
Course Pre-requisites	Students are expected to understand Basic English. Students should have desire and enthusiasm to involve, participate and learn.					
Anti-requisites	NIL					
Course Description	This course is designed to enable students to understand soft skills concepts to be corporate ready. The modules are set to improve self-confidence, communicate effectively and Prepare for the Interview to assist in employability. It helps the students to get a glimpse of the acceptable corporate readiness and equip them with the fundamental necessities of being able to confidently deal with the highly competitive corporate environment and helps in crafting different types of resumes. The pedagogy used will be group discussions, flipped classrooms, continuous feedback, role-play and mentoring.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "Preparing for Interview" and attain SKILL DEVELOPMENT through PARTICIPATIVE LEARNING techniques.					
Course Out Comes	On successful completion of this course the students shall be able to: CO1: Develop professional Resumes CO2: Illustrate Resumes effectively CO3: Apply skills and knowledge learnt for active and effective Group Discussions and Interview					
Course Content:						
Module 1	**Resume Building**	**Classroom activity**			10 Hours	
Topics: Resume structure, use of templates, Do's and Don'ts, ATS methods, Cover Letter and Video Resume **Activity:** Real world scenarios						
Module 2	**Group Discussion**	**Mock G D**			9 Hours	
Topics: Group discussion as a placement process, GD techniques like Keyword. SPELT & POV of affected parties. Do & Don't of GD, Case-lets and topics for GD, practice session and evaluation Activity: Real world scenarios						
Module 3	**Personal Interview**	**Grooming checks + Evaluation + Mock Interview+ Role Play**			9 Hours	

Topics: Placement process, Different interview rounds, HR interviews, Interview questions and desired answers, Different types of interviews, Do's and Don'ts. **Activity: -** Role Play & Real-world scenario				
Module 4	**Recap/Revision /Feedback Session**	**Practice sessions**		2 Hours
Targeted Application & Tools that can be used: 1. TED Talks 2. You Tube Links 3. Role Play activities				
Project work/Assignment: Continuous Individual Assessment				
The Topics related to Skill Development: Art Of Presentation and Group Discussion for **Skill Development** through **Participative Learning** Tech- niques. This is attained through assessment Component mentioned in course handout.				

Catalogue prepared by	**Faculty of L&D**
Recommended by the Board of Studies on	**BOS held on**
Date of Approval by the Academic Council	**Academic Council Meeting held on**

Course Code: DES1146	**Course Title:** Introduction to Design Thinking **Type of Course:** Theory		**L-T-P- C**	1	0	0	1
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The course aims to introduce students to the fundamental principles and processes of Design Thinking and will learn to apply Design Thinking methodologies to real-world challenges. The course emphasizes empathy, creativity, and collaboration, equipping students with essential skills for successful engineering practice.					
Course Objective	This course is designed to develop and familiarize the learners with the concepts of creating thinking and attain Entrepreneurship by using Participative Learning techniques.					
Course Outcomes	On successful completion of the course the students shall be able to: 1) Understand the concept and importance of Design Thinking. 2) Differentiate between traditional problem-solving and Design Thinking. 3) Identify the core stages of the Design Thinking process.					
Course Content:	All assignments and projects must be developed using the reference materials available from the PU e-resource database – JSTOR, EBSCO, Library OPAC, NPTEL Videos, etc.					
Module 1	Introduction to Design Thinking	Visual journal, book of essays, context-specific assignment/project	Visual output generation, by Visual Journal and narrative development.			**3 hours**
Topic 1) Definition and Introduction to Design Thinking 2) Understand the Design Thinking Process						
Module 2	Design Thinking in Action	Visual journal, book of essays, context-specific assignment/project	Visual output generation, by visual journal and narrative development.			**12 hours**
Topics: 1) Introduction to the steps of Design Thinking Process 2) Understand use cases of Design thinking 3) Design Thinking and Research Tools pertaining to Consumer Tech. , Home Tech. , Personal Tech. , Auto Tech. or Extended Reality.						
Targeted Application & Tools that can be used: 1) Design ideation tools like Miro , SCAMPER etc. 2) Research Tools for Human Centric Design using forecasting tools like WGSN 3) Feedback tools like Google Forms , etc. 4) Expert Lectures						
1. **Text Book**						

2. Thinking Design by S Balaram. New Delhi [India]: Sage Publications Pvt. Ltd. 2010. eBook., Database: eBook Collection (EBSCOhost)
3. https://puniversity.informaticsglobal.com:2284/ehost/detail/detail?vid=6&sid=18ab1f43-1f92-4d02-ae2e-a9c06dc06d8c%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=354920&db=nlebk

References

1. Design Thinking by Clarke, Rachel Ivy. Series: Library Futures, Vol. 4. Chicago: ALA Neal-Schuman. 2020. eBook., Database: eBook Collection (EBSCOhost)
2. https://puniversity.informaticsglobal.com:2282/ehost/detail/detail?vid=4&sid=c80a7d79-eda4-4b7e-a0d6-afafe437962b%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=2433506&db=nlebk
3. The Pocket Universal Methods of Design: 100 Ways to Research Complex Problems, Develop Innovative Ideas, and Design Effective Solutions by Bruce Hanington; Bella Martin. Minneapolis: Rockport Publishers. 2017. eBook., Database: eBook Collection (EBSCOhost)

https://puniversity.informaticsglobal.com:2282/ehost/detail/detail?vid=11&sid=f086b8c2-260e-4caa-8c48-d732c21a7724%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=1638693&db=nlebk

4. What Is Design Thinking and Why Is It Important? By Rim Razzouk and Valerie Shute - Review of Educational Research, Vol. 82, No. 3 (September 2012), pp. 330-348 (19 pages), Published by: American Educational Research Association

https://puniversity.informaticsglobal.com:2054/stable/23260048?Search=yes&resultItemClick=true&searchText=design+thinking&searchUri=%2Faction%2FdoBasicSearch%3FQuery%3Ddesign%2Bthinking%26so%3Drel&ab_segments=0%2FSYC-6168%2Ftest&refreqid=fastly-default%3Acb1be24976e25734cb5fc13a8af6fdfb&seq=1#metadata_info_tab_contents

5. Abductive Thinking and Sensemaking: The Drivers of Design Synthesis by John Kolko, Design Issues, Vol. 26, No. 1 (Winter, 2010), pp. 15-28 (14 pages), Published by: The MIT Press

https://puniversity.informaticsglobal.com:2054/stable/20627839?Search=yes&resultItemClick=true&searchText=design+thinking&searchUri=%2Faction%2FdoBasicSearch%3FQuery%3Ddesign%2Bthinking%26so%3Drel&ab_segments=0%2FSYC-6168%2Ftest&refreqid=fastly-default%3A0b89336ea274d63c010536b01316d7bb&seq=1#metadata_info_tab_contents

6. Designerly Ways of Knowing: Design Discipline versus Design Science by Nigel Cross, Design Issues, Vol. 17, No. 3 (Summer, 2001), pp. 49-55 (7 pages), Published by: The MIT Press

https://puniversity.informaticsglobal.com:2054/stable/1511801?Search=yes&resultItemClick=true&searchText=design+thinking&searchUri=%2Faction%2FdoBasicSearch%3FQuery%3Ddesign%2Bthinking%26so%3Drel&ab_segments=0%2FSYC-6168%2Ftest&refreqid=fastly-default%3A0d5b607b163f60876ca973ed90e22b1c&seq=1#metadata_info_tab_contents

Course Code: FIN1002	**Course Title: Essentials of Finance** **Type of Course: HSMC**		**L-T-P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	This course is designed to be accessible to all students, regardless of their prior financial knowledge.					
Anti-requisites						
Course Description	This course is designed to equip students with a **foundational understanding of key financial concepts and principles**. It will enable them to comprehend the **core functions of finance**, delve into the intricacies of **financial management within organizations**, and gain insights into the **fundamental aspects of taxation**. The course aims to develop students' abilities to **interpret financial statements, evaluate investment opportunities, understand capital structure decisions**, and navigate the **basics of tax implications**.					
Course Objective	Upon successful completion of this course, students will be able to: • **Understand the basic forms of business organization and their financial implications.** • **Understand the fundamental principles and concepts** that influence financial decision-making in various contexts. • **Analyse and interpret financial statements** to assess the financial health and performance of an organization. • **Identify income under various heads of income as per Income Tax Act, 1961 and determine the tax liability.**					
Course Outcomes	**List the course outcomes** **On successful completion of this course the students shall be able to:** 1. **Understand the basic concepts of finance and financial markets and organizations.** 2. **Apply and interpret financial information for business decision making.** 3. **Identify various heads of income and deduction under Income Tax Act, 1961.**					
Course Content:						
Module 1	**Introduction to Finance**	Assignment/ Quiz	Numerical solving Task	**10 Sessions**		
Definition and Scope of Finance, Areas of Finance: Corporate Finance, Investments, Financial Institutions, International Finance; Types of Financial Markets: Money Markets vs. Capital Markets, Primary vs. Secondary Markets; Forms of Business Organization and Financial Goals: Shareholder Wealth Maximization vs. Profit Maximization; Understanding Financial Statements: Balance Sheet and Income Statement- Simple Numerical.						
Module 2	**Financial Management**	Assignment/ Quiz	Numerical solving Task	**18 Sessions**		
Capital Budgeting Decisions: Payback Period, Net Present Value (NPV), Profitability Index (PI), Internal Rate of Return (IRR); Leverage- Basic Numerical; Capital Structure Decisions: Optimal Capital Structure, Trade-off Theory of Capital Structure; Cost of Capital: Equity, Debt, WACC; Dividend Policy: Factors influencing Dividend Policy.						
Module 3	**Taxation**	Assignment/ Quiz	Numerical solving Task	**17 Sessions**		
Principles of a Good Tax System: Equity, Certainty, Convenience, Economy; Direct vs. Indirect Taxes; Residential Status of an Individual- Basic Problems; Heads of Income;						

Salary, House Property- Basic Numerical; Deductions under Chapter VI-A; Computation of Taxable Income and Tax Liability; E-Filing procedure.
Targeted Application & Tools that can be used: **Textbooks, PPT, Spreadsheet Software (e.g., Microsoft Excel), Official Website of Income Tax Department.**
Project Work/ Assignment:
1. Presentation: There will be a group presentation, where the students will be given a topic. They will have to explain/demonstrate the working and discuss the applications for the same. **2. Case Study**: - At the end of the course students will be given a 'real-world' cases like business models of successful companies or tax evasion by reputed companies on which they have to come up with detailed analysis and assessment.
Text Book(s): 1. **Dr. Vinod K. Singhania & Dr. Monica Singhania.** (Latest Assessment Year Edition). *Students' Guide to Income Tax including GST*. Taxmann Publications. **2. Pandey, I. M.** (2025). *Financial Management*. Vikas Publishing House.
Reference Book (s): 1. **Bhole, L.M., & Mahakud, J.** (Current Edition). *Financial Institutions and Markets: Structure, Growth and Innovations*. McGraw Hill Education India. 2. **Mehrotra, H.C., & Goyal, S.P.** (Latest Assessment Year Edition). *Income Tax Law & Practice*. Sahitya Bhawan Publications. 3. **Gordon, E., & Natarajan, K.** (Current Edition). *Financial Markets and Services*. Himalaya Publishing House. **Online Resources (e-books, notes, ppts, video lectures etc.):** 1. https://presidencyuniversity.linways.com 2. https://onlinecourses.nptel.ac.in/noc24_ec01/preview 3. https://www.incometax.gov.in/iec/foportal/
Topics relevant to "SKILL DEVELOPMENT": This course is designed to provide practical financial skills through participative learning techniques. Students will engage in performing suitable calculations to determine financial parameters (e.g., time value of money, investment returns, tax liabilities) and analysing financial statements to assess organizational performance and make informed decisions.

Catalogue prepared by	**Dr. Amit Saha**
Recommended by the Board of Studies on	BoS No: 6th BOS, 5 June 2025
Date of Approval by the Academic Council	26th Academic Council Meeting held on June 2025

Course Code: MAT2301	Course Title: Calculus and Differential Equations Type of Course:1] School Core	L-T- P-C	3	1	0	4
Version No.	1.0					
Course Pre-requisites	Basic Concepts of Limits, Differentiation, Integration (PU level)					
Anti-requisites	**NIL**					
Course Description	Calculus and differential equations are used ubiquitously throughout mathematics, statistics and operations research. In this course, students can be able to build upon the foundations of calculus established to greatly enhance their repertoire of theory and practice in these areas. The application of calculus and differential equations in the description and modelling of real-world problems will also be considered. This unit will extend the problem-solving skills, range of knowledge and use of techniques in differential and integral calculus. The course focuses on the concepts of Calculus and Differential Equations with reference to specific engineering problems. The course is of both conceptual and analytical type in nature.					
Course Objective	The goal of the course Calculus and Differential Equations is to facilitate the students with a concrete foundation of differential calculus and to solve the first and higher-order ordinary differential equations enabling them to acquire the knowledge of these mathematical tools.					
Course Out Comes	On successful completion of the course the students shall be able to: 1) Apply the knowledge of differential calculus to solve problems related to ordinary and partial derivatives. 2) Apply the principles of integral calculus to evaluate integrals. 3) Learn the notion of partial differentiation to calculate rate of change of multivariate functions and solve problems related to composite functions and Jacobian. 4) Solve first-order linear/nonlinear ordinary differential equations analytically using standard methods.					
Course Content:						
Module 1	**Calculus**		**14 Sessions**			
Introduction, Application, Limit, continuity, Rolle's theorem, Mean value theorems, Indeterminate forms and L'Hospital's rule; Definite and indefinite integrals, Reduction formulae (without proof) of $\int \sin^n x\, dx$, $\int \cos^n x\, dx$ and $\int \sin^m x \cos^n x\, dx$ (m and n are positive integers), evaluation of these integral with standard limits (0 to $\frac{\pi}{2}$), Beta and Gamma functions and their properties.						
Module 2	**Multivariable Calculus**	**Assignment**	**8 Sessions**			
Partial derivatives, total derivative, Taylor's and Maclaurin (self-study) theorems, Euler's Theorem, Jacobians, Maxima, minima and saddle points; Method of Lagrange multipliers (self-study);						
Module 3	**Multiple integrals**		**10 Sessions**			
Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Triple integrals (Cartesian); Applications: areas, volume -Center of mass and Gravity (constant and variable densities), orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds (self-study);						
Module 4	**Differential Equations**	**Assignment**	**14 Sessions**			
Introduction, types of differential equation–variable separable (self-study), Homogeneous, Exact, linear, Bernoulli's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type; Linear differential equations of second and higher order with constant coefficients - non-homogeneous term of the type Q(x) = e^{ax}, Sin ax, Cosax, $e^{ax}v(x)$- Method of variation of parameters.						

Targeted Application & Tools that can be used:
Differential calculus is used extensively in science and engineering. It can solve problems related to motion, velocity, acceleration, angles of incline or curve on a surface, etc.
Differential Equations are used to model the behavior of electromagnetic fields, including in the design of antennas, microwave ovens, and other devices. Biology: DEs are used to model biological processes, such as the spread of diseases and the development of biological tissues.
Tools Used: Python.

Assignment:

Select any one simple differential equation pertaining to the respective branch of engineering, identify the dependent and independent variable – Obtain the solution and compare the solution sets by varying the values of the dependent variable.

Text Book

1. Erwin Kreyzig (2015), Advanced Engineering Mathematics, John Wiley and sons, Inc.10th Edition
2. B. S. Grewal (2017), Higher Engineering Mathematics by, 44th Edition, Khanna Publishers.

References:

1. Victor Henner, Tatyana Belozerova, Mickhail Khenner, Ordinary and Partial Differential Equations, CRC Press, Edition, 2013.
2. Walter Ledermann, Multiple integrals, Springer, 1st edition
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

E-resources/ Web links:

1. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_103205
2. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_106839
3. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_61605
4. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_134719
5. https://www.math.hkust.edu.hk/~maqian/ma006_0607F.html

Topics relevant to SKILL DEVELOPMENT: The course focuses on the concepts of calculus and differential equation with reference to specific engineering problems. The course is of both conceptual and analytical type in nature through Problem solving**.** This is attained through the assessment component mentioned in course handout.

Catalogue prepared by	**Dr. Jagan K& Dr. Meenakshi**
Recommended by the Board of Studies on	**14th BOS – Friday, 6th June 2025**
Date of Approval by the Academic Council	

Course Code: MAT2302	Course Title: Transform Techniques, Partial Differential Equations and Complex Variables Type of Course:1] School Core	L-T-P- C	3	1	0	4
Version No.	1.0					
Course Pre-requisites	MAT2301					
Anti-requisites	**NIL**					
Course Description	This course aims to introduce various transform techniques such as Laplace transform, Fourier transform and Z-transform in addition to expressing functions in terms of Fourier series. The course covers applications of Laplace transform to LCR circuits and solutions of different equations using Z-transform. The course also deals with the analytical methods for solving partial differential equations and the classical applications of partial differential equations. Complex variables studies function where both the independent and dependent variables are complex numbers, exploring concepts like differentiation, integration, power series, contour integration, and singularities within the complex plane.					
Course Objective	The objective of the course is to **familiarize the learners with the concepts of "Transform Techniques, Partial Differential Equations and Complex Variables**" and attain **Skill Development through Problem Solving Techniques**.					
Course Out Comes	On successful completion of the course the students shall be able to: CO1 - Express functions in terms of uniformly convergent Fourier series. CO2 - Apply Laplace transform technique to solve differential equations. CO3 - Employ Z-transform techniques to solve difference equations. CO4 - Solve a variety of partial differential equations analytically.					
Course Content:						

Module 1	**Laplace Transforms**		**8 Sessions**
Definition and Laplace transforms of elementary functions. Properties of Laplace transform, and Laplace transform of periodic function, unit-step function and Impulse function – related problems. Inverse Laplace transform of standard functions - problems, initial and final value theorem. Convolution theorem, solution of linear and simultaneous differential equations and LCR Circuit.			
Module 2	**Fourier Series**		**6 Sessions**
Fourier Series: Periodic functions, Dirichlet's condition. Fourier series of periodic functions period 2π and arbitrary period. Half range Fourier series. Practical harmonic analysis.			
Module 3	**Fourier Transforms and Z - Transforms**	**Assignment**	**9 Sessions**
Fourier Transforms: Definitions, infinite Fourier transforms, Fourier sine and cosine transforms, inverse Fourier transforms, Problems. **Difference equations and Z-transforms:** Z-transforms – Basic definitions, Standard Z-transforms, Linearity property, Damping rule, Shifting rule, Initial value theorem, Final value theorem, Inverse Z-transforms. Difference equations – Basic definitions, Application of Z-transforms to solve difference equations.			

Module 4	**Partial Differential Equations**		**9 Sessions**
Formation of PDE, Solution of non-homogeneous PDE by direct integration, Solution of homogeneous PDE involving derivative with respect to one independent variable only (Both types with given set of conditions) Method of separation of variables. (First and second order equations) Solution of Lagrange's linear PDE. of the type P p + Q q = R. Applications of PDE: Derivation of one-dimensional wave and heat equations. Various possible solutions of these by the method of separation of variables. D'Alembert's solution of wave equation. Two-dimensional Laplace's equation – various possible solutions. Solution of all these equations with specified boundary conditions (Boundary value problems).			
Module 5	**Complex Variables**	**Assignment**	**12 Sessions**
Introduction, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; Conformal mappings. Complex Integration: Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof).			
Targeted Application & Tools that can be used: The objective of the course is to familiarize students with a variety of numerical techniques and the theoretical concepts of probability and statistics to equip them with the necessary numerical approaches and basic statistical tools to tackle engineering and real-life problems.			
Assignment:			
Newton-Raphson Methods, Gauss-Seidel Method, LU Decomposition, Trapezoidal Rule, Simpson's rule, Runge-Kutta 4th Order.			
Text Book 1. Erwin Kreyzig, Advanced Engineering Mathematics, John Wiley and sons, Inc.10th Edition 2. B. S. Grewal (2017), Higher Engineering Mathematics by, 44th Edition, Khanna Publishers.			
References: 1. Victor Henner, Tatyana Belozerova, Mickhail Khenner, Ordinary and Partial Differential Equations, CRC Press, Edition, 2013. 2. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering, Computations, 6th Edition, New age Publishing House, 2015. 3. Walter Ledermann, Multiple integrals, Springer, 1st edition. 4. C. Ray Wylie and Louis C Barrett, "Advanced Engineering Mathematics", 6th Ed, McGraw-Hill, 2012. **E-resources/ Web links:** https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_140238 https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_233298 https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_204892 https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_246791 . https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_223548 . https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_134719 . https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_32614 . https://www.math.hkust.edu.hk/~maqian/ma006_0607F.html . https://www.scu.edu.au/study-at-scu/units/math1005/2022/			
Topics relevant to SKILL DEVELOPMENT: This course aims to introduce various transform techniques such as Laplace transform, Fourier transform, and Z transform in addition to			

expressing functions in terms of Fourier series. The course covers applications of Laplace transform to LCR circuits and solution of difference equations using z-transform. The course also deals with the analytical methods for solving partial differential equations and the classical applications of partial differential equations. Overall, this course provides the knowledge of transform techniques and partial differential equations for **Skill Development through Problem Solving methodologies**. This is attained through assessment component.

Catalogue prepared by	**Dr. Veeresh Sajjanar**
Recommended by the Board of Studies on	**14th BOS held on 06/06/2025**
Date of Approval by the Academic Council	

Course Code: MAT2303	**Course Title: Linear Algebra & Vector Calculus** **Type of Course:1] School Core**	**L-T- P- C**	**3**	**1**	**0**	**4**
Version No.	1.0					
Course Pre-requisites	MAT2301					
Anti-requisites	**NIL**					
Course Description	This course explores the fundamental concepts of vectors, matrices, and their operations within the context of calculus, including vector differentiation and integration, while applying these tools to solve problems related to linear systems, transformations, and geometric interpretations in higher dimensions, often with applications in fields like physics, engineering, and computer graphics; key topics include vector algebra, matrix operations, determinants, eigenvalues, eigenvectors, gradients, divergence, curl, line integrals, surface integrals, and the fundamental theorems of vector calculus like Green's Theorem, Stokes' Theorem, and the Divergence Theorem.					
Course Objective	The course is intended to develop computational proficiency involving procedures in Matrices, Linear Algebra and Vector Calculus which are useful to all engineering disciplines. This course is to equip students with the ability to understand and manipulate vectors in multidimensional space, apply matrix operations to solve systems of linear equations, and utilize concepts like gradients, divergence, and curl to analyze physical phenomena, all while developing a strong foundation for applying these tools in various scientific and engineering fields like physics, mechanics, and computer graphics.					
Course Out Comes	On successful completion of the course the students shall be able to: CO1 - Use matrix methods and certain techniques to solve the system of linear equations and to find eigen values, eigen vectors of a matrix to check whether it is diagonalizable. CO2 - Understand the abstract notions of vector space and dimensionality of it. CO3 - find the matrix representation of a linear transformation given bases of the relevant vector spaces. CO4 - Learn different notions of vector and scalar fields with their properties. Understanding the major theorems (Green's, Stokes', Gauss') and some applications of these theorems.					
Course Content:						
Module 1	**Systems of Linear Equations**		6 Sessions			
Systems of Linear Equations, Matrices and Elementary Row Operations, Echelon forms, Matrix operations, invertible matrices, Determinants and their properties, Cramer's Rule, LU-decomposition, Applications of Systems of Linear Equations.						
Module 2	**Vector Space**	**Assignment**	9 Sessions			
Linear Combinations and Linear Independence, Vectors in n R^n, Linear Combinations, Linear Independence Vector Spaces, Definition of a Vector Space, Subspaces, Basis and Dimension, Coordinates and Change of Basis, Orthogonal bases and orthogonal projections.						
Module 3	**Linear Transformations**		15 Sessions			
Linear Transformations, Algebra of transformations, The Null Space and Range, Isomorphisms, Matrix Representation of Linear Transformations, Similarity Eigenvalues and Eigenvectors, Eigen values and Eigen vectors, Diagonalization.						

Inner Product Spaces, The Dot Product on R^n and Inner Product Spaces, Orthonormal Bases, Orthogonal Complements, Application: Least Squares Approximation, Diagonalization of Symmetric Matrices, Application: Quadratic Forms.
Singular Value Decomposition: Singular values, computing singular value decomposition, and Introduction to principal component analysis.

Module 4	**Vector Calculus**	**Assignment**	15 Sessions

Vector & Scalar Functions and Fields, Derivatives, Curve, Arc length, Curvature & Torsion, Gradient of Scalar Field, Directional Derivative, Divergence of a Vector Field, Curl of a Vector Field, Physical interpretation, solenoidal and irrotational vector fields. Problems.
Line Integrals, Path Independence of Line Integrals, Green`s Theorem in the plane, Surface Integrals, Divergence Theorem of Gauss, Stokes`s Theorem.

Targeted Application & Tools that can be used:

- Solve systems of linear equations using various methods including Gaussian and Gauss Jordan elimination and inverse matrices.
- Perform matrix algebra, invertibility, and the transpose and understand vector algebra in R^n.
- Determine relationship between coefficient matrix invertibility and solutions to a system of linear equations and the inverse matrices.
- Find eigenvalues and eigenvectors and use them in applications.
- Find the dimension of spaces such as those associated with matrices and linear transformations.
- Understand real vector spaces and subspaces and apply their properties.
- Compute inner products in a real vector space and compute angle and orthogonality in inner product spaces.
- Create orthogonal and orthonormal bases: Gram-Schmidt process and use bases and orthonormal bases to solve application problems.
- Prove basic results in linear algebra using appropriate proof-writing techniques such as linear independence of vectors; properties of subspaces; linearity, injectivity and subjectivity of functions; and properties of eigenvectors and eigenvalues.

Assignment:

Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding the applications of Linear Algebra and Vector Calculus to engineering applications – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus of Linear Algebra and Vector Calculus is covered.

Text Book

1. Gilbert Strang, Linear Algebra and its applications, Wellesley-Cambridge Press,U.S.; 6th edition.
2. B. S. Grewal (2017), Higher Engineering Mathematics by, 44th Edition, Khanna Publishers.

References:

1. Introduction to Linear Algebra with Application, Jim Defranza, Daniel Gagliardi, Tata McGraw-Hill
2. Elementary Linear Algebra, Applications version, Anton and Rorres, Wiley India Edition.
3. Advanced Engineering Mathematics, Erwin Kreysig, Wiley Publication.
4. Elementary Linear Algebra, Ron Larson, Cengage Learning .
5. Linear Algebra and its Applications, David C. Lay, Pearson Education.

E-resources/ Web links:

1. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_9607
2. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_143156
3. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=CUSTOM_PACKAGE_EBSCO_29052023_270975
4. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_94555

5. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_243864 6. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_224531 7. NPTEL Video Lectures Matrices and Linear Algebra: 8. https://nptel.ac.in/courses/111106051/ 9. NPTEL Video Lectures Differential Equations: 10. https://nptel.ac.in/courses/111106100/ 11. NPTEL Vector Calculus: 12. https://nptel.ac.in/courses/111/105/111105122/ 13. https://www.math.hkust.edu.hk/~maqian/ma006_0607F.html 14. https://www.scu.edu.au/study-at-scu/units/math1005/2022/
Topics relevant to SKILL DEVELOPMENT: The course focuses on the concepts of Vector calculus and Linear Algebra with reference to specific engineering problems. The course is of both conceptual and analytical type in nature through Problem Solving**.** This is attained through the assessment component mentioned in the course handout.

Catalogue prepared by	**Dr. Shilpa N & Dr. Manikandan**
Recommended by the Board of Studies on	**14th BOS held on 06/06/2025**
Date of Approval by the Academic Council	

Course Code: MAT2304	**Course Title: Numerical Methods, Probability Distributions and Sampling Techniques** **Type of Course:1] School Core**	**L-T- P- C**	**3**	**1**	**0**	**4**
Version No.	1.0					
Course Pre-requisites	MAT2301 & MAT2302					
Anti-requisites	**NIL**					
Course Description	The course provides students with a comprehensive understanding of how to use computational methods to solve mathematical problems, analyze data using probability distributions, and effectively select representative samples from a larger population through various sampling techniques, equipping them to tackle real-world problems in various fields like engineering, statistics, and data science.					
Course Objective	The objective of the course is to equip students with theoretical understanding and practical skills to solve complex real-world problems using numerical approximation techniques, analyze data through probability distributions, and effectively collect representative samples using appropriate sampling methods, often applied in scientific and engineering fields.					
Course Out Comes	On successful completion of the course the students shall be able to: CO1 - Demonstrate the applications of numerical methods to find the roots of polynomial equations and eigen values of real symmetric matrices. CO2 - Apply various numerical methods for solving linear Ordinary & Partial differential equations arising in engineering field CO3 - be able to compute conditional probabilities directly and using Bayes' theorem, and check for independence of events. CO4 - be able to set up and work with discrete & continuous random variables; in particular, to understand the Bernoulli, binomial, geometric, Poisson distributions, uniform, normal, and exponential distributions. CO5 - be able to use specific significance tests, including z-test, t-test (one- and two-sample), and chi-squared test					
Course Content:						
Module 1	**Solution of Linear Systems of Equation**		**8 Sessions**			
Introduction, LU decomposition method, Jacobi iteration method, Gauss-Seidel iteration method. Solution of Algebraic and Transcendental Equations: Bisection method, Regula-Falsi method, Newton-Raphson method, secant method, fixed point iteration method.						
Module 2	**Numerical Interpolation, Differentiation and Integration**	**Assignment**	**10 Sessions**			
Newton's method, Divided difference method, Lagrange's method, Numerical differentiation, Numerical integration: Trapezoidal rule, Simpson's one-third rule, Simpson's three-eighth rule, Gaussian quadrature rule. Solution of ordinary differential equations: Taylor series method, modified Euler's method, Runge-Kutta method for 4th order.						
Module 3	**Curve Fitting & Statistical Methods**		**7 Sessions**			
Curve Fitting (Straight Line ($y = a + bx$), Parabola ($y = a + bx + cx^2$), Exponential Curves ($y = ae^{bx}$, $y = ab^x$ and $y = ax^b$), Correlation - Karl Pearson's coefficient of correlation and rank correlation, Problems. Regression analysis - lines of regression, Problems.						

Module 4	**Probability & Random Variables**		**10 Sessions**
Probability of an Event, Addition Law, Multiplication Law, Conditional Probability, Bayes's Theorem and Problems. Random Variables (discrete and continuous), Probability Mass/Density Functions, Mathematical Expectations, discrete probability distributions - Binomial distribution, Poisson distribution, Continuous uniform distribution - exponential distribution, normal distribution.			
Module 5	**Sampling Distributions**	**Assignment**	**10 Sessions**
Random sampling, sampling distributions, Standard Error, Type I & Type II errors, Testing of Hypothesis, Test of significance - Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations, Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.			
Targeted Application & Tools that can be used: The objective of the course is to familiarize students with a variety of numerical techniques and the theoretical concepts of probability and statistics so as to equip them with the necessary numerical approaches and basic statistical tools to tackle engineering and real-life problems.			
Assignment:			
Gauss-Jacobi iteration method, Numerical differentiation, Gaussian quadrature rule for numerical integration, Probability Sampling Methods, Non-probability Sampling methods, probability sampling			
Text Book 1. Ronald .E. Walpole, Raymond. H. Myers, Sharon. L Myers, and Keying E. Ye, "Probability and Statistics for Engineers and Scientists", Pearson Education, Delhi-9th edition, 2012. 2. B. S. Grewal (2017), Higher Engineering Mathematics by, 44th Edition, Khanna Publishers.			
References: 1. Miller and Freund, Probability and Statistics for Engineers, Pearson Education Ltd. 2. Erwin Kreyzig, Advanced Engineering Mathematics, John Wiley and sons, Inc.10th Edition. 3. Douglas C. Montgomery & George Runger, Applied Statistics and Probability for Engineers, Wiley Publications. **E-resources/ Web links:** . https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_135224 . https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_141727 . https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_217628 . https://www.math.hkust.edu.hk/~maqian/ma006_0607F.html . https://www.scu.edu.au/study-at-scu/units/math1005/2022/			
Topics relevant to SKILL DEVELOPMENT: The course focuses on the concepts of calculus and differential equation with reference to specific engineering problems. The course is of both conceptual and analytical type in nature through Problem solving**.** This is attained through the assessment component mentioned in course handout.			
Catalogue prepared by	**Dr. Nagendramma V.**		
Recommended by the Board of Studies on	**14th BOS held on 06/06/2025**		
Date of Approval by the Academic Council			

Course Code: PHY2503	Course Title: Fundamentals of Materials Physics Type of Course: 1] School Core & Laboratory integrated	**L-T-P-C**	2	0	0	2
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The course is intended to provide an overview of physics principles which determine the properties and behavior of materials. This knowledge will help students in identifying the most suitable material for a desired function and in estimating their behavior under different environmental conditions**.** This theory course integrated with lab providing practical application of the concepts taught while developing an **attitude of enquiry and confidence to tackle new problems**. The course also develops **team working and report writing skills through project work and assignments.**					
Course Out Comes	On successful completion of the course the students shall be able to: 1] Describe the mechanical, thermal and corrosive properties of materials. 2] Identify the crystal structure of materials from X-ray diffraction patterns. 3] Analyze the importance of material properties for a wide range of engineering applications. 4] Students can able to Design, build, or assemble a part, product, or system using specific methodologies, equipment and materials. (Lab objective)					
Course Objective	The objective of the course is **Skill Development** of student by using **Experiential Learning** techniques.					
Course Content:						
Module 1	**Introduction to crystallography**	Assignment	Prepare models of crystal structures	**8 Sessions**		
Bonding in solids, Space lattice and unit cells, Bravais Lattices, crystal system and symmetry, Miller Indices, calculation of packing fractions, coordination number, Bragg's law, principle of X-Ray diffraction and structure determination, Defects. Significance of defects and imperfections in real time applications						
Module 2	**Mechanical, Wave properties of Materials**	Assignment	Data collection	**7 Sessions**		
Mechanical properties: Elastic behavior of materials, concept of stress and strain, ductile materials, brittle materials, toughness, hardness, tensile property, yield point phenomenon. Comparison between metal, ceramic and plastics properties.						
Module 3	**Thermal and Electrical**	Term paper	Write/Modify a Program using Excel to calculate specific	**8 Sessions**		

	properties of materials		heat and thermal expansion	
Thermal properties such as specific heat, thermal conductivity, thermal expansion, Calorimeter, thermal shock resistance, thermoelectric effect, thermopile. **Electrical Properties of Materials:** Classification of materials based on band gap, Fermi energy, Fermi temperature. Semiconductors and its applications, Hall effect, Dielectric Materials				
Module 4	**Introduction to Nano Technology**	Term paper	Case study on applications of Nano materials	**7 Sessions**
Topics: Introduction to Nano-materials and Properties, effect of Quantum confinement on material properties. Carbon Nano-tubes (CNT). Applications of nanotechnology in various fields -Production technologies, Material surface protection, medical and sustainable environment.				

List of Laboratory Tasks:

Experiment No. 1: Experimental errors and uncertainty using excel
Level 1: Calculation of accuracy and precision of a given data
Level 2: propagation of errors in addition, subtraction, multiplication and division.

Experiment No. 2: Determination of rigidity modulus using torsional pendulum
Level 1: Determination of rigidity modulus of a steel wire using a circular disc.
Level 2: Determination of moment of inertia of irregular body using the steel wire.

Experiment No. 3: Determination of the Young's Modulus of a wire or uniform bar
Level 1: Determination of the Young's Modulus of a given wire or uniform bar of known cross section
Level 2: Plot the stress vs. strain graph and estimate Young's modulus from the graph and compare the results. Determine the material by referring to standards handbook.

Experiment No. 4: Determine the specific heat capacity of a material using a calorimeter
Level 1: Determine the specific heat capacity of (Copper, lead, glass) using a calorimeter.
Level 2: Determine the absolute specific heat of the calorimeter using a material of known specific heat.

Experiment No. 5: Calculation of lattice parameter and particle size using X-ray diffraction pattern
Level 1: Crystallite size calculation using Scherrer's formula
Level 2: Crystallite size and microstrain broadening of diffraction peaks

Experiment No. 6: Calculate the spring constant
Level 1: Calculate the spring constant of a set of parallel / series connected springs
Level 2: Calculate the spring constant of a combination of parallel and series springs

Experiment No. 7: Thermal conductivity of a non-metallic solid
Level 1: Determine the coefficient of thermal conductivity of a bad-conductor by Lee`s & Charlton's disc method.
Level 2: Determine the coefficient of thermal conductivity of a metal by using Searle's apparatus.

Experiment No. 8: Experiment based on Seebeck effect.
Level 1: To study the variation of thermo EMF with temperature of hot junction for copper-iron thermocouple by means of potentiometer

Level 2: The comparative study of the variation of thermo EMF with temperature of hot junction for different thermocouple by means of potentiometer

Experiment No. 9: To determine elastic constants of a wire by Searles's method
Level 1: To determine Young modulus, Modulus of rigidity
Level 2: To determine Poisson`s ratio, Bulk modulus

Experiment No. 10: To plot the characteristics of thermistor and hence find the temperature coefficient of resistance.
Level 1: Determine Positive temperature coefficient (**PTC**) thermistor:-resistance increase with increase in temperature.
Level 2: Determine Negative temperature coefficient (**NTC**) thermistor:-resistance decrease with increase in temperature and compare the results of PTC and NTC.

Experiment No. 11: Determination of Fermi energy
Level 1: Determination of Fermi energy of copper coil
Level 2: Determination of Fermi energy of alloy (Brass)

Experiment No. 12: Elastic and plastic deformation
Level 1: To investigate the elastic and plastic extension of metal wires (determination of spring constant and Young's modulus)
Level 2: To investigate the elastic and plastic extension of alloy from the stress strain graph and determine the elastic limits

Experiment No. 13: Speed of Sound using Kundt's tube
Level 1: To find the speed of sound.

Experiment No.14: Determine the velocity of ultrasonic waves in a liquid
Level 1: To determine the velocity of ultrasonic waves in a liquid

Experiment No.15: Four probe method
Level 1: To determine the resistivity of a given semiconductor using four probe method.

Targeted Application & Tools that can be used:

1. Application area in determination of standard values using UTM machine, strength of materials, building materials, machine tools.
2. Microsoft Excel for mathematical calculations.
3. JCPDS data for XRD analysis, ASTM.

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

Assessment Type

- Midterm exam
- Assignment (review of digital/ e-resource from PU link given in references section - mandatory to submit screen shot accessing digital resource.)
- Quiz
- End Term Exam
- Self-Learning

Assignment 1:

1. Identify the crystal planes and directions for a given crystal structure (Schematic)
2. Draw the plane and directions for a given miller indices (Ex. (111), (110), (010), ($1\bar{1}$ 1) <110>)

3. Collect the data like, Elastic modulus, Stiffness, Ultimate Tensile Strength, Yield point for a given material.
4. Determine the mechanical properties of given sample (Ex. Aluminum) , ASTM standards

Text Book

1. M.A. Wahab, Structure and Properties of Materials, Solid State Physics, Third Edition, Narosa Publications 2015.

References:

1. Charles P. Poole Jr, Frank J. Owens, Introduction to Nanotechnology, ISBN: 0471079359. Wiley Publications, 2003.
2. P.N. Chandramouli, Fundamentals of Strength of Materials, PHI learning Private Limited, 2013.
3. Chares Kittel, Introduction to Solid State Physics, Wiley publications, 2015.
4. Engineering Physics by Avadhanalu, Revised edition, S. Chand Publications,2018

Material Physics e-content:

https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=754098&site=ehost-live

https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1076817&site=ehost-live

https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=18084&site=ehost-live

https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=683520&site=ehost-live

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https://presiuniv.knimbus.com/user#/searchresult?searchId=material%20physics&_t=1657688744862

Topics relevant to "Skill Development" : Elastic, thermal and mechanical properties of materials, fermi energy of coper for skill development through Experiential Learning techniques. **This is attained through the assignment and lab experiments as mentioned in the assessment component.**

Catalogue prepared by	Dr. G. Srinivas Reddy, Dr. Harish Sharma A, Dr. Pradeep Bhaskar, Dr. Ranjeth Kumar Reddy, Dr. P. Mohan Kumar Naidu,Dr. Deepthi P. R, Dr. U. Mahaboob Pasha, Dr. Sivasankara Reddy, Dr. Anindita, Dr. Naveen C. S, Dr. Bharati .
Recommended by the Board of Studies on	7th BOS conducted on "25th July 2022.
Date of Approval by the Academic Council	18th Academic meeting held on 03/08/2022.

Course Code: **PHY2506**	**Course Title:** **Fundamentals of Materials Physics Lab** **Type of Course:** **1] School Core**	**L-T-P-C**	**0**	0	2	1
Version No.	1.0					
Course Pre-requisites	**Class 11 and 12 Physics**					
Anti-requisites	**NIL**					
Course Description	The lab provides practical application of the concepts taught while developing an attitude of enquiry and confidence to tackle new problems. The course also develops team working and report writing skills.					
Course Out Comes	On successful completion of the course the students shall be able to: CO1: To understand mechanical and thermal properties of materials. CO2: Students can able to Design, build, or assemble a part, product, or system using specific methodologies, equipment and materials.					
Course Content:	**List of Laboratory Tasks:** Experiment No. 1: Experimental errors and uncertainty using excel Level 1: Calculation of accuracy and precision of a given data Level 2: propagation of errors in addition, subtraction, multiplication and division. Experiment No. 2: Determination of rigidity modulus using torsional pendulum Level 1: Determination of rigidity modulus of a steel wire using a circular disc. Level 2: Determination of moment of inertia of irregular body using the steel wire. Experiment No. 3: Determination of the Young's Modulus of a wire or uniform bar Level 1: Determination of the Young's Modulus of a given wire or uniform bar of known cross section Level 2: Plot the stress vs. strain graph and estimate Young's modulus from the graph and compare the results. Determine the material by referring to standards handbook. Experiment No. 4: Determine the specific heat capacity of a material using a calorimeter Level 1: Determine the specific heat capacity of (Copper, lead, glass) using a calorimeter. Level 2: Determine the absolute specific heat of the calorimeter using a material of known specific heat. Experiment No. 5: Calculation of lattice parameter and particle size using X-ray diffraction pattern Level 1: Crystallite size calculation using Scherrer's formula					

	Level 2: Crystallite size and microstrain broadening of diffraction peaks Experiment No. 6: Calculate the spring constant Level 1: Calculate the spring constant of a set of parallel / series connected springs Level 2: Calculate the spring constant of a combination of parallel and series springs Experiment No. 7: Thermal conductivity of a non-metallic solid Level 1: Determine the coefficient of thermal conductivity of a bad-conductor by Lee`s & Charlton's disc method. Level 2: Determine the coefficient of thermal conductivity of a metal by using Searle's apparatus. Experiment No. 8: Experiment based on Seebeck effect. Level 1: To study the variation of thermo EMF with temperature of hot junction for copper-iron thermocouple by means of potentiometer Level 2: The comparative study of the variation of thermo EMF with temperature of hot junction for different thermocouple by means of potentiometer Experiment No. 9: To determine elastic constants of a wire by Searles's method Level 1: To determine Young modulus, Modulus of rigidity Level 2: To determine Poisson`s ratio, Bulk modulus Experiment No. 10: To plot the characteristics of thermistor and hence find the temperature coefficient of resistance. Level 1: Determine Positive temperature coefficient (**PTC**) thermistor:- resistance increase with increase in temperature. Level 2: Determine Negative temperature coefficient (**NTC**) thermistor:- resistance decrease with increase in temperature and compare the results of PTC and NTC. Experiment No. 11: Determination of Fermi energy Level 1: Determination of Fermi energy of copper coil Level 2: Determination of Fermi energy of alloy (Brass) Experiment No. 12: Dielectric constant Level 1: Determination of Dielectric constant of given material
Topics relevant to development of "FOUNDATION SKILLS": **Elastic, thermal and mechanical properties of materials.** **Topics relevant to "HUMAN VALUES &PROFESSIONAL ETHICS":** **Emphasizes team work, self-learning and professional development.**	
Catalogue prepared by	Dr. G. Srinivas Reddy , Dr. Naveen C S ,Dr. Sivasankar Reddy, , Dr. Mahaboob Pasha, .

Recommended by the Board of Studies on	5th BOS, 6th August 2021
Date of Approval by the Academic Council	Mention the Academic Council Meeting No. & the date of the meeting:

Course Code: **CHE2505**	**Course Title: Materials Chemistry for Engineers** **Type of Course: Theory only (Basic Sciences course)**	L- T-P- C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	Fundamental Knowledge of Chemistry					
Anti-requisites	NIL					
Course Description	The primary objective of the course is to introduce the students to the fundamental concepts and applications of materials chemistry in Engineering. The course also aims to enhance the knowledge of chemical composition of materials, their properties and recent method for the preparation of the materials for various engineering applications. The course further seeks to cultivate the ability to recognize the role of chemistry in smart engineered products used in households and industry. It targets to strengthen the fundamental concepts of chemistry and materials then builds an interface with their industrial applications. **This course is designed to cater to Environment and Sustainability**					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **'Materials Chemistry for Engineers'** and attain **'Skill Development'** through **'Participative Learning'** techniques**.**					
Course Outcomes	On successful completion of this course the students shall be able to: 1) Recognize the principles of water chemistry to develop innovative solutions in water technology. 2) Describe the general introduction of nanomaterials for water treatment and industrial processes. 3) Summarize the importance of various chemical and electrochemical sources in modern energy systems. 4) Relate the knowledge of electrochemical principles for protection of different metals from corrosion. 5) Identify the suitable polymers to replace the conventional materials.					
Course Content:						
Module 1	**Water Chemistry and Nano technology**	Assignment/ Quiz	Data Collection and analysis	**13 Classes**		
Water technology: Introduction to water chemistry, Hardness of water: types, causes and numerical problems, disadvantages of hard water, Boiler feed water and common boiler troubles, Potable water- Standards and Specifications, Treatment of water for municipal supply, Desalination by Reverse osmosis and ion exchange process, Waste water analysis- Chemical Oxygen Demand (COD) and Dissolved Oxygen (DO) estimation using Winkler's method, Sewage treatment: Primary, Secondary and Tertiary processes. **Nanomaterials:** Introduction to nanoscience and nanomaterials, size-dependent properties of nanomaterials, Classification of nanomaterials: Carbon Nanotubes (CNTs), Nanorods, Nanotubes, Fullerenes, Nanocomposites, Carbon Nanofibres, Nanowires, and Nanopowders, synthesis of nanomaterials by Top-down and Bottom-up approaches, Properties and applications of graphene and carbon nanotubes, Softening of industrial wastewater by Nanofiltration techniques, Advantages and future scope of nanomaterials in water treatment.						
Module 2	**Chemical and Electrochemical energy sources**	Assignment/ Quiz	Data collection	**12 Classes**		

Chemical energy sources: Definition and classification of fuels, Characteristics of good fuels, calorific value, Gross and net calorific value, Bomb Calorimeter-numerical problems, Fractional distillation of petroleum, Knocking and octane number, cetane number, Cracking of petroleum, Fluid Catalytic Cracking (FCC).

Electrochemical energy sources: Introduction to electrochemistry, basic concepts of batteries and characteristics, Classification of batteries –Primary battery: Dry cell and Li-MnO_2, Secondary battery-Pb-acid, Ni-MH and Lithium-ion batteries. Supercapacitor: classification, construction and applications in hybrid vehicles, Fuel cells: hydrogen-oxygen and Methanol-oxygen fuel cells: Principle, working mechanism and their applications.

Module 3	**Corrosion and metal finishing**	Assignment/ Seminar	Data collection and analysis	**09 Classes**

Introduction to Corrosion – Reasons for corrosion, Effects of corrosion, Types of Corrosion, Electrochemical theory of corrosion, Differential metal Corrosion, Differential aeration Corrosion and cases, and Stress Corrosion. Factors that affecting the rate of corrosion- Primary and Secondary Factors.
Corrosion Control Methods–Design and selection, Protective Coatings-Anodic and Cathodic coatings, Cathodic protection- Sacrificial anodic methods and impressed current method, Inorganic Coatings-Anodizing.
Metal Finishing- Importance, Techniques, electroplating (Cr and Ni), Difference between electroplating and electroless plating, electroless plating of Cu on PCBs.

Module 4	**Macromolecules as engineering materials**	Assignment/ Seminar	Data collection and analysis	**11 Classes**

Polymers: Introduction, Classifications, Types of Polymerization: Addition and Condensation polymerization, Degree of polymerization, Molecular weight of the polymers – numerical, Thermoplastics & thermosetting polymers. Preparation, properties, and applications of industrially important polymers - Teflon, PVC, Nylon 6,6 and Phenol-formaldehyde resin; Elastomers: Natural rubber, Merits and Demerits of Natural rubber. Vulcanization of rubber, Synthetic Rubber-Advantages, Inorganic rubbers- silicone polymers. Polymer composites- Synthesis and applications of Kevlar, conducting polymers-Criteria for conduction, synthesis of conducting polyaniline and applications, Biodegradable polymers-introduction, examples and applications.

Targeted Application & Tools that can be used:
Application areas: Water treatment sector, boilers, battery technology, nanotechnology, polymers, automotive and manufacturing industries.
Tools: Statistical analysis of Corrosion in materials using software tools like Design expert (ANOVA (Analysis of Variance) and RSM (Response Surface Methodology) etc.).

Project work/Assignment:

Assessment Type

- Midterm exam
- Assignments (Review of digital/ e-resource from PU link given in references section - mandatory to submit screen shot accessing digital resource.)
- Quiz/Seminar
- End Term Exam
- Self-Learning

Text Book

1. Wiley. *Engineering Chemistry*. Wiley Publishing.
2. Ozin, G.A., & Arsenault, A.C. (2009). *Nanochemistry: A Chemical Approach to Nanomaterials*. Royal Society of Chemistry.
3. Gadag, R.V., & Shetty, Nityananda. (2016). *A Textbook of Engineering Chemistry* (2nd ed.). I.K. International Publishing House.

4. Wiley. *Introduction to Petroleum Engineering*. Wiley Publishing.

Reference Books

1. Engineering Chemistry, Jain and Jain (18th Edition) Dhanpat Rai Publishing Company
2. Engineering Chemistry, Shika Agrawal (2018), Cambridge University Press
3. Hari Singh Nalwa, "Nanostructured Materials and Nanotechnology", Academic Press, 2008
4. Chemistry for Engineering Students, B.S. Jai Prakash, R. Venugopal, Sivakumaraiah & Dr. Pushpa Iyengar., Subash Publications, 5th Edition, 2014.
5. Callister, W. D., & Rethwisch, D. G., Materials Science and Engineering: An Introduction, 10th Edition, Wiley, 2018.

E-resources:

https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_108033
https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_50412
https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_222231
https://archive.nptel.ac.in/courses/103/107/103107212/
https://nptel.ac.in/courses/118104008
https://archive.nptel.ac.in/courses/113/105/113105102/
https://nptel.ac.in/courses/113108051
https://www.mdpi.com/books/pdfview/book/1069
https://www.bloomsburycollections.com/book/fuel-an-ecocritical-history/
https://www.youtube.com/watch?v=S-SOEBTplOM&t=1537s
https://interestingengineering.com/science
https://www.sciencedirect.com/book/9780123838469/standard-handbook-of-petroleum-and-natural-gas-engineering
https://www.bagchee.com/books/BB66394/petroleum-refining-technology

Skill Sets

All topics in theory component are relevant to Environment and Sustainability.

Catalogue prepared by	Faculty Members, Department of Chemistry
Recommended by the Board of Studies on	BoS No.: 13th BoS held on xx/xx/xxxx
Date of Approval by the Academic Council	Xxth Academic council meeting held on xx/xx/xxxx

Course Code: CHE2506	**Course Title: Materials Chemistry Lab** **Type of Course: Laboratory only-Basic science course**	L-T-P- C	0	0	2	1
Version No.	1.0					
Course Pre-requisites	Before undertaking this Materials Chemistry Lab course, students are expected to possess foundational knowledge of chemistry, particularly in acids and bases, redox reactions, titration techniques, and the use of laboratory apparatus. Additionally, students should be familiar with handling chemicals and glassware safely and adhering to essential laboratory safety precautions.					
Anti-requisites	**NIL**					
Course Description	The laboratory course aims to develop experimental skills and apply fundamental chemical principles to address chemistry-related problems in engineering. The experiments are carefully designed to complement the theoretical concepts covered in lectures, providing hands-on experience to deepen scientific understanding and reinforce learning.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "Materials Chemistry Lab" and attain **SKILL DEVELOPMENT** through **EXPERIENTIAL LEARNING** techniques.					
Course Outcomes (COs)	On successful completion of the course, students shall be able to: **CO1:** Identify the basic techniques used in chemistry laboratories for both small- and large-scale water analysis and purification processes. **CO2:** Estimate the presence of ions or metal ions in domestic or industrial/domestic wastewater using laboratory methods. **CO3:** Recognize the laboratory techniques, such as titrations, separation/purification, and instrumentations, to perform chemical analysis. **CO4:** Compare the experimental results and demonstrate improved experimental skills through hands-on laboratory experience.					
Course Content:	**Total 30 sessions**					
Experiment 1	Experiment- 1	Experimental	Data Collection	Analysis and interpretation		
Estimation of Fe (II) in Mohr's salt using Standard Potassium permanganate (Water treatment, metallurgy).						
Experiment 2	Experiment-2	Experimental	Data Collection	Analysis and interpretation		
Estimation of total hardness of water by EDTA complexometric method (Water quality parameter).						
Experiment 3	Experiment-3	Experimental	Data Collection	Analysis and interpretation		
Determination of Chemical Oxygen Demand (COD) of Industrial Wastewater sample (Water Quality Assessment)						
Experiment 4	Experiment-4	Experimental	Data Collection	Analysis and interpretation		

Estimation of calcium oxide in cement solution by rapid EDTA method (Cement quality control)				
Experiment 5	Experiment-5	Experimental	Data Collection	Analysis and interpretation
Estimation of Copper by iodometric method. (Metallurgy and mining)				
Experiment 6	Experiment-6	Experimental	Data Collection	Analysis and interpretation
Estimation of strength of an acid by Conductometric titration (Water Quality Assessment)				
Experiment 7	Experiment-7	Experimental	Data Collection	Analysis and interpretation
Potentiometric estimation of iron from industrial effluents (Electrochemical Analysis)				
Experiment 8	Experiment-8	Experimental	Data Collection	Analysis and interpretation
Determination of Viscosity co-efficient of a liquid mixture using Ostwald's viscometer (Fluid Dynamics)				
Experiment 9	Experiment-9	Experimental	Data Collection	Analysis and interpretation
Determination of pKa of weak acid using pH meter				
Experiment 10	Experiment-10	Experimental	Data Collection	Analysis
Determination of corrosion of mild steel in acidic medium by weight loss method (Understanding corrosion process)				
Experiment 11	Experiment-11	Experimental	Data Collection	Analysis
Determination of calorific value of a given solid fuel by Bomb Calorimeter (Fuel energy calculation)				
Experiment 12	Experiment-12	Experimental	Data Collection	Analysis
Synthesis of polyaniline (Understanding method of Materials synthesis)				

Any 8-9 experiments will be conducted out of 12

Assessment:

- Midterm exam
- Experimental Evaluation
- Report submission and Viva-voce
- End-term Exam

Text Book

1. Ramadevi, B., & Aparna, P., *Lab Manual for Engineering Chemistry*, S. Chand Publications, New Delhi, 2022.
2. Vogel, A. I., *Textbook of Practical Organic Chemistry*, 5th Edition.
3. Vogel, A. I., *Inorganic Quantitative Analysis*, ELBS Publications.
4. Ahluwalia, V. K., *College Practical Chemistry*, Narosa Publishing House, New Delhi.

References

Manoj Kumar Solanki, Engineering Chemistry Laboratory Manual – Educreation Publishing.
Sudha rani, S. K. Bashin, Engineering Chemistry Lab Manual – Krishna's Educational Publishers.

E-resources:

1. https://books-library.net/files/download-pdf-ebooks.org-kupd-679.pdf

Video Links:

1. https://www.youtube.com/watch?v=gDsGHYUHeBE
2. https://www.youtube.com/watch?v=1QkYvERH0sg
3. https://www.youtube.com/watch?v=ODFN6RZktn0
4. https://www.youtube.com/watch?v=L7KDozP1Tfo
5. https://www.youtube.com/watch?v=qKIA8EPnsyA
6. https://www.youtube.com/watch?v=y3Oa0L404oM

The topics related to Skill Development

All the experiments are relevant to **Skill Development** through **Experiential Learning Techniques**. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Faculty Members, Department of Chemistry
Recommended by the Board of Studies on	BoS No.: 13th BoS held on xx/xx/xxxx
Date of Approval by the Academic Council	Xxth Academic council meeting held on xx/xx/xxxx

<table>
<tr><td>Course Code: CIV1200</td><td colspan="4">Course Title: Foundations of Integrated Engineering
Type of Course: Engineering Science Course & Theory Only</td><td>L-T-P-C</td><td>2</td><td>0</td><td>0</td><td>2</td></tr>
<tr><td>Version No.</td><td colspan="9">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="9">NIL</td></tr>
<tr><td>Anti-requisites</td><td colspan="9">NIL</td></tr>
<tr><td>Course Description</td><td colspan="9">The purpose of this course is to introduce the foundational principles, tools, and approaches essential to modern engineering practice. The course also integrates sustainability and systems thinking, highlighting the role of engineers in achieving sustainable development through material efficiency, sustainable design, and case-based learning. Students will gain exposure to emerging technologies such as IoT, robotics, AI, machine learning, and 3D printing. Knowledge in digital modeling, project planning, simulation, and programming are developed to prepare students for integrated engineering workflows.</td></tr>
<tr><td>Course Objective</td><td colspan="9">The objective of the course is to familiarize the learners with the concepts of Foundations of Integrated Engineering and attain Skill Development through Participative Learning techniques.</td></tr>
<tr><td>Course Outcomes</td><td colspan="9">On successful completion of this course the students shall be able to:
CO.1 Explain core concepts of problem-solving, ethics, environment, and safety in engineering projects.
CO.2 Describe sustainability principles and the engineer’s role in sustainable development.
CO.3 Apply sustainability assessment tools to evaluate the environmental impact.
CO.4 Explain the basic concepts of automation, IoT, robotics, AI, machine learning, and 3D printing in the context of engineering applications.
CO.5 Describe the functions of digital modeling, simulation, and project management tools used in integrated engineering projects.</td></tr>
<tr><td>Course Content:</td><td colspan="9"></td></tr>
<tr><td>Module 1</td><td>Foundations of Engineering Practice</td><td>Quiz</td><td>Memory recall questions</td><td>8 Sessions</td></tr>
<tr><td colspan="5">Basics of Engineering Problem Solving and Engineering Mechanics, Multi-Disciplinary Project Collaboration, Creative Thinking and Innovation in Engineering, Ethics, Environment, and Social Responsibility, Managing Cost, Safety, and Risks in Projects.</td></tr>
<tr><td>Module 2</td><td>Sustainability and Systems Thinking in Engineering</td><td>Review of case studies</td><td>Sustainability based Engineering Projects</td><td>10 Sessions</td></tr>
<tr><td colspan="5">Introduction to Sustainability and Systems Thinking, Role of Engineers in Driving Sustainable Development, Sustainable Engineering Tools and Approaches, Energy and Material Sustainability in Engineering, Sustainable Design Principles, Practices and Case Studies</td></tr>
<tr><td>Module 3</td><td>Technology and tools for Integrated Engineering projects</td><td>Seminar</td><td>Group Seminar Presentation on Latest Technological Evolutions</td><td>12 Sessions</td></tr>
<tr><td colspan="5">Introduction to Automation and Smart Technologies, Basics of IoT and Robotics, Introduction to AI and Machine Learning, Fundamentals of 3D Printing and Its Uses
Design and drafting using digital modeling for components, systems, and structures; Project planning and management - scheduling, resource allocation, and tracking; Simulation and analysis for virtual testing of engineering problems; Programming and scripting for automation, problem-solving, and system control.</td></tr>
</table>

Targeted Application & Tools that can be used:
Engineering design, sustainability analysis, automation, project management using AutoCAD, Revit, STAAD Pro., IoT platforms, AI, 3D printing.

Text Book:

1. William C Oakes & Les L Leone, "Engineering Your Future: A Comprehensive Introduction to Engineering", Oxford University Press, 9th Edition, 2018
2. Allen, D. T. and Shonnard, D. R., "Sustainability Engineering: Concepts, Design and Case Studies", Prentice Hall, 1st Edition, 2011.
3. Bradley. A.S; Adebayo, A.O., Maria, P., "Engineering applications in sustainable design and development", CL Engineering, 2015
4. Ian Gibson, David Rosen, & Brent Stucker, "Additive Manufacturing Technologies", Springer, 3rd Edition, 2021
5. Sudip Misra, "The Internet of Things: Enabling Technologies, Protocols, and Use Cases", Wiley, 2nd Edition, 2022

References

1. Bradley. A.S; Adebayo, A.O., Maria, P., Engineering applications in sustainable design and development, CL Engineering. 2015
2. Robert McGinn, "The Ethical Engineer: Contemporary Concepts and Cases", Princeton University Press, 1st Edition, 2020
3. David Buchla, "Renewable Energy Systems: A Smart Energy Systems Approach", Pearson, 2nd Edition, 2023
4. Charles Platt, "Make: Electronics: Learning Through Discovery", Make Community, 3rd Edition, 2021

Web-resources:

1. New Industry 4.0 Advances in Industrial IoT and Visual Computing for Manufacturing Processes
   https://www.mdpi.com/books/reprint/2109-new-industry-4-0-advances-in-industrial-iot-and-visual-computing-for-manufacturing-processes
2. Additive Manufacturing Technologies and Applications
   https://www.mdpi.com/books/reprint/462-additive-manufacturing-technologies-and-applications
3. Sustainability in Construction Engineering
   https://www.mdpi.com/books/reprint/754-sustainability-in-construction-engineering

Catalogue prepared by	Mr. Santhosh M B, Dr. Niveditha S V, Mr. Gopalakrishnan N
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on 23 July 2025

Course Code: MEC1006	Course Title: Engineering Graphics Type of Course: 1] Professional Core Course 2] Theory	L-T-P-C	2	0	0	2
Version No.	1.2					
Course Pre-requisites	NIL					
Anti-requisites						
Course Description	The course is designed with the objective of giving an overview of engineering drawing with the help of software tools. It is introductory in nature and acquaints the students with the techniques used to create engineering drawings with computerized drafting tools. Computerized drafting provides accurate and easily modifiable graphic entities, easy data storage, easy retrieval facility and it enhances creativity. It will expose students to the concept of engineering drawing and teach them to draw different views of planes and solids in different orientations. The course will teach students to use AutoCAD to produce engineering drawings. They will learn to create drawing layouts, dimensioning, the theory of projection, orthographic projection of points, lines, planes and solids, isometric projection and be introduced to the development of surfaces.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Engineering Graphics and attain SKILL DEVELOPMENT through Problem solving methodologies.					
Course Outcomes	On successful completion of this course the students shall be able to: (1) Demonstrate competency using AutoCAD graphics software as per BIS conventions and standards. (2) Comprehend the theory of projection for drawing projections of Points, Lines and Planes under different conditions. (3) Prepare Multiview orthographic projections of Solids by visualizing them in different positions. (4) Prepare pictorial drawings using the principles of isometric projections to visualize objects in three dimensions.					
Course Content						
Module 1	Introduction to Drawing	Assignment	Standard technical drawing	02 classes		
Topics: Introduction, drawing instruments and their uses, relevant BIS conventions and standards, Lettering, Line conventions, dimensioning, Selection of drawing sheet size and scale. [02 Hours: Comprehension Level]						
Module 2	Orthographic projections of Points, Straight Lines and Plane Surfaces	Assignment	Projection methods Analysis	10 classes		
Topics:						

Introduction, Definitions – Elements of projection and methods of projection, Planes of projection, reference line and conventions adopted. First angle and third angle projections. Projection of Points in all 4 quadrants.
Projections of Straight Lines (located in first quadrant/first angle projection only): True and apparent lengths, true and apparent Inclinations to reference planes. (No application problems). Projection of Plane surfaces (First angle projection): Regular plane surfaces – triangle, square, rectangle, pentagon, hexagon and circle – in different positions inclined to both the planes using change of position method only.
[10 Hours: Application Level]

Module 3	Orthographic Projections of Solids	Assignment	Multi-view drawing Analysis	10 classes

Topics:
Introduction, Projection of right regular prisms, pyramids, cone, hexahedron and tetrahedron in different positions (Problems resting on HP only and First angle projection).
[10 Hours: Application Level]

Module 4	Isometric Projections of Solids (Using isometric scale only)	Assignment	Spatial Visualization	8 classes

Topics:

Introduction, Isometric scale, Isometric projections of right regular prisms, cylinders, pyramids, cones and their frustums, spheres and hemispheres, hexahedron (cube), and combination of 2 solids, conversion of orthographic view to isometric projection of simple objects.
[8 Hours: Application Level]

Targeted Application & Tools that can be used:
Application Area is in understanding and interpreting an object in various positions and converting it into a technical drawing which can be universally accepted.
Professionally Used Software: AutoCAD

Text Book:
1.N. D. Bhatt, "Engineering Drawing: Plane and Solid Geometry," Charotar Publishing House Pvt. Ltd.

References:
1. K.R. Gopalakrishna, "Engineering Graphics", Subhash Publishers, Bangalore.

2. D. M. Kulkarni, A. P. Rastogi, A. K. Sarkar, "Engineering Graphics with AutoCAD," Prentice Hall.

3. D. A. Jolhe, "Engineering Drawing with Introduction to AutoCAD," Tata McGraw Hill.

4. Engineering Graphics Manual provided by Instructor incharge.

Web Resources :
Knimbus - Your Library. Anywhere, Anytime.

Topics relevant to "SKILL DEVELOPMENT":Projection in first and third angle for SKILL DEVELOPMENT through Problem Solving methodologies. This is attained through the assessment component mentioned in the course handout.

Catalogue prepared by	Mr. Yeshwanth D
Recommended by the Board of Studies on	BOS NO: 15th BOS held on 27/8/2022
Date of Approval by the Academic Council	Academic Council Meeting No. 18, Dated 03/08/2022.

<table>
<tr><td>Course Code: EEE1200</td><td colspan="5">Course Title: Basics of Electrical and Electronics Engineering
Type of Course: Professional Core - Theory</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="10">2.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="10">NIL</td></tr>
<tr><td>Anti-requisites</td><td colspan="10">NIL</td></tr>
<tr><td>Course Description</td><td colspan="10">This is a fundamental Course which is designed to know the use of basics of electrical and electronics engineering principles occurs in various fields of Engineering. The course emphasises on the characteristics and applications of electrical and electronic devices. The course also emphasizes on the working, analysis and design of electrical circuits using both active & passive components. Additionally, this course creates a foundation for the future courses such as Electrical machines, power system, power electronics Linear Integrated Circuits, Analog Communication and Digital Communication etc.</td></tr>
<tr><td>Course Objective</td><td colspan="10">The objective of the course is to familiarize the learners with the concepts of Basics of Electrical and Electronics Engineering and attain Skill Development through Participative Learning techniques.</td></tr>
<tr><td>Course Outcomes</td><td colspan="10">On successful completion of this course the students shall be able to:
CO.1 Apply basic laws of Electrical Engineering to compute voltage, currents and other parameters in the circuits.
CO.2 Discuss various fundamental parameters appearing in the characteristics of semiconductor devices and their applications.
CO.3 Summarize the operations of different biasing configurations of BJTs and amplifiers.
CO.4 Discuss the performance characteristics and applications of various electrical Machines.</td></tr>
<tr><td>Course Content:</td><td colspan="10"></td></tr>
<tr><td>Module 1</td><td>Introduction to Electrical Circuits</td><td colspan="5">Assignment/ Quiz</td><td>Numerical solving Task</td><td>10 Sessions</td></tr>
<tr><td colspan="11">DC Circuits: Concept of Circuit and Network, Types of elements, Network Reduction Techniques- Series and parallel connections of resistive networks, Star–to-Delta Transformations, Mesh Analysis, Nodal Analysis, Numerical examples.
AC Circuits: Fundamentals of single phase circuits - Series RL, RC and R-L-C Circuits, Concept of active power, reactive power and Power factor, Numerical examples.
Introduction to three phase system and relation between line and phase values in Star & Delta connection, Numerical examples.</td></tr>
<tr><td>Module 2</td><td>Semiconductor and Diode applications</td><td colspan="5">Assignment/ Quiz</td><td>Memory Recall based Quizzes</td><td>10 Sessions</td></tr>
<tr><td colspan="11">Mass Action Law, Charge densities in a semiconductor, Types of SC, Junction diodes -Ideal and practical behaviour, Modelling the Diode Forward Characteristic, and Diode applications like rectifiers, Zener diode, characteristics and its applications like voltage regulator.</td></tr>
<tr><td>Module 3</td><td>Transistors and its Applications</td><td colspan="5">Assignment/ Quiz</td><td>Memory Recall-based Quizzes</td><td>10 Sessions</td></tr>
<tr><td colspan="11">Transistor characteristics, Current components, BJT Configurations (CB, CC, CE configurations) and their current gains. Operating point, Biasing, Fixed Bias, and load line analysis. Single Stage amplifier. JFET (Construction, principal of Operation and Volt –Ampere characteristics). Pinch- off voltage, Comparison of BJT and FET. MOSFET (Construction, principal of Operation and symbol), MOSFET characteristics in Enhancement and Depletion modes.</td></tr>
</table>

Module 4	Fundamentals of Electrical Machines	Assignment/ Quiz	Numerical solving Task	10 Sessions

Electrical Machines: Single phase transformers: principle of operation and EMF equation, Numerical examples. DC Motor: principle of operation, Back EMF, torque equation, Numerical examples. AC Motor: Principle operation of Induction Motors and its Applications.

Self-Learning Topics:

Clipping and clamping circuits, Stabilization Techniques, Voltage divider bias and its stability factor, Multistage amplifier, Darlington pair.
Special Machines: Introduction to special electrical machines and its applications.

Targeted Application & Tools that can be used:

Targeted Applications: Application Area includes all electrical and electronic circuits (power supply unit, regulator unit, embedded devices, hardware electronics etc.). The students will be able to join a profession which involves basics to high level of electronic circuit design.
Professionally Used Software: Multisim/ P Spice
Besides these software tools hardware equipment such as Multimeters, Function Generators, Power Supplies, Oscilloscopes etc., can be used to perform component/circuit testing and analysis..

Project Work/ Assignment:

1. Article review: At the end, of course an article topic will be given to an individual or a group of students. They need to refer the library resources and write a report on their understanding about the assigned article in appropriate format.
2. Presentation: There will be a group presentation, where the students will be given a topic. They will have to explain/demonstrate the working and discuss the applications for the same.
3. Case Study: - At the end of the course students will be given a 'real-world' application based circuits like Power Amplifier, Signal/Function Generator etc. as a case study. Students will be submitting a report which will include Circuit Diagrams, Design, Working Mechanism and Results etc. in appropriate format

Text Book(s):

3. Kothari D. P. & Nagrath I. J., "Basic Electrical and Electronics Engineering", Tata McGraw-Hill
4. Education
5. Theraja B.L. and Theraja A.K., "A Textbook of Electrical Technology: Basic Electrical Engineering" in S.I. System of Units, 23rd ed., New Delhi: S. Chand, 2002.
6. A.P.Malvino, Electronic Principles,7thEdition, Tata McGraw Hill,2007
7. J. Millman, C. C. Halkias and C. D. Parikh, "Millman's Integrated Electronics", McGraw Hill Education, 2nd Edition.
8. Basics of Electrical & Electronics Laboratory Manual.

Reference Book (s):

4. John Hiley, Keith Brown and Ian McKenzie Smith, "HUGHES Electrical and Electronic Technology", 10th Edition (Indian Edition published by Dorling Kindersley), Pearson,2011
5. Samarajit Ghosh, "Fundamentals of Electrical and Electronics Engineering", 2nd Edition, Prentice Hall India, 2007.
6. K Uma Rao, A Jaya Lakshmi, "Basic Electrical engineering" IK International publishing house Pvt. Ltd
7. R. L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education India 7th Edition.
8. A K. Maini, V. Agrawal, "Electronic Devices & Circuits", Wiley, 2nd Edition
9. A.S Sedra, K. C. Smith, "Microelectronic Circuits", Oxford University Press, 6th Edition

Online Resources (e-books, notes, ppts, video lectures etc.):

4. https://presidencyuniversity.linways.com
5. https://www.digimat.in/nptel/courses/video/108105112/L01 "Fundamentals of Electrical Engineering-Basic Concepts, Examples"
6. Seminar Topic: https://nptel.ac.in/courses/108/105/108105153/ "Electrical Measurements"

7. Video lectures on "Electronic Devices" by Prof. Dr. A. N. Chandorkar, IIT Bombay http://www.satishkashyap.com/2013/03/video-lectures-on-electron-devices-by.html
8. Video lectures on "Analog Electronics" by Prof. S.C. Dutta Roy, IIT Delhi https://nptel.ac.in/courses/108/102/108102095/
9. Video lectures on "Diodes", by Prof. Chitralekha Mahanta, IIT Guwahati, https://nptel.ac.in/courses/117/103/117103063/

E-content:

1. "Introduction to Electrical Machines https://nptel.ac.in/courses/108/102/108102146/"
   M. -Y. Kao, H. Kam and C. Hu, "Deep-Learning-Assisted Physics-Driven MOSFET Current Voltage Modeling," in IEEE Electron Device Letters, vol. 43, no. 6, pp. 974-977, June 2022, doi: 10.1109/LED.2022.3168243
   https://ieeexplore-ieee-org-resiuniv.knimbus.com/document/9758727
2. F. Bonet, O. Aviñó-Salvadó, M. Vellvehi, X. Jordà, P. Godignon and X. Perpiñà, "Carrier Concentration Analysis in 1.2 kV SiC Schottky Diodes Under Current Crowding," in IEEE Electron Device Letters, vol. 43, no. 6, pp. 938-941, June 2022, doi: 10.1109/LED.2022.3171112. https://ieeexplore-ieeeorg-presiuniv.knimbus.com/document/9764749
3. M. Chanda, S. Jain, S. De and C. K. Sarkar, "Implementation of Subthreshold Adiabatic Logic for Ultralow-Power Application," in IEEE Transactions on Very Large Scale Integration (VLSI) Systems, vol. .23, no. 12, pp. 2782-2790, Dec. 2015. https://ieeexplore.ieee.org/document/7018053
4. R. Raut and O. Ghasemi, "A power efficient wide band trans-impedance amplifier in submicron
   CMOS integrated circuit technology," 2008 Joint 6th International IEEE Northeast Workshop on Circuits and Systems and TAISA Conference, 2008, pp. 113-116, doi: 0.1109/NEWCAS.2008.4606334. https://ieeexplore.ieee.org/document/4606334

Topics relevant to "SKILL DEVELOPMENT": Performing suitable experiments to compute the electric circuit parameters, performance operation of machines, and operation of semiconductor devices for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course plan.

Catalogue prepared by	Dr. Ajay Kumar Maurya
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	

Course Code EEE1250	Course Title: Basics of Electrical and Electronics Engineering Lab Type of Course: Professional Core - Laboratory	L-T-P-C	0	0	2	1
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This fundamental laboratory provides an opportunity to validate the concepts taught in the basics of electrical and electronics engineering and enhances the ability to visualize real system performance, using both hardware and simulation tools.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Basics of Electrical and Electronics Engineering and attain Skill Development through Experiential Learning techniques.					
Basic skill sets required for the laboratory:						
	The students shall be able to develop: 1) An attitude of enquiry. 2) Confidence and ability to tackle new problems. 3) Ability to interpret events and results. 4) Ability to work as a leader and as a member of team. 5) Assess errors and eliminate them. 6) Observe and measure physical phenomenon. 7) Write Reports. 8) Select suitable equipment, instrument and materials. 9) Locate faults in systems. 10) Manipulative skills for setting and handling equipment. 11) The ability to follow standard test procedures. 12) An awareness of the need to observe safety precautions. 13) To judge magnitudes without actual measurement.					
Course Out Comes	On successful completion of the course the students shall be able to: 1. Apply basic laws of Electrical Engineering to compute voltage, currents, and other parameters in the circuits. 2. Demonstrate the working of electrical machines to observe performance characteristics. 3. Demonstrate the working of electronic circuits to obtain the V-I Characteristics of various semiconductor devices. 4. Sketch the characteristics and waveforms relevant to standard electrical and electronic circuits					
Course Content:						
	List of Laboratory Tasks: Experiment No 1: Verification of KVL and KCL for a given DC circuit. Level 1: Study and Verify KVL and KCL for the given electrical Circuit. Level 2: For the same circuit considered in level 1, perform the simulation using NI LabVIEW/Multisim/MATLAB. Experiment No 2: Analyse AC series circuits – RL, RC and RLC . Level 1: Conduct an experiment to perform and verify the impedance, current and power of Series RL and RC circuits Level 2: Conduct an experiment to perform and verify the impedance and current of RLC series circuits.					

	Experiment No 3: Calculation of power and power factor of the given AC Circuit. Level 1: Conduct an experiment to measure the power and power factor for given resistive load. Level 2: Conduct an experiment to measure the power and power factor for given inductive load. Experiment No 4: Perform the experiments on given Transformer. Level 1: Verify the EMF equation of a transformer and compute the voltage transformation ratio. Level 2: Study the effect of load on the secondary side of the transformer and verify the EMF equation under load conditions. Experiment No 5: Load test on DC shunt motor Level 1: Conduct load test on DC shunt motor and find its efficiency at different loads Level 2: Conduct load test on DC shunt motor and plot the performance characteristics. Experiment 6: Study of PN-Junction Diode Characteristics in Forward and Reverse Bias Conditions. Level 1: Carry out an experiment to plot VI Characteristics and hence find the cut-in voltage on forward characteristics for the Silicon P-N Junction diode. Level 2: Carry out an experiment to plot Load Line Characteristics of P-N Junction diode. Experiment No. 7: To observe the output waveform of half wave and full wave rectifier circuit and compute ripple factor and efficiency Level 1: Identify the components required for a rectifier circuit, rig up the circuit, and sketch the output waveforms without filter. Level 2: Rig up the rectifier circuit with RC filter, observe the output waveforms, determine the efficiency and ripple factor. Experiment 8: Study of Zener Diode Characteristics. Level 1: Carry out an experiment to plot VI Characteristics of Zener Diode and hence find the Zener voltage on reverse characteristics. Level 2: Assemble the circuit for a Zener Diode as Voltage Regulator. Level 2: Given a sinusoidal input of 10 V p-p, implement a positive / negative clipper with output clipped at 2 V. Experiment 9: Study the characteristics of the NPN transistor in common emitter configuration. Level 1: To study the input and output characteristics of the NPN transistor in common emitter configuration. Level 2: Identify the components required to implement an emitter follower circuit. Rig up the circuit and observe the variations in output waveform with respect to the variations in input waveform. Experiment 10: To Implement RC Coupled amplifier using a BJT. Level 1: To study, analyze and implement the common Emitter amplifier and observe their results for DC Analysis. Level 2: To study, analyze and implement the common Emitter amplifier and observe their results for AC Analysis.
Targeted Application & Tools that can be used: Targeted Applications: Application Area includes all electrical and electronic circuits (power supply unit, regulator unit, embedded devices, hardware electronics etc.). The students will be able to join a profession which involves basics to high level of electronic circuit design. Professionally Used Software: Multisim/ P Spice Besides these software tools hardware equipment such as Multimeters, Function Generators, Power Supplies, Oscilloscopes etc., can be used to perform component/circuit testing and analysis.	

Course Material

1. Basics of Electrical and Electronics Engineering Laboratory Manual, Presidency University, Bengaluru.

Text Book:

2. Kothari D. P. & Nagrath I. J., "Basic Electrical and Electronics Engineering", Tata McGraw-Hill

Reference Books:

3. John Hiley, Keith Brown and Ian McKenzie Smith, "HUGHES Electrical and Electronic Technology", 10th Edition (Indian Edition published by Dorling Kindersley), Pearson,2011
4. Samarajit Ghosh, "Fundamentals of Electrical and Electronics Engineering", 2nd Edition, Prentice Hall India, 2007.
5. K Uma Rao, A Jaya Lakshmi, "Basic Electrical engineering" IK International publishing house Pvt. Ltd
6. R. L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education India 7th Edition.
7. A K. Maini, V. Agrawal, "Electronic Devices & Circuits", Wiley, 2nd Edition
8. A.S Sedra, K. C. Smith, "Microelectronic Circuits", Oxford University Press, 6th Edition

Online Learning Resources:

9. https://presidencyuniversity.linways.com
10. https://www.digimat.in/nptel/courses/video/108105112/L01 "Fundamentals of Electrical Engineering-Basic Concepts, Examples"
11. Video lectures on "Diodes", by Prof. Chitralekha Mahanta, IIT Guwahati, https://nptel.ac.in/courses/117/103/117103063/

Topics relevant to "SKILL DEVELOPMENT": All the experiments which are listed are for Skill Development through Experiential Learning Techniques. This is attained through the assessment component mentioned in course handout.

Catalogue prepared by	Dr. Ajay Kumar Maurya
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	

Course Code: CSE2282	Course Title: Computational Thinking and AI Programming Type of Course: Theory	L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	NIL					
Course Description	This course provides a solid foundation in Computational Thinking and basic Artificial Intelligence concepts. AI segment introduces various search methods for problem-solving and knowledge-based logic representations. Students explore uncertainty handling using models such as the Naïve Bayes Classifier and Hidden Markov Models. The course bridges fundamental coding skills with intelligent system development for practical problem-solving.					
Course Object	The objective of the course is to familiarize the learners with the concepts Computational Thinking and AI Programming and attain Skill Development through Experiential Learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: CO.1 Explain algorithms to solve fundamental computational problem. CO.2 Demonstrate conditional loops, functions and structures to address problem-solving tasks. CO.3 Apply various uninformed and heuristic search algorithms to solve real-world state space problems. CO.4 Analyze constraint satisfaction problems and logic-based representations using resolution techniques for effective problem-solving in AI applications.					
Course Content:						
Module 1	Fundamentals of Computing & Programming	Assignment		7 Sessions		
Topics: Fundamentals of Computing– Identification of Computational Problems Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language). Python interpreter and interactive mode,debugging; values and types: int, float, boolean, string , and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Conditionals: Boolean values and operators, conditional (if), alternative (if else),chained conditional (if-elif-else), Illustrative programs						
Module 2	Control Flow, Data Structures & Files	Assignment		14 Sessions		
Topics: Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability. List, Tuple, Sets, Dictionaries and their operations. Files: Illustrative Programs file operations.						
Module 3	Search Algorithms & Problem Solving	Assignment		12 Sessions		
Topics: Introduction – State Space Search; General Formulation of Search Problems; Data Structures used in Searching. Uninformed Search Algorithms – Breadth First Search, Depth First Search, Uniform Cost Search, Generalized Uniform Cost Search, Iterative Deepening Depth-First Search, Time and Space Complexity Analysis of Uninformed Search Algorithms. Heuristic Search Algorithms – Heuristics and Admissibility, Greedy Best-First Search, A*						

Search and weighted A* Search, Local Search – Local Search, Hill Climbing, Genetic Algorithms, Gradient Descent. Adversarial Search – Minimax Search, Alpha-Beta Pruning, Ideal Ordering.

Module 4	Knowledge-Based Logic Representation	Assignment		12 Sessions

Topics:

Constraint Satisfaction – Constraint Satisfaction Problems Definitions and Examples – Map Colouring, N Queens, Cryptarithmetic, Generalized CSP; Back-tracking Heuristics; Arc Consistency and Path Consistency. Propositional Logic – Syntax and Semantics of Propositional Logic. Logical connectives. Inference Rules. Conjunctive and Disjunctive Normal Forms. First Order Logic – Syntax and Semantics of Propositional Logic. Logical connectives. Inference Rules. Conjunctive and Disjunctive Normal Forms. Resolution – Resolution Principle. Propositional and First Order Resolution. Applications for solving story problems using Resolution.

Project work/Assignment:

1. Assignment 1 on (Module 1 and Module 2)
2. Assignment 2 on (Module 3 and Module 4)

Text Books

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021
2. Eric Matthes, Python Crash Course,: A Hands-On, Project-Based Introduction to Programming, 3rd Edition, 2023
3. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson Education, 4th Edition, 2022.
4. Elaine Rich, Kevin Knight and Shivashankar B Nair. *Artificial Intelligence*. 4th Edition. MedTech Science Press. 2024

References

1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.
3. Nils J. Nilsson, Fundamentals of Artificial Intelligence, Morgan Kaufmann, 2021
4. Elaine Rich, Kevin Knight, and Shivashankar B. Nair, Artificial Intelligence, McGraw Hill Education, 3rd Edition, 2008.

Web Resources

1. https://onlinecourses.nptel.ac.in/noc20_cs70/preview
2. NPTEL Courses: Mausam (IIT Delhi), "An Introduction to Artificial Intelligence" Link: https://nptel.ac.in/courses/106102220.
3. Shyamanta M. Hazarika (IIT Guwahati), "Fundamentals of Artificial Intelligence". Link: https://nptel.ac.in/courses/112103280. Useful for the full course.
4. Deepak Khemani (IIT Madras), "Artificial Intelligence: Search Methods for Problem-Solving". Link: https://nptel.ac.in/courses/106106226. Useful for Module 3 and 4

Topics relevant to development of "Employability": Data structures using python., Kowledge Based Logic representation

Topics relevant to "PROFESSIONAL ETHICS": Involves using algorithms responsibly to ensure fairness, transparency, accountability, and the well-being of society.

<table>
<tr><td>Course Code:
CSE2283</td><td colspan="4">Course Title:
Computational Thinking and AI Programming Lab
Type of Course: Lab</td><td>L-T-P-C</td><td>0</td><td>0</td><td>2</td><td>1</td></tr>
<tr><td>Version No.</td><td colspan="9">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="9"></td></tr>
<tr><td>Anti-requisites</td><td colspan="9">NIL</td></tr>
<tr><td>Course Description</td><td colspan="9">This course offers a foundational introduction to Computational Thinking and basic Artificial Intelligence (AI) concepts, emphasizing hands-on experimentation and practical implementation. Students engage in a series of guided lab sessions designed to bridge core programming skills with real-world intelligent system development.</td></tr>
<tr><td>Course Objective</td><td colspan="9">The objective of the course is to familiarize the learners with the concepts Computational Thinking and AI Programming lab and attain Skill Development through Experiential Learning techniques.</td></tr>
<tr><td>Course Out Comes</td><td colspan="9">On successful completion of the course the students shall be able to:
CO.1 Apply algorithms to solve fundamental computational problem.
CO.2 Utilize conditional loops, functions, structures and files to implement effective solutions to problem-solving tasks. (Apply)
CO.3 Apply uninformed and heuristic search algorithms to address real-world scenarios.
CO.4 Apply resolution techniques to analyze constraint satisfaction and logic-based problems in AI.)</td></tr>
<tr><td>Course Content:</td><td colspan="9"></td></tr>
<tr><td>Module 1</td><td colspan="3">Fundamentals of Computing & Programming</td><td colspan="2">Assignment</td><td colspan="2"></td><td colspan="2">Sessions : 7</td></tr>
<tr><td colspan="10">Lab sheet :
Introduction to Python Programming.
Demonstration of Colabs or Jupiter environment.
BMI Calculator with Health Classification
Accept height (in meters) and weight (in kilograms) from the user, calculate BMI, and classify into Underweight, Normal, Overweight, or Obese.
Loan Eligibility Checker
Determine loan eligibility based on income, age, credit score, and employment status.
Basic ATM Simulation
Simulate ATM operations: check balance, deposit, withdraw (with checks for sufficient balance), and exit.

Online Shopping Cart Total
Create a system that takes multiple items with their quantities and unit prices, applies GST or discounts, and prints a bill summary.
Password Strength Checker
Check if a password entered by the user is strong (contains uppercase, lowercase, digit, special character, and is of minimum length).</td></tr>
<tr><td>Module 2</td><td colspan="3">Control Flow, Data Structures & Files</td><td colspan="2">Assignment</td><td colspan="2"></td><td colspan="2">10 Sessions</td></tr>
<tr><td colspan="10">Topics:
Number Analyzer
Accept a list of numbers from the user and use a loop to calculate the count, sum, and average. Use break if a negative number is entered.</td></tr>
</table>

ATM Pin Retry System
Allow the user 3 attempts to enter the correct PIN. Use while and break to lock the user out after 3 failed attempts.
Tax Calculator
Write a function that takes income as input and returns the amount of tax payable using slab rates. Demonstrate local vs. global scope with variables.
Factorial Using Recursion
Use a recursive function to compute factorial of a number.
Email Validator
Check if a string contains "@" and "." in valid positions. Use slicing to extract the username and domain.
Palindrome Checker
Use string slicing to check if the input string is a palindrome.
☐ tudent Score Tracker
Store student names and their marks using a dictionary. Allow searching, updating, and deleting records.
Unique Words Extractor
Read a sentence and extract unique words using sets.
Tuple-Based Weekly Planner
Use a tuple to store fixed schedule entries for the week. Display the activity for a given day.
Shopping List Manager
Create a dynamic list that adds, removes, and updates grocery items with their quantities.
Attendance Logger
Write names of students present today into a text file. Append new entries each time the program is run.
Student Record Reader
Read student data from a file, calculate total and average marks, and print formatted results.
Word Counter from File
Read a paragraph from a file and count the number of words, lines, and characters.

Module 3	Search Algorithms & Problem Solving	Assignment		10 Sessions

Topics:
State Space Search & Problem Formulation
Lab 1: Missionaries and Cannibals Problem
- Objective: Model the state space and use BFS and DFS to find a valid sequence of moves that ensures safe river crossing.

Uninformed Search Algorithms
Lab 2: Maze Solver
- Objective: Represent a maze as a grid and use BFS and DFS to find the shortest or any valid path from start to goal.

Lab 3: Puzzle Solver (8-puzzle / 15-puzzle)
- Objective: Solve the sliding puzzle using Iterative Deepening DFS.

Heuristic Search Algorithms
Lab 4: Informed Search for Puzzle Solving
- Objective: Solve the 8-puzzle using Greedy Best-First and A* Search. Compare heuristics like Manhattan Distance vs Misplaced Tiles.

Lab 5: Optimal Route Planning

- Objective: Simulate a map with cities and distances. Implement A* Search for route optimization using straight-line distance as heuristic.

Local Search

Lab 6: N-Queens Problem with Hill Climbing

- Objective: Solve the N-Queens problem using local search with sideway moves and random restarts.

Lab 7: Genetic Algorithm for String Matching

- Objective: Use genetic algorithms to evolve a string to match a target phrase.

Adversarial Search

Lab 10: Tic-Tac-Toe with Minimax Algorithm

- Objective: Implement a two-player Tic-Tac-Toe game using the Minimax algorithm.

Module 4	Knowledge-Based Logic Representation	Assignment		10 Sessions

Constraint Satisfaction Problems (CSP)

Lab 1: Map Coloring Problem

Lab 2: N-Queens Solver Using CSP

- Write a program that places N queens on an N×N chessboard so that no two queens attack each other.

Lab 3: Propositional Logic Formula Evaluator

Lab 4: Conversion to CNF and DNF

- Implement algorithms to convert propositional logic formulas to Conjunctive Normal Form (CNF) and Disjunctive Normal Form (DNF).

Lab 5: First Order Logic Representation

- Translate English statements about students and courses into First Order Logic expressions.

Project work/Assignment:

3. Assignment 1 on (Module 1 and Module 2)
4. Assignment 2 on (Module 3 and Module 4)

Text Books

1) Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021
2) Eric Matthes, Python Crash Course,: A Hands-On, Project-Based Introduction to Programming, 3rd Edition, 2023
3) Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson Education, 4th Edition, 2022.
4) Elaine Rich, Kevin Knight and Shivashankar B Nair. *Artificial Intelligence*. 4th Edition. MedTech Science Press. 2024

References

1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.
3. Nils J. Nilsson, Fundamentals of Artificial Intelligence, Morgan Kaufmann, 2021
4. Elaine Rich, Kevin Knight, and Shivashankar B. Nair, Artificial Intelligence, McGraw Hill Education, 3rd Edition, 2008.

Web Resources

1. https://onlinecourses.nptel.ac.in/noc20_cs70/preview
2. NPTEL Courses: Mausam (IIT Delhi), "An Introduction to Artificial Intelligence" Link: https://nptel.ac.in/courses/106102220.
3. Shyamanta M. Hazarika (IIT Guwahati), "Fundamentals of Artificial Intelligence". Link: https://nptel.ac.in/courses/112103280. Useful for the full course.
4. Deepak Khemani (IIT Madras), "Artificial Intelligence: Search Methods for Problem-Solving". Link: https://nptel.ac.in/courses/106106226. Useful for Module 3 and 4

Topics relevant to development of "Employability": Data structures using python., Knowledge Based Logic representation Topics relevant to "PROFESSIONAL ETHICS": Involves using algorithms responsibly to ensure fairness, transparency, accountability, and the well-being of society.

Course Code: CIV1501	Course Title: Elements of Engineering Mechanics Type of Course: Engineering Science Theory		L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	"Mechanics" is an area related to the motion of physical objects and "Engineering Mechanics" is an application of Mechanics used for solving problems involving common engineering elements. The purpose of this course is to expose the students to problems related to real-world scenarios. This course is both conceptual and analytical in nature that would help the student to predict the effects of forces and its motion while carrying out creative design functions.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Elements of Engineering Mechanics and attain Skill Development through Problem Solving methodologies.					
Course Out Comes	On successful completion of the course the students shall be able to: 1) Explain fundamental concepts, principles, laws, idealizations, theorems of Engineering Mechanics. 2) Calculate the Resultant Force for coplanar concurrent and non-concurrent force system. 3) Use Lami's theorem and equations of equilibrium for a coplanar concurrent force system in equilibrium condition. 4) Determine the support reactions in 2D statically determinate beams using the equations equilibrium for coplanar non-concurrent force system. 5) Compute the frictional resistance offered by different planes 6) Determine the location of centroid and moment of Inertia for two dimensional built-up sections					
Course Content:						
Module 1	Fundamentals of Engineering Mechanics	Assignment	Numerical solving tasks	15 Sessions		
Topics: Engineering Mechanics and its relevance. Force and its Characteristics: Laws of motion, Principle of superposition and transmissibility, Force system and its classification. Moment and Couple Composition of forces –Determination of Resultant for concurrent and non-concurrent co-planar force systems – Law of triangle, parallelogram and polygon of forces- Numericals on force system						
Module 2	Equilibrium of Forces	Assignment	Numerical solving tasks	15 Sessions		
Topics: Equilibrium and Equilibrant, Concept of Free-body diagram. Lami's theorem – statement and application for various engineering problems. Types of beam, supports and reactions (simple, hinged, roller and fixed) and loads acting on beam (vertical point load, uniformly distributed load).						

Module 3	Friction on Rigid bodies	Assignment	Numerical solving tasks	15 Sessions

Topics:
Types of Friction, Laws of friction and its applications, sliding friction, wedge friction, body on inclined planes.
Centroid of geometrical plane figures (square, rectangle, triangle and circle). Centre of gravity of Simple solid, Moment of inertia and related numericals

Targeted Application & Tools that can be used:
Applications in Systems containing Multi-Force Members, Frames, Trusses, Machines, Cable Bridges etc.
Professionally used software – Staad Pro/ETABS

Project Work/ Assignment:

Assignment 1: Conversions of units, Problems on Concurrent and Non- concurrent Coplanar Force Systems

Assignment 2: Computation of Forces using Lami's Theorem and to determine the Support reactions for statically determinate beams subjected to different loading conditions.

Assignment 3: Problems on calculating the Centre of gravity and Moment of Inertia for the combinations of geometrical plane figures.

Text Book(s):
T1. D.S. Bedi, '*Engineering Mechanics', 2nd Edition,2021,* Khanna Publications, New Delhi.

T2. Kumar K.L, Kumar V, '*Engineering Mechanics', 4th ed.,*Tata McGraw Hill, 2017.

T3. M.N. Shesha Prakash, Ganesh B. Mogaveer, 'Elements of Civil Engineering and Engineering Mechanics', PHI Learning, 2014.

References

R1. Timoshenko. S and Young D.H, '*Engineering Mechanics',* 5th Edition, Tata McGraw Hill, 2006.
R2. Shames I.H and Rao G.K.M, '*Engineering Mechanics – Statics and Dynamics',* Pearson Education-2009.
R3. Khurmi, R.S.,' *Applied Mechanics',* S. Chand & Co. New Delhi, 2010.

Weblinks:
W1. https://nptel.ac.in/courses/112/106/112106286/
W2.https://www.youtube.com/watch?v=nGfVTNfNwnk&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT
W3. https://onlinecourses.nptel.ac.in/noc25_me108/preview
W4. https://nptel.ac.in/courses/122104015

Topics relevant to "SKILL DEVELOPMENT": Engineering Mechanics and its relevance. Force and its Characteristic, Laws of Motion for Skill Development through Problem Solving methodologies. This is attained through assessment component mentioned in course handout

Catalogue prepared by	Mrs. Divya Nair
Recommended by the Board of Studies on	BOS Meeting No: 20, Dated: 6th June 2025

Date of Approval by the Academic Council	Academic Council Meeting No: 21, dated on 28th August 2023

Course Code: CIV1201	Course Title: Engineering Geology Lab Type of Course: Laboratory only	L-T-P-C	0	0	2	1
Version No.	1.0					
Course Pre-requisites	Nil					
Anti-requisites	Nil					
Course Description	The main purpose of this lab course is to make students to understand the basics of Engineering Geology subject and to know implications of geology in planning, designing and construction of large Civil engineering projects. Basically, the course emphasizes on the study of various types of rock formation and its physical properties. Topics such as rocks, minerals, earthquake epicentre identification are discussed with special reference to local geological problems. Further study of geological and contour maps exposes the Earth's structure and natural hazards and also ascertain the water, energy, and minerals resources.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Engineering Geology Lab and attain Skill Development through Experiential Learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: CO.1 Classify the common minerals & rocks and their applications in civil engineering projects. CO.2 Locate the earthquake epicentre using seismographic data. CO.3 Demonstrate contour and geological maps for land terrain and topography.					
Course Content:						

List of Laboratory Tasks:

Experiment No. 1: Megascopic identification of ore forming minerals based on their physical and special properties.

Experiment No. 2: Megascopic identification of rock forming minerals based on their physical and special properties.

Experiment No. 3: Megascopic identification of rocks based on their physical and special properties.

Experiment No. 4: Determination of epicentre of earthquake using travel - time curve. [Provide the seismographic data required in the processed form].

Experiment No. 5: Determination of of earthquake epicentre by triangulation [Provide the seismographic data required in the processed form].

Experiment No. 6: interpretation of geological maps for land terrain.

Experiment No. 7: interpretation of contour maps for land topography

Targeted Application & Tools that can be used:

Text Book(s):

1. S.K.Duggal, H.K.Pandey, N.Rawat, Engineering Geology", Mc. Graw Hill, Tata McGraw-Hill, Fourth Edition, 2014.

2. Parbin Singh, Engineering and General Geology, S.K. Kataria & Sons; Eighth Edition, 2017 Web Resources: W1.https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=NAP_1_29062023_9	
References 1. P.C.Varghese, Engineering Geology for Civil Engineers", PHI. 2. R2 Judd and Krynine, Principles of Engineering Geology and Geotechnics, McGraw-Hill Book Company 3. R3 N ChennaKesavulu, Textbook of Engineering Geology, Trinity Press, Second Edition 4. R4 Lab Manual prepared by Civil Engineering Department, Presidency University, Bangalore.	
Topics relevant to "SKILL DEVELOPMENT": Minerals and Rock Identification, classification, Uses. Preparation of profiles and interpretation of geological maps. for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course plan.	
Catalogue prepared by	Dr. Venkatesha Raju K
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 4th June 2025
Date of Approval by the Academic Council	Academic Council Meeting No: 21, dated on 28th August 2025

Course Code: CIV2500	Course Title: Strength of Materials Type of Course: Engineering Science Course	L-T-P-C	3	1	0	4
Version No.	1.0					
Course Pre-requisites	CIV1501 -Engineering Mechanics Principal of superposition, Moment, Equilibrium of forces, Centroid, and Moment of inertia of simple solid geometry					
Anti-requisites	NIL					
Course Description	The course deals with estimating the internal forces and deformations in a structural member produced by any combination of external loading. The content of the course focussed on the mechanical behavior of engineering materials when subjected to axial, bending, shear, and torsional forces. This course is both conceptual and analytical in nature and gives the real visualization of structural internal forces by using professional softwares.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Strength of Materials and attain Skill Development through Problem Solving methodologies.					
Course Out Comes	On successful completion of the course the students shall be able to: CO.1 Predict the stress-strain behavior of various materials subjected to different loading conditions. CO.2 Sketch the Shear Force Diagram, Bending Moment Diagram and stress distribution along a c/s for statically determinate beams. CO.3 Compute the torsional strength of the shaft. CO.4 Compute the load carrying capacity of axially loaded columns.					
Course Content:						
Module 1	Stresses and Strains	Assignment	Numerical solving tasks	18 Sessions		
Topics: Stress in Simple, compound and composite bars, Elastic constants and volumetric strains, Introduction to Principal stress and principal planes, Mohr's circle of stresses.						
Module 2	Shear Force, Bending Moments, Shear and Bending stresses	Assignment	Numerical solving tasks	20 Sessions		
Topics: Definition of Shear force and bending moment at a section, the relationship between shear force, bending moment and loading, Shear force and bending moment diagram for statically determinate beams subjected to various loading conditions Euler Bernoulli beam theory, Stress distribution at a cross-section due to Bending Moment and Shear force, Bending and shear stress distribution across the depth of a section for various loading conditions in statically determinate beams.						
Module 3	Torsion of Shafts	Assignment	Numerical solving tasks	10 Sessions		
Topics: Theory of torsion - Torsion of circular and hollow circular shafts and shear stresses due to torsion.						
Module 4	Columns and Struts	Assignment	Numerical solving tasks	12 Sessions		
Topics: Theory of columns- Axial load, Euler's theory, Rankine's formula, combined bending and axial load on Struts.						

Targeted Application & Tools that can be used:

The knowledge of this course can be applied in the design of structure elements, selection of engineering material, and design of pavements.
Professionally used software – MD Solids, STAAD.Pro, Etabs MS-Excel

Project Work/ Assignment:

Assignment 1: Conversions of units, Problems on Stress, Strain and Modulus of Elasticity. Calculating Elastic constants when Poisson's ratio is given.
Assignment 2: Computation of Shear force and Bending moments for statically determinate beams subjected to different loading conditions. Sketch the SFD and BMD for the same.
Assignment 3: Problems on determining the diameter of a solid and hollow shafts, also the Torque transmitted by shaft considering allowable shear stresses.
Assignment 4: Problems on calculation of Crippling load using Euler's Theory and Rankine's Theory under various end conditions in columns.

Text Book

1. S. Ramamrutham, R Narayanan, "Strength of Materials", 19th edition (Latest edition) Dhanpat Rai Publishing, 2025.
2. S. Ramamrutham, R Narayanan, "Strength of Materials", 18th edition. Dhanpat Rai Publishing, 2014.
2. P. Beer, E. R. Johnston (Jr.) and J.T. DeWolf, "*Mechanics of Materials"*, 8th edition, Tata McGraw Hill, 2019. (6th Edition, 2009)

References:

1. Egor Popov, "Mechanics of Materials", Pearson, 1976. (Indian Reprint , 2nd edition, 2015.
2. Timoshenko, S.P. and Gere, "J.M. Mechanics of Materials", 4th edition,Tata McGraw Hill, 1996.
3. R K Bansal, A Textbook of Strength of Materials (Mechanics of Solids), 7th edition, Laxmi Publications Pvt. Ltd, 2024.

E-Resources:

https://onlinecourses.nptel.ac.in/noc25_me107/preview
https://nptel.ac.in/courses/105105108

Topics relevant to "SKILL DEVELOPMENT": Plotting Shear Force and Bending Moment Diagrams, estimating torsional strength of shafts and load carrying capacity of columns for Skill Development through Problem Solving methodologies. This is attained through assessment component mentioned in course handout

Catalogue prepared by	Ms. Divya Nair
Recommended by the Board of Studies on	BOS Meeting No: 20, Dated: 6th June 2025
Date of Approval by the Academic Council	Academic Council Meeting No: 26, dated on ___ June 2025

<table>
<tr><td>Course Code: ECE1511</td><td colspan="4">Course Title: Design Workshop
Course Type: Engineering Science</td><td>L-T-P-C</td><td>1</td><td>0</td><td>2</td><td>2</td></tr>
<tr><td>Version No.</td><td colspan="9">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="9">NIL</td></tr>
<tr><td>Anti-requisites</td><td colspan="9">NIL</td></tr>
<tr><td>Course Description</td><td colspan="9">This course is designed to provide an in-depth understanding of Arduino, microcontrollers Raspberry pi and their application in various real time projects involving sensors. Throughout the course, students will learn the fundamentals of Arduino and Raspberry Pi programming and gain hands-on experience with a wide range of sensors. Students will explore how to connect and interface sensors with Arduino and Raspberry Pi boards, read sensor data, and use it to control various output devices This course is suitable for beginners who are interested in exploring the world of electronics and developing practical applications using Arduino, Raspberry Pi and sensors.</td></tr>
<tr><td>Course Objective</td><td colspan="9">The objective of the course is Employability Skills of student by using PARTICIPATIVE LEARNING techniques.</td></tr>
<tr><td>Course Outcomes</td><td colspan="9">On successful completion of the course the students shall be able to
1) Explain the main features of the Arduino & the Raspberry Pi prototype board.
2) Demonstrate the hardware interfacing of the peripherals to Arduino and Raspberry Pi system.
3) Understand the types of sensors and its functions
4) Demonstrate the functioning of live projects carried out using Arduino and Raspberry Pi system.</td></tr>
<tr><td>Course Content:</td><td colspan="9"></td></tr>
<tr><td>Module 1</td><td colspan="3">Basic concepts of Microcontrollers</td><td>Hands-on</td><td colspan="3">Interfacing Task and Analysis</td><td colspan="2">3 Sessions</td></tr>
<tr><td colspan="10">Topics:
Introduction to Arduino, ESP and Node MCU Pin configuration and architecture, Device and platform features, Concept of digital and analog ports, Familiarizing with Arduino Interfacing Board, API’s , Introduction to Embedded C and Arduino platform, Arduino Datatypes and variables, Arduino i/o Functions, Arduino Communications, Arduino IDE, Various Cloud Platforms.</td></tr>
<tr><td>Module 2</td><td colspan="3">Sensory Devices</td><td>Hands-on</td><td colspan="3">Interfacing Task and Analysis</td><td colspan="2">3 Sessions</td></tr>
<tr><td colspan="10">Arduino Sensors: Humidity Sensor, Temperature Sensor, Water Detector / Sensor, PIR Sensor, Ultrasonic Sensor, Connecting Switches and actuators, sensor interface with Arduino.
Introduction to 3D Printer: 3D Printer technology and its working Principles, Applications.
Introduction to online Simulators: Working with AutoCAD/Fusion 360 Simulator.</td></tr>
</table>

Module 3	Introduction to Micro python	Hands-on	Interfacing Task and Analysis	4 Sessions
Topics: Introduction to MicroPython, Comparison with other programming languages, Setting up the MicroPython development environment, Basics of MicroPython syntax and structure.				
Module 4	Working with Raspberry-pi	Hands-on	Interfacing Task and Analysis	5 Sessions
Introduction to raspberry pi boards, pin-diagram, different types of raspberry pi boards and its application, LED and switch control. Mastering Modules, Setup Raspberry - PuTTY SSH,VNC Viewer to interface with more complicated sensors and actuators. Various Libraries and its functions.				

Lab: Name of the Experiments:

1. Introduction Lab 1:
   Level 1: Overview on Arduino based Micro-controller, and sensors.
   Level 2: Interfacing of Arduino and ESP boards with sensors and other components.
2. Lab 2: Smart Plant Monitoring
   Level 1- Push button-controlled LED.
   Level 2- Automatic Irrigation and monitoring System using Arduino
3. Lab 3: Robotics with Arduino.
   Level 1- Servo Motor control using Arduino
   Level 2: DC Motor Control Using Arduino for Robotics.
4. Lab 4: Environmental pollution using ESP.
   Level 1 - IoT based air Pollution Monitoring System.
   Level 2- IoT Based water pollution system
5. Introduction Lab for raspberry pi:
   Level 1: Overview on Different Raspberry Pi Boards, and sensors.
   Level 2: Configuring the Raspberry Pi and Interfacing with sensors and other components.
6. Lab 7: Raspberry Pi based Object Detection using TensorFlow and OpenCV.
7. Lab 8: Speech Recognition on Raspberry Pi for Voice Controlled Home Automation.
8. Lab 9: Design the website using HTML and CSS, and host the website on Raspberry Pi.
9. Introduction Lab for 3D printing:
   Overview of 3D printing. Design of 3D structure using the CAD. Understand the steps of fabrication of simple rectangular box using 3D printer.
10. Lab 10: Design and print of Hollow Cylindrical structure using 3D CAD and 3D printer.
11. Lab 11 Demonstration of Jetson nano board and its capability. (OPTIONAL)
12. Lab 12: Revision
13. Lab 13: Revision
14. Lab 14: Mini Project
15. Lab 15: Mini Project Evaluation.

Topics: Types of Arduino boards, Thonny Python, Python IDLE, sensors, 3D Printer

Targeted Application & Tools that can be used:

Application Area:

Home Automation, Environmental Monitoring, Agriculture and Farming, Industrial Automation, Internet of Things (IoT), Robotics, Wearable Devices, Security Systems,

Education and Learning. These are just a few examples of the many application areas where Arduino, Raspberry Pi and sensors can be applied. The flexibility and affordability of Arduino, and Raspberry Pi combined with the wide range of sensors available, allow for endless possibilities in creating innovative projects.

Professionally Used Software: Students can use open SOURCE Software's Arduino IDE and Tincker CAD, Thonny Python, Python IDLE etc.

Project work/Assignment:

1. Projects: At the end of the course students will be completing the project work on solving many real time issues.

2. Book/Article review: At the end of each module a book reference or an article topic will be given to an individual or a group of students. They need to refer the library resources and write a report on their understanding about the assigned article in appropriate format. Presidency University Library Link .

3. Presentation: There will be a presentation from interdisciplinary students group, where the students will be given a project on they have to demonstrate the working and discuss the applications for the same

Textbook(s):

1. Monk Simon "Programming Arduino: Getting Started with Sketches", Mc Graw Hill Publications Second Edition
2. Monk Simon "Raspberry Pi Cookbook: Software and Hardware Problems and Solutions", Publisher(s): O'Reilly Media, Inc. ISBN: 9781098130923 fourth Edition.

References

Reference Book(s)

1. Neerparaj Rai "Arduino Projects for Engineers" BPB publishers,first edition, 2016.
2. Ryan Turner "Arduino Programming " Nelly B.L. International Consulting Ltd. first edition,2019.
3. Charles Bell Micro Python for the Internet of Things: A Beginner's Guide to Programming with Python on Microcontrollers" by" Edition 1, 2017, ISBN 978-1-4842-3123-4
4. Stewart Watkiss "Learn Electronics with Raspberry Pi " Apress Berkeley, CA . second edition,2020. ISBN978-1-4842-6348-8
5. Jo Prusa, "Basic of 3D printing", Prusa Research, 3rd edition.
6. Volker Ziemann, "A Hands-On Course in Sensors Using the Arduino and Raspberry Pi (Series in Sensors)", CRC Press, 1st Edition. 2018.

Online Resources (e-books, notes, ppts, video lectures etc.):

1. Arduino trending Projects < https://www. https://projecthub.arduino.cc/>
2. Introduction to Arduino < https://onlinecourses.swayam2.ac.in/aic20_sp04/preview>
3. Case studies on Wearable technology< https://www.hticiitm.org/wearables>
4. Raspberry-pi Projects < https://magpi.raspberrypi.com/articles/category/tutorials/>
5. Introduction to internet of things< https://nptel.ac.in/courses/106105166>

E-content:

1. Cattle Health Monitoring System Using Arduino and IOT (April 2021| IJIRT | Volume 7 Issue 11 | ISSN: 2349-6002)
2. M H Hemanth Kumar, Ravi Pratap Singh, Nishu Sharma, Pragya Singh" IOT BASED SMART SECURITY SYSTEM USING ARDUINO" 2021 JETIR August 2021, Volume 8, Issue 8.
3. R. Maheswar, P. Jayarajan, S. Vimalraj, G. Sivagnanam, V. Sivasankaran and I. S. Amiri, "Energy Efficient Real Time Environmental Monitoring System Using Buffer

Management Protocol," 2018, pp. 1-5, doi: 10.1109/ICCCNT.2018.8494144. https://ieeexplore.ieee.org/document/8494144.
4. Yaser S Shaheen,Hussam., " Arduino Mega Based Smart Traffic Control System ," December 2021 Asian Journal of Advanced Research and Reports 15(12): 43-52, 2021(15(12): 43-52, 2021):15(12): 43-52, 2021.
5. Basil, Eliza Sawant, S.D. "IoT based traffic light control system using Raspberry Pi " DOI 10.1109/ICECDS.2017.8389604
6. Supriya S, 2Dr. Aravinda " Green leaf disease detection and identification using Raspberry Pi https://www.irjet.net/archives/V9/i8/IRJET-V9I847.
7. Dr. E.N. Ganesh., "Health Monitoring System using Raspberry Pi and IOT" DOI : http://dx.doi.org/10.13005/ojcst12.01.03

Topics relevant to development of "SKILL": System design for achieving Sustainable Development Goals.

Catalogue prepared by	Dr Ashutosh Anand
Recommended by the Board of Studies on	BOS NO:
Date of Approval by the Academic Council	Academic Council Meeting No. ___ dated on _____

Course Code: CIV2100	Course Title: Building Materials and Concrete Technology Type of Course: Professional Core Theory	L-T-P-C	3	0	0	3
Version No.	1.1					
Course Pre-requisites	Pre Engineering Courses (Basics of Chemistry and Mathematics)					
Anti-requisites						
Course Description	The Course consists of the study of different building materials and their properties which are used in construction of civil engineering projects. This course includes basic properties of building materials such as Bricks, Stones, Paver blocks and constituents of concrete (cement, aggregates and water). It also includes various assessment tests to investigate quality of ingredients and Building materials as per IS codal provisions. The course can develop first-hand knowledge on types of Brick and stone masonry works, concrete production process including properties and uses of concrete, various plastering works and tile laying works. The knowledge about all the materials will help to gain the ability in making decision to select the suitable ingredient in required proportions for making appropriate concrete in the construction industry. This course will provide the opportunity to experience physical properties of all the building materials, behavior as well as construction methods in the form of demonstrations. Furthermore, material applications and detailing in structural and non-structural building components are explored.						
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Building Materials and Concrete Technology and attain Skill Development through Participative Learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: CO.1 Interpret the various engineering properties of building construction materials and suggest their suitability CO.2 Identify the functional role of ingredients of concrete and the properties of concrete CO.3 Design economic mix proportions for concrete mixes					
Course Content:						
Module 1	Introduction to Building Materials	Assignment	Memory recall	15 Sessions		
Topics: Stones - Classification of Stones – Properties of stones in structural requirements, Bricks- Bricks; Classification, Manufacturing of clay bricks, Requirement of good bricks. Field and laboratory tests on bricks; compressive strength, water absorption, efflorescence, dimension and warpage. Cement Concrete blocks, Autoclaved Aerated Concrete Blocks, Sizes, requirement of good blocks. Timber as construction material. Classification of aggregate, Bond, Strength and other mechanical properties of aggregate, Physical properties of aggregate.						
Module 2	Fresh Concrete	Assignment	Memory recall	15 Sessions		
Portland Cement: Chemical composition, Hydration, Structure of hydrated cement – Setting of cement, Fineness of cement, Tests for physical properties – Different grades of cements, Properties of Mineral and Chemical admixtures.						

Fresh Concrete: Manufacture of concrete – Mixing and vibration of concrete, Workability – Segregation and bleeding – Factors affecting workability, Measurement of workability by different tests, Effect of time and temperature on workability – Quality of mixing water, Ready mix concrete, Shotcrete.

Module 3	Hardened Concrete and Mix design of concrete	Assignment	Numerical solving task	15 Sessions

Hardened Concrete: Grades of concrete, Water / Cement ratio, Gel space ratio, Gain of strength of concrete with age – Maturity concept, Various strength tests as per IS Code. Relation between compressive strength and tensile strength of concrete – Properties of Hardened Concrete – Creep and Shrinkage- types and factors.

Mix design of concrete: Concept of Mix Design with and without admixtures, variables in proportioning and exposure conditions, Selection criteria of ingredients used for mix design, Procedure of mix proportioning. Numerical Examples of Mix Proportioning using IS-10262.

Targeted Application & Tools that can be used:
Application Area is Infrastructure developing companies, Design and Construction Companies, Structural Consultancy Servicing Firms, Central and State Public Works Department.
Professionally Used Software: Excel, MATLAB, SAP 2000, STAAD Pro-RCDC, ETABS, ProConcrete, PRE-Stress, RAM, Concept and Auto CAD Software

Project Work/ Assignment:
Memory Recall based Questions for assignment from Module 1 and 2
Numerical solving task is assigned from Module 3.

Textbook(s):
1. S. K. Duggal, "Building Materials", (Fourth Edition) New Age International (P) Limited, 6th Edition, 2025
2. M.S Shetty and A.K Jain, "Concrete Technology Theory and Practice", S.Chand & Company Pvt. Ltd.2019

Reference Book(s)
1. Varghese P.C, "Building Materials", Prentice-Hall of India Pvt. Ltd,2nd Edition, 2015.
2. A.M.Neville, J.J.Brookes, "Concrete Technology", 5th Edition, Pearson Education, 2009
3. IS 10262: 2019: Concrete Mix proportioning and Guidelines

Web resources:
https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=CUSTOM_PACKAGE_EBSCO_29052023_286071
The Fundamentals of Building Materials - Record details - EBSCOhost Research Databases

Topics relevant to "SKILL DEVELOPMENT":
Design mix of concrete, Tests on concrete and analysis of concrete properties for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mr. Dayalan J
Recommended by the Board of Studies on	BOS Meeting No: 20, Dated: 6th June 2025
Date of Approval by the Academic Council	Academic Council Meeting No 26 dated __ June 2025

<table>
<tr><td>Course Code:
CIV2101</td><td colspan="4">Course Title: Surveying
Type of Course: Professional Core & Theory Only</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="9">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="9">Nil</td></tr>
<tr><td>Anti-requisites</td><td colspan="9">Nil</td></tr>
<tr><td>Course Description</td><td colspan="9">This course will introduce the fundamentals of surveying measurements to provide a broad overview of the surveying instrumentation, procedures, measurement corrections and reductions, survey datum's, and computations that are required to produce a topographical map or a site plan for engineering and design projects. The purpose of this course is to enable the students to appreciate the need of surveying and to develop the basic abilities to perform chain surveying, Compass surveying, theodolite, Levelling, Drone surveying, LIDAR, contouring and Plane table surveying.</td></tr>
<tr><td>Course Objective</td><td colspan="9">The objective of the course is to familiarize the learners with the concepts of Surveying and attain Skill Development through Problem Solving methodologies.</td></tr>
<tr><td>Course Out Comes</td><td colspan="9">On successful completion of the course the students shall be able to:
CO.1 Summarize the knowledge of fundamental principles of surveying to establish points by predetermined linear and angular measurements.
CO.2 Compute the distance and elevation using the concepts of levelling by direct or indirect method.
CO.3 Interpret the details of contouring, plane table survey, Drone and DGPS technologies for precise spatial data collection and mapping.</td></tr>
<tr><td>Course Content:</td><td colspan="9"></td></tr>
<tr><td>Module 1</td><td colspan="3">Chain and Compass surveying</td><td>Quiz</td><td colspan="3">Memory Recall based quiz</td><td colspan="2">12 Sessions</td></tr>
<tr><td colspan="10">Topics:
Chain surveying: Introduction to survey, Objectives and importance of surveying, Classification of surveys, Principles of surveying, conventional symbols.
Measurement of Horizontal Distances: Direct and indirect methods of ranging, Booking of chain survey work, Obstacles in chain survey, Numerical problems.
Compass surveying: Basic definitions; meridians, bearings, magnetic and true bearings. Prismatic and surveyor's compasses, temporary adjustments, declination. Quadrantal bearings, whole circle bearings, local attraction and related problems.</td></tr>
<tr><td>Module 2</td><td colspan="3">Levelling, Theodolite and Trigonometric Levelling:</td><td>Assignment</td><td colspan="3">Numerical solving tasks</td><td colspan="2">18 Sessions</td></tr>
<tr><td colspan="10">Topics:
Levelling: Definitions, Levelling instruments, Temporary adjustments, Reduction to levels, Classification of levelling, Profile Levelling, Differential levelling and Problems.
Trigonometric Levelling: Determination of distance and elevation of objects when the base is accessible and inaccessible by single plane and double method, problems.
Theodolite: Theodolite and types, Fundamental axes and parts of Transit theodolite, uses of theodolite, Temporary adjustments of transit theodolite, measurement of horizontal and vertical angles.</td></tr>
</table>

Module 3	Contouring, Plane table surveying, and Drone surveying	Case study	Presentations	15 Sessions

Topics:
Contouring: Contours, Methods of contouring, Interpolation of contours, characteristics of contours and uses.
Plane table survey: Methods of orientation, methods of plotting – radiation, and intersection methods.
Drone Surveying: Definitions, Benefits, limitations, data output, accuracy, Determination of distance and elevation of objects, and introduction to LIDAR in Remote sensing and applications, Introduction to DGPS in surveying.

Targeted Application & Tools that can be used:
Application area of surveying is for data collection for construction of various structures. Construction companies, Public works department, Irrigation department, Railway department and Survey of India etc.
Professionally used software: AutoCAD Civil 3D, Google Earth Pro, Pix4D & Drone Deploy, ArcGIS/QGIS and E-survey.

Project Work/ Assignment:

1) Quiz:- Multiple choice questions on Chain surveying, Measurement of Horizontal Distances, and Compass surveying.
2) Assignment 2: - Problems to determine the reduced level by Profile Levelling and Differential levelling.
3) Case Study:- Students should give presentations on case studies relevant to LIDAR in Remote sensing and applications, Introduction to DGPS in surveying.

Text Book

3. B.C. Punmia, Ashok Kr. Jain, Arun Kr. Jain., Surveying I & II, Laxmi Publications-2009.
4. Hans van der Marel, René Reudink, Surveying and Mapping, Open Textbook Library, 2023.

References

5. Dr. Ramakant Agrawal, Mr. Parshottam Sarathe, Advanced Surveying: Theory & Practice, [Publisher Not Specified], 2023.
6. Garvit Pandya, " Basics of Unmanned Aerial Vehicles: Time to start working on Drone Technology" nationpress-2021.
7. Gopi, "Advanced Surveying: Total Station, GIS and Remote Sensing" Pearson-2016.

Web resources:
1. https://onlinecourses.nptel.ac.in/noc22_ce05/preview
2. https://nptel.ac.in/courses/105107122

Topics relevant to "SKILL DEVELOPMENT": Measurement of angles and elevation by using Total station and DGPS for Skill Development through Problem Solving methodologies. This is attained through the assessment component mentioned in course handout.

Catalogue prepared by	Dr. Shwetha A
Recommended by the Board of Studies on	BOS Meeting No: 20, Dated: 6th June 2025
Date of Approval by	Academic Council Meeting No 26 dated __ June 2025

the Academic Council	

Course Code: CIV2102	Course Title: Surveying Lab Type of Course: 1]Professional Core/ 2]Laboratory only	L-T-P-C	0	0	2	1
Version No.	1.0					
Course Pre-requisites	Nil					
Anti-requisites	Nil					
Course Description	This course delves into the fundamentals of surveying measurements to provide a broad overview of the surveying instrumentation. The course provides training on chain, Compass, theodolite, Levelling, Plane table and Drone surveying.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Surveying and attain Skill Development through Experiential Learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: CO.4 Apply the basic principles of engineering surveying for carrying out linear and angular measurements using conventional and advanced instruments. CO.5 Calculate Distance, Elevation and Area using advanced Surveying instruments by direct and indirect method.					
Course Content:						

List of Laboratory Tasks:
Experiment No 1: Chaining a line by ranging.
Level 1: Chaining a line by direct ranging.
Level 2: Chaining a line by indirect ranging.

Experiment No. 2: Measurement of area by chain surveying.
Level 1: Measurement of the given area by chain triangulation.
Level 2: Measurement of the given area of land by cross staff survey.

Experiment No. 3: To perform closed traverse by using prismatic compass.
Level 1: Setting out of geometrical figures (Rectangle or Pentagon or Hexagon) using compass.
Level 2: Closed traversing covering a given area.

Experiment No. 4: Determine the difference in elevation by levelling.
Level 1: Conduct fly levelling and profile levelling.
Level 2: Conduct profile levelling using dumpy level.

Experiment No. 5: Conduct total station surveying.
Level 1: Study of total station in detail and practice for taking measurements.
Level 2: Conduction of block levelling by DGPS.

Experiment No. 6: Measurement of angles and elevation by using Total station.
Level 1: Conduct fly levelling and profile levelling
Level 2: Measure horizontal and vertical angle by using Total station.

Experiment No. 7: Plotting of objects/features of field by plane table surveying.
Level 1: To locate points using radiation method of plane tabling.
Level 2: To find distance between two inaccessible points using Intersection method of plane tabling.

Experiment No. 8: Plotting of objects/features of field by plane table surveying.
Level 1: Study of survey Drone in detail for conducting Topographic Mapping & Land Surveying.
Level 2: Study of survey Drone in for conducting flood zone mapping .

Targeted Application & Tools that can be used:

Application area of surveying is for data collection for construction of various structures. Construction companies, Public works department, Irrigation department, Railway department and Survey of India etc.
Professionally used software: AutoCAD Civil 3D, Google Earth Pro, Pix4D & Drone Deploy, ArcGIS/QGIS and E-survey.

Text Book

5. B.C. Punmia, Ashok Kr. Jain, Arun Kr. Jain., Surveying I & II, Laxmi Publications-2009.
6. Hans van der Marel, René Reudink, Surveying and Mapping, Open Textbook Library, 2023.

References

1. Dr. Ramakant Agrawal, Mr. Parshottam Sarathe, Advanced Surveying: Theory & Practice, [Publisher Not Specified], 2023.
2. Garvit Pandya, " Basics of Unmanned Aerial Vehicles: Time to start working on Drone Technology" nationpress-2021.
3. Gopi, "Advanced Surveying: Total Station, GIS and Remote Sensing" Pearson-2016.

Web resources:

1. https://onlinecourses.nptel.ac.in/noc22_ce05/preview
2. https://nptel.ac.in/courses/105107122

Topics relevant to "SKILL DEVELOPMENT": Measurement of angles and elevation by using Total station for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Dr. Shwetha A
Recommended by the Board of Studies on	BOS Meeting No: 20, Dated: 6th June 2025
Date of Approval by the Academic Council	Academic Council Meeting No 26 dated __ June 2025

Course Code: CIV2103	Course Title: Building Planning and Drawing Type of Course: Professional Core and Laboratory only	L-T-P-C	0	0	2	1
Version No.	1.1					
Course Pre-requisites	Nil					
Anti-requisites	NIL					
Course Description	This course delves into the fundamentals of architectural and structural drawings used to build components at a construction site. The course provides training on drafting software such as AutoCAD for structural detailing of beam. It also provides insights into designing and planning of a building's electrical and plumbing layouts.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Building Planning and Drawing and attain Skill Development through Experiential Learning techniques.					
Course Outcomes	On successful completion of the course the students shall be able to: CO.1 Produce plan, section and elevation drawings for buildings using AutoCAD tools. CO.2 Sketch structural detailing for basic Structural Components. CO.3 Prepare layout drawing of utilities like water supply, sanitary and electrical connections.					
Course Content:	List of Laboratory tasks Task 01: Basics of AutoCAD – Tools for drawing and modifying in AutoCAD. Level No. 01: Tools for drawing and modifying in AutoCAD. Level No. 02: Advanced Modifications and tools in AutoCAD Task 02: Introduction to Building components & AutoCAD in Civil Engineering- (Detailed drawing and components of a masonry wall, Lintel & chajja) Level No. 01: Sectional elevation of masonry wall including footing, RCC Lintels & Chajjas (without RC details). Level No. 02: Sectional elevation of masonry wall including footing, RCC Lintels & Chajjas (with RC details). Task 03: Centerline Drawing- Developing a plan from a center line diagram Level No. 01: Development of plan from center line drawing for a storied building. Level No. 02: Development of plan from center line drawing for a storied building. Adopting appropriate Line weight and Line thickness etc. Task 04: Single storey house – Concept of plan, cross section, elevation, and schedule of opening of a single bed residential building- As per by-laws. Level No. 01: Plan layout of a single storey house with elevation and cross-section Level No. 02: Plan layout of a two storey house with elevation and cross-section					

	Task 05: Office and School Building – Concept of plan, cross section, elevation, and schedule of opening for an office building and School.- as per by-Laws Level No. 01: Plan layout of an Office/Commercial Building with elevation and cross-section Level No. 02: Plan layout of a Hospital/School Building with elevation and cross-section. Task 06: Sectional elevation of RC Beam - Study and learn types of beams and drawing the components of a Beam Level No. 01: Drawing beam with RC details Level No. 02: Drawing Cantilever beam incorporated with slab Task 07: Water Supply, and Sewage Layout- Mark water supply, and sewage layout on existing plan Level No. 01: Development of water supply, and sanitary drawing for a given residential building as a layer. Level No. 02: Development of water supply, and sanitary drawing for a given residential building as a layer Including Solar Hot water supply and Rainwater harvesting Task 08: Electrical Layout - Mark electrical layout on existing plan Level No. 01: Development of electrical drawing for a given residential building as a layer. Level No. 02: Development of electrical drawing for a given residential building as a layer along with alternative source of electricity (Generator and Un interrupted power supply –UPS connections) as a different layer.

Targeted Application & Tools that can be used:

AutoCAD is an essential tool and skill which is required by all the state of the art civil engineering establishments in the country and abroad. Student will learn to work with AutoCAD Software and get exposed to various tools in the software which helps him/her to apply the gained knowledge in various Civil Engineering Businesses.

Professional Softwares: AutoCAD

Text Book

1. Gurucharan Singh and Subash Chander, *Civil engineering drawing, 2014, English Standard Publishers and Dist., Delhi*
2. Sikka V B Kataria S K & Sons. *A Course in Civil Engineering Drawing*

References

1. Shah M H and Kale C M, *Building drawing, Tata Mc-Graw Hill Publishing Co. Ltd., New Delhi.*
2. Gurucharan Singh, *Building Construction, Standard publishers and distributors, New Delhi.*
3. *National Building Code, BIS, New Delhi.*
4. Sham Tickoo, *Understanding AUTOCAD 2004 A beginner's Guide,* Wiley Dreamtech India Pvt Ltd.
5. Jayaram M A., Rajendra Prasad D S., *A referral on CAD Laboratory,* Sapna Publications.

Additional Web Resources:

1. NPTEL course – Building materials and Construction - Dr. B. Bhattacharjee
   https://nptel.ac.in/courses/105/102/105102088/
2. NPTEL course – Principles and Applications of Building Science- Dr. E. Rajasekar
   https://nptel.ac.in/courses/105107156

Topics relevant to "SKILL DEVELOPMENT": Concept of plan, cross section, elevation, and schedule of opening of a single bed residential building- As per by-laws for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course plan.	
Catalogue prepared by	Ms. Anju Mathew
Recommended by the Board of Studies on	BOS Meeting No: 20, Dated: 6th June 2025
Date of Approval by the Academic Council	Academic Council Meeting No 26 dated __ June 2025

<table>
<tr><td>Course Code:
CIV2501</td><td colspan="3">Course Title: Transportation Engineering
Type of Course: Professional Core
Theory</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="8">1.2</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="8">1] CIV2101 Surveying 2] CIV2100 Building Materials and Concrete Technology

Basics of surveying required for highway alignment and project preparation.

Knowledge about building materials required for selection and testing of highway construction materials</td></tr>
<tr><td>Anti-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Course Description</td><td colspan="8">The course helps in understanding the importance and characteristics of various modes of transportation such as road, rail and air.

This course provides a comprehensive introduction to transportation engineering, beginning with the history and evolution of highway development. It covers the classification of roads and progresses into the fundamental principles of highway geometric design. Students are introduced to various pavement materials and their respective testing methods to assess suitability and performance.

In the area of railway engineering, the course examines the key components of railway tracks, the basics of geometric track design, and modern signalling systems. Airport engineering topics include aircraft characteristics, the principles of runway design, and the planning of terminal areas.

The course detailing about Highway materials, Highway Geometric Design and it develops the critical thinking and analytical skills.</td></tr>
<tr><td>Course Objective</td><td colspan="8">The objective of the course is to familiarize the learners with the concepts of Transportation Engineering and attain Skill Development through Problem Solving methodologies.</td></tr>
<tr><td>Course Out Comes</td><td colspan="8">On successful completion of the course the students shall be able to:
1. Describe the surveys involved in highway planning and the characterization of materials used in highway construction
2. Determine highway geometric parameters
3. Explain the elements of airport planning and railway engineering.</td></tr>
<tr><td>Course Content:</td><td colspan="8"></td></tr>
<tr><td>Module 1</td><td colspan="3">Introduction to Transportation Engineering and Highway Materials</td><td>Quiz</td><td colspan="2">Memory Recall based Quizzes</td><td>15 Sessions</td></tr>
<tr><td colspan="9">Topics:
Importance of various modes of transportation, highway engineering, developments in Road Construction, characteristics of road transport, scope of highway and traffic engineering. Highway development and planning: Importance, classification of roads, planning surveys; highway alignment and surveys. Maximum utility value.
Specification and tests on pavement materials</td></tr>
<tr><td>Module 2</td><td colspan="3">Highway Geometric Design</td><td>Assignment</td><td colspan="2">Numerical Solving task</td><td>20 Sessions</td></tr>
<tr><td colspan="9">Topics:</td></tr>
</table>

Highway Cross section elements, sight distance, extra widening on horizontal curves, Setback distance on horizontal curves and design of horizontal and vertical alignment.				
Module 3	Railway Engineering and Airport Planning	Seminar	Participative based learning	10 Sessions
Topics: Location survey and alignment, permanent way, gauges, components, sleeper density, functions and requirements, signals, points and crossings Aircraft characteristics, airport obstructions and zoning, runway, taxiways and aprons, terminal area planning.				
Targeted Application & Tools that can be used: Application areas include employment in Public Sector Undertakings such as the National Highways Authority of India (NHAI), Airports Authority of India (AAI) and Indian Railways. Rapid globalization with increase in mobility provides ample opportunities for employment in leading firms such as Tesla, Uber and Alstom. Professionally used software: Auto CAD				
Project work/Assignment: **Quiz:** Surprise quiz will be conducted in regular class based on highway classification and highway materials **Assignment:** Practice problems based on sight distance, horizontal and vertical highway alignment **Seminar:** There will be a group presentation, where students will present concepts related to railway engineering and airport planning				
Text Books 1. Khanna, S.K and Justo, C.E.G., "*Highway Engineering*", Nem Chand and Bros. Roorkee (U.P), 10th edition: 2018. 2. M.M. Agarwal, "*Railway Engineering*", Prabha & Co., 2007. 3. Khanna, S.K. and Arora, M.G. "*Airport Planning and Design*", Nemchand and Bros. 1999.				
References 1. Kadiyali L R, "*Traffic* Engineering *and Transport Planning*", Khanna Publishers, 6th edition:2016. Web Link: W1: https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=NAP_1_29062023_3495 W2: https://archive.nptel.ac.in/courses/105/101/105101087/				
Topics relevant to "Skill Development" : Tests on pavement materials, Sight Distance Calculations, Design of Horizontal and Vertical Alignment for Skill Development through Problem solving methodologies. This is attained through assessment component mentioned in course handout.				
Catalogue prepared by	Mr Santhosh M B			
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025			
Date of Approval by	Academic Council Meeting No. 26 held on __ June 2025			

the Academic Council	

Course Code: CIV2502	Course Title: Infrastructure Materials Testing Lab Type of Course: Professional Core Lab	L-T-P-C	0	0	2	1
Version No.	1.1					
Course Pre-requisites	CIV2100 Building Materials and Concrete Technology CIV2501 Transportation Engineering					
Anti-requisites	NIL					
Course Description	The objective of concrete laboratory is to determine the physical properties of building construction materials like cement, fine and coarse aggregate. The tests include determination of specific gravity, fineness, normal consistency, setting times, workability and soundness of cement, fineness modulus of fine and coarse aggregate, strength of cement mortar, cement concrete. The course gives the knowledge on design the mix, make the specimens and test the same for their respective strengths. The objective of highway materials laboratory is to determine some of the properties of coarse aggregates and bitumen. Experiments include tests for impact, abrasion and crushing strength for coarse aggregates. For bitumen, tests include penetration, ductility, viscosity, softening point and flash and fire point, Marshall Stability and Binder content. The course enable to infer the suitability of these materials for construction of road. This laboratory course will help to understand the theoretical concepts learned in the course transportation engineering. On pursuing this Course, the first-hand knowledge on the properties and uses of concrete and highway materials will be developed.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Concrete and Highway Materials Testing Lab and attain Skill Development through Experiential Learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: 1] Determine the quality of cement and aggregates as per the IS codes 2] Interpret the properties of fresh and hardened concrete 3] Illustrate the stability & properties of bituminous materials 4] Infer the experimental results of concrete and highway materials based on laboratory tests					
Course Content:	Task 01: Standard Consistency of cement and Setting time of cement Level No. 01: Calculate the standard consistency and setting time of a given sample of cement. Level No. 02: Determination of the percentage of weight of water to be added to cement to produce a cement paste of standard consistency, i.e. the paste of certain solidity, which is used to fix the quantity of water to be mixed in cement to conduct various tests on cement. Estimate the time when the cement loses its complete plasticity and attains sufficient firmness in order to resist definite loading. Task 02: Soundness Test of cement and Specific gravity of cement. Level No. 01: To determine the soundness test and specific gravity of cement sample. Level No. 02: Discuss the expansion of cement based on amount of lime present in cement and also discuss the expansion of cement influencing the properties of cement. Discuss the importance of the value of specific gravity of cement in concrete mix design. Task 03: Compressive strength of cement. Level No. 01: To determine the average compressive strength of cement. Level No. 02: Based on the test, discuss about the capacity of material to withstand or resist the compressive loads. Asses the grade of cement based on this test value.					

	Task 04: Workability test of fresh concrete- Slump test, Compaction Factor test and Vee-bee Consistometer test. Level No. 01: To determine the workability of concrete mix of given proportions using slump cone test, compaction factor test and Vee-Bee Consistometer test. Level No. 02: Based on the test, discuss about the requirement of water content needed for concrete to be used for different type of works and workable concrete which can be easily mixed, placed, compacted and finished. Compare the results of three different tests and suggest the suitability of concrete for specific types of construction. Task 05: Strength Tests of Hardened Concrete- Compressive strength, Split tensile strength and Flexural Strength of Concrete Level No. 01: To determine the average compressive strength, Split tensile strength and Flexural Strength of Concrete of a given grade of concrete. Level No. 02: Based on the test values, discuss the behavior of concrete under the compressive, tensile and bending stresses. Compare the results of all strength tests and discuss the performance of concrete under various types of loads. Task 06: Los Angeles Abrasion test Level No. 01: Calculate the abrasion value of a given sample of aggregates. Discuss the reasons for different number of drum rotations for different gradation of aggregates. Level No. 02: Compare the abrasion value of aggregates with different number of steel balls in the drum. Discuss suitability of the aggregates accordingly for their use in pavement construction, concrete or otherwise. Task 07: Specific Gravity and Penetration Test on Bitumen Level No. 01: To estimate the specific gravity and penetration value of a given sample of bitumen. Level No. 02: Investigate whether the penetration test can be used to evaluate the penetration value of tar. Comment on the results. Discuss the Penetration Grading System with its drawbacks. Task 08: Softening Point Test and Ductility Test Level No. 01: To estimate the softening point and ductility of a given sample of bitumen. Level No. 02: Compare different grades of bitumen with respect to their softening points and ductility values. Think about the temperature of laying and correlate with the softening point test. Also, try to establish a relationship between ductility and softening point (if any). Task 09: Viscosity and Flash, Fire Point Test Level No. 01: Estimate the viscosity of a given sample of bitumen. Also find out its flash and fire point test. Level No. 02: Compare viscosity values with penetration values. Analyze the relationship between the two. Discuss the viscosity grading system and compare it with the penetration grading system. Find out industrial values of flash and fire point. Interpret the results obtained in the laboratory and draw conclusions. Task 10: Marshall Stability Test Level No. 01: Estimate the Marshall stability value and the optimum binder content for a given mix. Level No. 02: Code the process of estimation of optimum binder content in MATLAB/Python and use it to estimate the optimum binder content for varying percentages of bitumen and different gradation of aggregates. Also use data visualization techniques to interpret various Marshall curves.

Targeted Application & Tools that can be used:

The laboratory course would be useful in gaining exposure in material characterization which would help in future quality control related positions at construction firms. Also, material testing tasks and result interpretation could help students in future consulting work and even research.

Text Book(s):

1. Concrete and Highway Materials Testing Lab Manual, Presidency University
2. Khanna SK and Justo C E G, Veeraraghavan A "Highway Engineering", Nem Chand Bros, Roorkee, 10th Edition, 2018
3. M.S Shetty and A.K Jain, "Concrete Technology Theory and Practice", S.Chand & Company Pvt. Ltd., 2019

Reference Book(s)

1. Relevant IS Codes.

Web Resources:

https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=2721708&site=ehost-live&ebv=EB&ppid=pp_36

https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=2665206&site=ehost-live

Topics relevant to "SKILL DEVELOPMENT": Workability test of fresh concrete- Slump test, Compaction Factor test and Vee-bee Consistometer test, Strength Tests of Hardened Concrete- Compressive strength, Split tensile strength and Flexural Strength of Concrete, Marshall Stability Test for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mr. Dayalan J
Recommended by the Board of Studies on	BOS Meeting No: 20, Dated: 6th June 2025
Date of Approval by the Academic Council	Academic Council Meeting No 26 dated __ June 2025

Course Code: CIV2503	Course Title: Fluid Mechanics Type of Course: Professional Core Theory	L-T-P-C	3	1	0	4
Version No.	1.2					
Course Pre-requisites	[1] CIV1501 Elements of Engineering Mechanics [2] Calculus and Linear Algebra [3] Vector Calculus and Differential equations Basic concepts of engineering Mechanics, Fundamentals of Calculus and Vectors.					
Anti-requisites	NIL					
Course Description	The purpose of this course is to introduce the students to the fundamentals of fluid mechanics and to develop an understanding of fluid under static and dynamic conditions. The benefit of the course is for the students as they will be able to understand the concept through application-based numerical problems. Fluid flow under different scenarios will give better insight into the subject. The nature of the course is theory, practical part will be covered in higher semester, this ensures better visualization and understanding of the topics covered in theory portions. This course is designed to introduce students to the science and practice of fluid mechanics. It aims to develop an understanding of the basic equations that govern fluid statics and fluid dynamics. Throughout the course, physical understanding and fundamental approaches are emphasized					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Fluid Mechanics and attain Skill Development through Problem Solving methodologies.					
Course Outcomes	On successful completion of this course the students shall be able to: 1) Explain the properties of fluid behavior under static conditions. 2) Apply Bernoulli's equation to measure flow rates in pipes using various devices. 3) Determine the Major and Minor energy losses in pipe systems 4) Demonstrate the working principles of hydraulic turbines and pumps					
Course Content:						
Module 1	Fundamentals of Fluid Statics	Assignment	Numerical	14 Sessions		
Topics: Introduction to fluids and its properties, fluid Pressure and its measurement, Pascal's law, Pressure measurement by simple, differential manometers, Hydrostatic forces acting on horizontal, vertical, Inclined and Curved surfaces, Archimedes principle, Buoyancy and Metacenter. Stability of floating bodies						
Module 2	Fluid kinematics and Dynamics	Assignment	Numerical	11 Sessions		
Topics: Introduction to Velocity of fluid particles and types of fluid flow, Basic principles of fluid flow, Continuity equation, Velocity potential and stream function. Units and dimensional analysis. Introduction to forces acting on Fluids in motion- Euler equation of motion, Bernoulli's						

principle of conservation of Energy, Applications of Bernoulli's theorem, Flow measurement devices.				
Module 3	Flow through pipe systems	Lab visit	Participative based learning	10 Sessions
Topics: Introduction to flow through pipes, Laminar flow, Reynold's experiment, Calculation of energy losses: Darcy's Weisbach equation, Chezy's equation. Flow through parallel and series pipe system.				
Module 4	Hydraulic turbines and Pumps	Seminar presentation	Activity based learning	10 sessions
Topics: Elements of hydropower plants, head and efficiencies of hydraulic turbines, classification of turbines, work done and efficiencies of turbines. Centrifugal pumps: Components, working and types of centrifugal pumps. Head of pumps, losses and efficiencies.				
Targeted Application & Tools that can be used: Application Area is Hydraulic modelling, hydraulic design, Water supply and distribution network design. Flow measurement devices used: Venturi Meter, Orifice meter, notches				
Project work/Assignment: **Assignment 1:** Practice problems based on simple, differential monometer, and hydrostatic forces acting on horizontal and vertical plane surfaces **Assignment 2:** Practice problems based on Bernoulli's equation and flow measurement devices. **Lab Visit:** Demo on flow measurement, major and minor losses through pipe system. Students should perform the same experiments in a virtual lab and submit the report. **Seminar presentation:** There will be group presentation, where students will present working principles and applications of various turbine and pumps				
Textbooks: T1 P.N.Modi and S.M.Seth Hydraulics and Fluid Mechanics Including Hydraulics Machines, Standard Book House, Twentieth edition: 2015 T2 R.K.Bansal, A Textbook of Fluid Mechanics and Hydraulic Machines, Laxmi Publications, 2018.				
References: R1 K Subramanya, "Fluid Mechanics and Hydraulic Machines", Tata McGraw, New Delhi, 2020. R2 Yunus A, Cengel, John.M.Cimbala"Fluid Mechanics - Fundamentals and Applications", McGraw Hill, 2019. Web links: W1: https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DOAB_1_06082022_22823 W2: https://nptel.ac.in/courses/112104118				

Topics relevant to "SKILL DEVELOPMENT": Analysis of Pipe flow networks for Skill Development through Problem Solving methodologies. This is attained through the assessment component mentioned in the course handout.	
Catalogue prepared by	Mr. Santhosh M B
Recommended by the Board of Studies on	BOS Meeting No: 20, Dated: 6th June 2025
Date of Approval by the Academic Council	Academic Council Meeting No 26 dated __ June 2025

Course Code: CIV2504	Course Title: Fluid Mechanics Lab Type of Course: Professional Core Laboratory	L-T-P-C	0	0	2	1
Version No.	1.1					
Course Pre-requisites	1] CIV2503 Fluid Mechanics Pressure measurement devices, Application of Bernoulli's equation, Concepts of Flow through pipes					
Anti-requisites	NIL					
Course Description	The primary objective of this course is to equip students with a practical understanding of fluid properties and behaviour. Emphasis is placed on the measurement of discharge, as well as the evaluation of major and minor losses in pipe systems. This course is designed to build upon basic fluid mechanics concepts, enabling students to better understand the behaviour of fluids at rest and in motion. It will provide hands-on knowledge essential for the design of hydraulic structures such as culverts, bridges, and closed conduits, ensuring that these structures can safely and efficiently carry specified discharges.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Fluid Mechanics Lab and attain Skill Development through Experiential Learning techniques.					
Course Outcomes	On successful completion of the course the students shall be able to: 1) Determine the coefficient of discharge, major and minor losses for flow through pipes. 2) Interpret the values of flow measurement devices like Venturi Meter, orifice meter, v notch and its application in real projects					
Course Content:	Task 01: Discharge Measurement through Rotameter. Level 01- To measure the discharge through a liquid Rotameter. Level 02- To calibrate the Rotameter and find the error. Task 02: Verification of Bernoulli's theorem. Level 01- To verify Bernoulli's theorem. Level 02- To find the variation in the energy across various sections and plot the same on the graph. Task 03: To perform Reynold's Experiment. Level 01- To find the Reynold's number in pipe flow under various conditions. Level 02- To classify the nature of flow based on Reynold's number. Task 04: Discharge through Venturi meter Level 01- To measure the discharge through Venturi meter. Level 02- To study the variation of coefficient of discharge with the Reynold's number. Task 05: Discharge through Orifice meter. Level 01- To measure the discharge through orifice meter. Level 02- To study the variation of coefficient of discharge with the Reynold's number. Task 06: Determination of energy losses in pipe flow system. Level 01- To compute the major and minor losses in a pipe flow network.					

	Level 02- To relate the friction coefficient with the Reynold's number Task 07: To determine the discharge through open channel flows. Level 01- To compute the discharge in open channel using rectangular and triangular notches. Level 02- To calibrate the notch and compute the discharge in any open channel in the Campus Task 08: Determination of Impact of jet on vanes Level 01- To compute the Impact of jet on flat plate Level 02- To compute the Impact of jet on curved and inclined plate Task 09: Determination of metacentric height of a floating body Level 01- To compute the metacentric height of floating body with simple loading conditions Level 02- To compute the metacentric height of floating body with different combinations of load Task 10: Determination of energy losses in parallel pipe system Level 01- To compute the friction losses in a pipe parallel pipe network. Level 02- To compute the friction losses in a pipe parallel pipe network with varying diameter of pipes. Task 11: Determination of energy losses in series pipe system Level 01- To compute the friction losses in a series pipe network. Level 02- To compute the friction losses in a pipe series pipe network with varying diameter of pipes.
Targeted Application & Tools that can be used: Application Area is Hydraulic modelling, hydraulic design, Water supply and distribution network design. Flow measurement devices used: Venturi meter, Orifice meter, notches	
Project Work/ Assignment: Assignment: The students must conduct the experiments and interpret the data using graph sheet and standards. For each of the experiment, students must write the inferences.	
Text Book 1. "Fluid Mechanics Lab Manual", Presidency University. 2. P.N.Modi and S.M.Seth Hydraulics and Fluid Mechanics Including Hydraulics Machines, Standard Book House, 20th edition : 2015	
References 1. R1 K Subramanya, "Fluid Mechanics and Hydraulic Machines", Tata McGraw, New Delhi, 2020. 2. R2 Yunus A, Cengel, John.M.Cimbala" Fluid Mechanics, - Fundamentals and Applications", McGraw Hill, 2019. E-Resources 1. W1:https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=TEXTBOOK_LIBRARY01_06082022_240 2. W2: https://sm-nitk.vlabs.ac.in/	
Topics relevant to "SKILL DEVELOPMENT": Measurement of Discharge, Major and minor losses through pipe for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout	
Catalogue prepared by	Mr. Santhosh M B

Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

<table>
<tr><td>Course Code: CIV2505</td><td colspan="4">Course Title: Hydrology and Irrigation Systems

Type of Course: Program Core
Theory Only</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="9">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="9">CIV2053 Fluid mechanics</td></tr>
<tr><td>Anti-requisites</td><td colspan="9">NIL</td></tr>
<tr><td>Course Description</td><td colspan="9">The course introduces hydrology as both a science and as an engineering practice, particularly as relates to its application in water resources management and estimation. Topics that will be developed include understanding the Earth’s water and energy cycles, describing and monitoring components of the hydrological cycle, and modelling aspects of hydrological systems. The course highlights various design techniques of effective irrigation methods which otherwise will boost food production and promote food security in the entire world at large.</td></tr>
<tr><td>Course objectives:</td><td colspan="9">The objective of the course is to familiarize the learners with the concepts of Hydrology and Irrigation Systems and attain Skill Development through Problem Solving methodologies</td></tr>
<tr><td>Course Out Comes</td><td colspan="9">On successful completion of the course the students shall be able to:

CO.1 Explain the concept of hydrological cycle
CO.2 Illustrate the losses in precipitation
CO.3 Calculate the runoff and flood hydrograph
CO.4 Summarize the irrigation procedure to conserve the water.</td></tr>
<tr><td>Course Content:</td><td colspan="9"></td></tr>
<tr><td>Module 1</td><td colspan="3">Introduction to Hydrology and Precipitation</td><td>Assignment</td><td colspan="2">Data Collection/ Analysis</td><td colspan="2">9 Sessions</td></tr>
<tr><td colspan="10">Topics:
Hydrology: Introduction, Hydrologic Cycle, Water Budget Equation, Applications of Hydrology in Engineering.
Precipitation: Definition, Forms and types of precipitation, measurement of rain fall, optimum number of rain gauge stations, computation of mean rainfall, Estimation of missing data, Presentation of rainfall data.</td></tr>
<tr><td>Module 2</td><td colspan="3">Losses from Precipitation</td><td>Assignment</td><td colspan="2">Data Collection/ Analysis</td><td colspan="2">9 Sessions</td></tr>
<tr><td colspan="10">Topics:
Initial Losses, Evaporation, Evapo-transpiration, Infiltration: Introduction, Process, factors affecting, measurement.</td></tr>
<tr><td>Module 3</td><td colspan="3">Runoff and Hydrograph</td><td>Assignment</td><td colspan="2">Simulation/Data Collection</td><td colspan="2">12 Sessions</td></tr>
<tr><td colspan="10">Topics:
Runoff: Components of Runoff, Hydrograph, Influence of Catchment characteristics on Runoff
Hydrographs: Definition, components of hydrograph, base flow separation, unit hydrograph, Conversion of UH of different durations.
Flood: Concepts of Design Flood, Design Storm, Risk, Reliability and Safety, Introduction to Reservoir and Channel Routing Procedures, Concept of Flood Peak Attenuation</td></tr>
<tr><td>Module 4</td><td colspan="3">Irrigation</td><td>Case Study</td><td colspan="2">Data Collection/Analysis</td><td colspan="2">9 Sessions</td></tr>
</table>

Topics: Irrigation: Necessity of Irrigation, Types of Irrigation Systems, Methods of Irrigation, Water Requirements of Crops, Canal Irrigation, Water Logging and its Control	
Targeted Application & Tools that can be used: Application Area is Water Resource engineering, Irrigation Expert/Hydrological Modeling Specialist, Environmental Scientists. Professionally Used Software: QGIS/SWAT/MODFLOW	
Project Work/ Assignment:	
1. Assignment: Students will submit in written Memory recall and Numerical solving task on module 1 and 2. 2. Seminar: Students will give presentation on relevant topics in group.	
Text Book T1. K. Subramanya, "Engineering Hydrology", Tata McGraw Hill Publishers, New Delhi. T2. Garg S.K., Hydrology and Water Resources Engineering T3. Jayarami Reddy, "A Text Book of Hydrology", Lakshmi Publications, New Delhi.	
References R1. VenTe Chow, "Applied Hydrology", Tata McGraw Hill Publishers, New Delhi. R2. Garg S.K, "Irrigation Engineering and Hydraulic Structures" Khanna publications, New Delhi. R3. Modi, P.N., Irrigation Water Resources and Water Power Engineering, Standard Book House, New Delhi. Web link: W1:https://www.mdpi.com/books/reprint/717-hillslope-and-watershed-hydrology	
Topics relevant to "SKILL DEVELOPMENT": Concepts of Design Flood, Design Storm, Risk, Reliability and Safety for Skill Development through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Dr. Venkatesha Raju K and Mr. Santhosh M B
Recommended by the Board of Studies on	BOS Meeting No: 20, Dated: 6th June 2025
Date of Approval by the Academic Council	Academic Council Meeting No 26 dated __ June 2025

<table>
<tr><td>Course Code: CIV2506</td><td colspan="4">Course Title: Analysis of Determinate Structures
Type of Course: Professional Core Theory</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="9">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="9">Strength of Materials - CIV2500

Basic concepts of stresses, conditions of equilibrium and types of loads such as point load, UDL & UVL and supports.

The basic properties of the materials, internal forces for various loads.</td></tr>
<tr><td>Anti-requisites</td><td colspan="9">NIL</td></tr>
<tr><td>Course Description</td><td colspan="9">The course illustrates the effect of external load in calculating the internal forces induced in the structures. The course deals with application of mathematical and engineering knowledge in calculating the slope and deflection which are required to analyze the determinate structures.</td></tr>
<tr><td>Course Objectives</td><td colspan="9">The objective of the course is to familiarize the learners with the concepts of Analysis of Determinate Structures and attain Skill Development through Problem Solving methodologies.</td></tr>
<tr><td>Course Outcomes</td><td colspan="9">On successful completion of the course the students shall be able to:
CO.1 Identify the static and kinematic indeterminacies of structures and analyze the plane trusses.
CO.2 Analyze the arches and cables to determine the internal forces.
CO.3 Calculate the slope and deflection in beam elements by using moment area method and conjugate beam method.
CO.4 Apply the compatibility equation by knowing slope and deflection in analyzing the indeterminate structure by using the consistent deformation method.</td></tr>
<tr><td>Course Content:</td><td colspan="9"></td></tr>
<tr><td>Module 1</td><td colspan="3">Introduction to Structural analysis and Analysis of Plane trusses</td><td>Assignment</td><td colspan="3">Numerical problems and validating the results by using STAAD Pro</td><td colspan="2">12 Sessions</td></tr>
<tr><td colspan="10">Topics:
Structural forms, Conditional of equilibrium, Static degree of Indeterminacy, Static and Kinematic degree of indeterminacies of structural systems, linear and Nonlinear analysis, Types of trusses- Assumptions in analysis- Analysis of determinate trusses by method of joints and method of sections.</td></tr>
<tr><td>Module 2</td><td colspan="3">Arches and Cables</td><td>Assignment</td><td colspan="3">Numerical problems</td><td colspan="2">12 Sessions</td></tr>
<tr><td colspan="10">Topics:
Arches: Three hinged parabolic arches with supports at same and different levels, Determination of normal thrust, radial shear and bending moment. Three hinged symmetrical circular arch and determination of bending moment
Cable: Analysis of cables under point loads and UDL, Length of cables for supports at same and at different levels.</td></tr>
<tr><td>Module 3</td><td colspan="3">Deflection of beams</td><td>Assignment</td><td colspan="3">Numerical problems</td><td colspan="2">8 Sessions</td></tr>
<tr><td colspan="10">Topics:
Introduction to slope and deflection, Moment area method, Mohr’s Theorems, sign convention, slope and deflection by moment area method for simply supported and cantilever beams for standard load cases.</td></tr>
</table>

<table>
<tr><td colspan="5">Introduction to Conjugate beam, slope and deflection by conjugate beam method for simply supported and cantilever beams for standard load cases.
Introduction to Slope and Deflection, Use of slopes and deflections in formulating the compatibility.</td></tr>
<tr><td>Module 4</td><td>Consistent Deformation Method</td><td>Assignment</td><td>Numerical problems</td><td>08 Sessions</td></tr>
<tr><td colspan="5">Topics:
Use of slopes and deflections in formulating the compatibility equations in analyzing the Propped cantilever beam and fixed beam, Constructing the BMD and SFD when the structural elements are subjected to point load, UDL and UVL.</td></tr>
<tr><td colspan="5">Targeted Application & Tools that can be used:
The Couse enables the students to draw the Shear force and Bending moment diagram and determine the shear and bending stress distribution at a cross section in a beam. Identify the type of the structures and enhance their skill in determining the internal forces in the structural systems which are required in designing the structural element. The course also helps in understanding the behavior of the structural elements by knowing the slope and deflection of determinate beams.
Professionally Used Software: STAAD.Pro/ETABS.</td></tr>
<tr><td colspan="5">Project work/Assignment:
1. Numerical problems are given for performing manual analysis and cross validating with software tools based on topics covered in Module 1.
2. Numerical problems to solve based on the topics covered in Module 2 and 3.
3. Construct the BMD and SFD for the given continuous beam</td></tr>
<tr><td colspan="5">Text Books:
1. Reddy C. S. “Basic Structural Analysis”, Tata McGraw-Hill, Publishing Company Ltd.</td></tr>
<tr><td colspan="5">References
1. Devadoss Menon, “Structural Analysis”, Narosa Publishing House, New Dehli.
2. M.L. Gambhir, “Fundamentals of Structural Mechanics and Analysis”, Eastern Economy Edition, PHI publishing Pvt. Ltd., 2nd printing, 2014.
PU e-Library Resources
1. https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1227287&site=ehost-live
2. https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=346589&site=ehost-live</td></tr>
<tr><td colspan="5">Topics related to Skill development: Analysis of trusses by method of joints and method of sections, Analysis of arches and cables with supports at same and different levels, Analysis of determinate beams to find slope and deflection for Skill Development through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.</td></tr>
<tr><td>Catalogue prepared by</td><td colspan="4">Dr. S. B. Anadinni
Mr. Ajay H A</td></tr>
<tr><td>Recommended by the Board of Studies on</td><td colspan="4">BOS Meeting No: 20, Dated: 6th June 2025</td></tr>
<tr><td>Date of Approval by the Academic Council</td><td colspan="4">Academic Council Meeting No 26 dated __ June 2025</td></tr>
</table>

Course Code: CIV2507	Course Title: Analysis of Indeterminate Structures Type of Course: Professional Core & Theory	L-T-P-C	3	0	0	3
Version No.	1.1					
Course Pre-requisites	CIV2500- Strength of Materials. CIV2506- Analysis of determinate structures. Basic concept in determinate structures and its structural behavior when they are subjected to various loads					
Anti-requisites	NIL					
Course Description	The course is conceptual in nature and demonstrates the behavior of the structural elements when they are subjected to various loads. This course helps to apply the mathematical and engineering knowledge in calculating the internal forces such as bending moment and shear force in the structural elements which may help in constructing the BMD and SFD. The internal forces can be validated by STAAD pro and ETABS software.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Analysis of Indeterminate Structures and attain Skill Development through Problem Solving methodologies					
Course Outcomes	On successful completion of the course the students shall be able to: 1. Apply the slope deflection equation to determine the slope and deflection in analyzing the indeterminate structure. 2. Calculate the internal forces such as bending moment and shear force by using slope deflection, moment distribution and kani's method. 3. Analyze the beam element by flexibility and stiffness matrix method.					
Course Content:						
Module 1	Slope and deflection method	Assignment	Numerical solving tasks			18 Sessions
Introduction, Derivation of slope deflection equation, Analysis of continuous beams including settlement with different cross sectional area. Analysis of orthogonal rigid portal frame including sway with kinematic indeterminacy is ≤ 3. Construction of BMD & SFD for both the cases. Assignment: Determine the Final end moments for the given beam and frame using Slope deflection method						
Module 2	Moment Distribution method	Assignment	Numerical solving tasks			17 Sessions
Introduction, Definition of basics terms (Absolute stiffness & relative Stiffness), Distribution factor. Analysis of continuous beams including settlement with different cross sectional area. Analysis of orthogonal rigid portal frame without sway with kinematic indeterminacy is ≤ 3. Construction of BMD & SFD for both the cases. Assignment: Determine the Final end moments for the given continuous beam and rigid portal frame using Moment Distribution method.						
Module 3	Kani's Method	Assignment	Numerical solving tasks			10 Sessions
Topics: Introduction, rotation factor. Analysis of continuous beams including settlement with different cross sectional area. Analysis of orthogonal rigid portal frame without sway with kinematic indeterminacy is ≤ 3. Construction of BMD & SFD for both the cases. Assignment: For a given continuous beam and rigid portal frame, determine the Final end moments using Kani's Method and draw SFD and BMD for the same.						

Module 4	Matrix Method	Assignment	Numerical solving tasks	15 Sessions

Topics:
Introduction Flexibility and Stiffness Matrix methods, Analysis of continuous beam by Flexibility and Stiffness matrix method with kinematic indeterminacy is ≤ 2. Construction of BMD & SFD for both the cases.
Assignment: Using the Stiffness method or Flexibility method, analyze the continuous beam.

Targeted Application & Tools that can be used:
The Course enables the students to enhance their skill in understanding the structural behavior which helps in designing the RC structural elements. The course also helps in structural steel detailing by knowing the nature of bending moment. The concept of the course can be used in designing the Pre-stressed and Steel structural elements.
Professionally Used Software: STAAD pro/ ETAB.

Project Work/ Assignment:

1. Assignment 1: - Problems to determine the Final end moments for a given beam and frame using Slope deflection Method
2. Assignment 2: - Problems to determine the Final end moments for a given continuous beam and rigid portal frame using Moment distribution method
3. Assignment 3: - For a continuous beam and rigid portal frame, determine the Final end moments using Kani's method and draw SFD and BMD for the same.
4. Assignment 4: - Using Stiffness and Flexibility method, analyze the continuous beam.

Text Books:
T1. Reddy C. S. "Basic Structural Analysis", Tata McGraw-Hill,3rd Ed. Publishing Company Ltd, 2011.

References:
R1. V. N. Vazarani and M. M. Ratvani, "Analysis of Structures", Vol 2, 16th Ed., Khanna Publishers, 1999.
R2. Gupta S. P., G. S. Pandit and R Gupta, "Theory of Structures", Vol. II,1st Ed., Tata McGraw-Hill, Publishing Company Ltd,2000.
R3. Wang C. K., Indeterminate Structural Analysis", 1st International Ed.,Tata McGraw-Hill Publishing Company Ltd, 1984.

Weblink:
https://nptel.ac.in/courses/105/105/105105109/
https://nptel.ac.in/content/storage2/courses/105105109/pdf/m2l8.pdf

Topics relevant to "SKILL DEVELOPMENT": Analysis of continuous beams including settlement with different cross sectional area using Slope Deflection method, Moment Distribution method and Kani's method for Skill Development through Problem Solving methodologies. This is attained through assessment component mentioned in course handout

Catalogue prepared by	Dr. S. B. Anadinni / Mrs. Divya. Nair
Recommended by the Board of Studies on	BOS Meeting No: 20, Dated: 6th June 2025
Date of Approval by the Academic Council	Academic Council Meeting No 26 dated __ June 2025

<table>
<tr><td>Course Code:
CIV2508</td><td colspan="4">Course Title: Design of RCC Structural Elements
Type of Course: Professional Core
Theory Only Course</td><td>L-T-P-C</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Version No.</td><td colspan="9">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="9">CIV2506 Analysis of Determinate Structures</td></tr>
<tr><td>Anti-requisites</td><td colspan="9">NIL</td></tr>
<tr><td>Course Description</td><td colspan="9">This course equips students with the skills to analyze and design reinforced concrete (RCC) structural elements in accordance with IS standards. Students will be able to design beams, slabs and columns. Emphasis is placed on practical application, problem-solving, and developing readiness for industry-based structural design roles.</td></tr>
<tr><td>Course Objectives</td><td colspan="9">The objective of the course is to familiarize the learners with the concepts of Design of RC Structural Elements and attain Skill Development through Problem Solving methodologies.</td></tr>
<tr><td>Course Out Comes</td><td colspan="9">On successful completion of the course the students shall be able to:
CO.1 Apply the principles of limit state design to analyze and design reinforced concrete beams.
CO.2 Solve engineering problems of reinforced concrete elements subjected to shear, torsion and bond.
CO.3 Demonstrate the procedural knowledge in designs of RC slabs, columns and foundation.</td></tr>
<tr><td>Course Content:</td><td colspan="9"></td></tr>
<tr><td>Module 1</td><td colspan="3">Introduction to Limit State Method and Design of RC Beams</td><td>Assignment</td><td colspan="3">Problem Solving Assignment</td><td>18 Sessions</td></tr>
<tr><td colspan="10">Topics:
Introduction to Reinforced Concrete Structures, Materials for Reinforced Concrete and Code requirements. Philosophy and principle of limit state design along with the assumptions, Introduction to stress block parameters, Concept of balanced, under and over reinforced sections.</td></tr>
<tr><td>Module 2</td><td colspan="3">Design of RC Sections for Shear, Torsion and Bond</td><td>Assignment</td><td colspan="3">Problem Solving Assignment</td><td>12 Sessions</td></tr>
<tr><td colspan="10">Topics:
Shear stresses in homogeneous rectangular beams, behavior of reinforced concrete under shear, Nominal shear stress, critical sections for shear design, Design shear strength with shear reinforcement with example. Primary and secondary torsion, general behavior in torsion. Concept of bond, Code requirements for bond, anchorage length and lap length.</td></tr>
<tr><td>Module 3</td><td colspan="3">Design of Slabs</td><td>Assignment</td><td colspan="3">Problem Solving Assignment</td><td>11 Sessions</td></tr>
<tr><td colspan="10">Topics: Introduction to one way and two –way slab, Design of simply supported one-way and two-way slab with simple support.</td></tr>
<tr><td>Module 4</td><td colspan="3">Design of Column and Foundation</td><td>Assignment</td><td colspan="3">Problem Solving Assignment</td><td>19 Sessions</td></tr>
<tr><td colspan="10">Topics:
Estimation of effective length of a column, code requirements on slenderness limit, minimum eccentricities and reinforcement. Design of short axially loaded columns, Design of column subjected to combined axial load, uniaxial and biaxial moment. Types of footings, soil</td></tr>
</table>

pressure under isolated footings, General design considerations and code requirements. Design examples of isolated footing.

Targeted Application & Tools that can be used:

Application Area is infrastructure developing companies, Design and Construction Companies, Structural Consultancy Servicing Firms, Central and State Public Works Department.

Professionally Used Software: Excel, MATLAB, SAP 2000, STAAD Pro-RCDC, ETABS, ProConcrete, PRE-Stress, RAM Concept and Auto CAD Software.

Project Work/ Assignment:

1. Problem solving assignment on analysis and design of RC beams.
2. Problem solving assignment on analysis and design of RC beams for shear.
3. Problem solving assignment on analysis and design of RC slabs.
4. Problem solving assignment on analysis and design of RC columns and foundation.

Text Book

1. Unnikrishnan Pillai and Devdas Menon, "*Design of Reinforced Concrete Structures",* Tata McGraw Hill Publications.
2. Verghese P C, "*Limit State Design of Reinforced Concrete*", Prentice Hall of India, New Delhi

References

1. BC Punmia, "*Limit State Design of Reinforced Concrete*", Prentice Hall of India, New Delhi
2. Park and Paulay, "*Reinforced Concrete*", John Wiley and Sons.
3. N. Krishnaraju*, "Reinforced Concrete Design: Principles and Practice",* New Age International.

Web Resources:

1. https://nptel.ac.in/courses/105/105/105105105/
2. https://nptel.ac.in/courses/105/106/105106118/

Topics relevant to "Skill Development": Philosophy and principle of limit state design of RC sections, Analysis and Design of RCC rectangular and Flanged beams, Analysis and Design of RCC sections subjected Shear, Torsion and Bond, Analysis and design of Slabs, Columns and Foundation for Skill Development through Problem Solving methodologies

Catalogue prepared by	Ms. Anju Mathew
Recommended by the Board of Studies on	BOS Meeting No: 20, Dated: 6th June 2025
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<table>
<tr><td>Course Code: CIV2509</td><td colspan="4">Course Title: Analysis and Design of Pre-Stressed Concrete Elements
Type of Course: Professional Core Theory</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="9">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="9">CIV2508 - Design of RCC Structural Elements</td></tr>
<tr><td>Anti-requisites</td><td colspan="9">NIL</td></tr>
<tr><td>Course Description</td><td colspan="9">The course aims to provide a comprehensive introduction to the principles and behavior of prestressed concrete. It covers various prestressing systems and discusses the associated losses. The course emphasizes the analysis of stress distribution in prestressed concrete elements and examines the deflection of prestressed concrete beams under different loading scenarios. Additionally, it introduces fundamental techniques for analyzing prestressed members under flexural loads and designing shear reinforcements. The course also includes essential design principles for prestressed members, addressing flexure, axial tension, and compression.</td></tr>
<tr><td>Course Objective</td><td colspan="9">The objective of the course is to familiarize the learners with the concepts of Fundamentals of Pre-Stressed Concrete Design and attain Skill Development through Problem Solving methodologies.</td></tr>
<tr><td>Course Out Comes</td><td colspan="9">On successful completion of the course the students shall be able to:
CO.1 Understand the fundamental behavior of prestressed concrete and the functioning of various prestressing systems
CO.2 Analyze prestress losses and calculate deflections in prestressed concrete elements under various loading conditions.
CO.3 Perform analysis of prestressed members under flexure and design appropriate shear reinforcements.
CO.4 Apply elementary design principles for prestressed members subjected to flexure, axial tension, and compression.</td></tr>
<tr><td>Course Content:</td><td colspan="9"></td></tr>
<tr><td>Module 1</td><td colspan="3">Introduction, Pre-stressing systems and Analysis of PSC Beams</td><td>Assignment</td><td colspan="2">Numerical problems</td><td colspan="2">12 Sessions</td></tr>
<tr><td colspan="10">Topics:
Basic concepts of pre stressing, historical development, need for high strength steel and concrete, terminology, advantages and applications. Tensioning device and post tensioning systems.
Basic assumptions, analysis of pre-stress, resultant stresses at a section, pressure/thrust line. Concept of load balancing, stresses in tendons, cracking moments.</td></tr>
<tr><td>Module 2</td><td colspan="3">Losses of pre-stress and Deflection of PSC beams</td><td>Assignment</td><td colspan="2">Numerical problems</td><td colspan="2">12 Sessions</td></tr>
<tr><td colspan="10">Topics:
Nature of losses of pre stress, losses due to elastic deformation, shrinkage, creep, relaxation of stresses in steel, friction, anchorage slips, and total losses allowed in the design. Deflection of PSC members: Factors influencing the deflections. Short-term and long-term deflections.</td></tr>
<tr><td>Module 3</td><td colspan="3">Flexural and shear strength of PSC members</td><td>Assignment</td><td colspan="2">Numerical problems</td><td colspan="2">9 Sessions</td></tr>
<tr><td colspan="10">Topics:
Types of flexural failure, strain compatibility, code procedures, Full and partial pre-stressed sections. Principal stresses, Flexural strength of PSC beams, ultimate shear resistance, design of shear reinforcements.</td></tr>
</table>

<table>
<tr><td>Module 4</td><td>Design of prestressed concrete sections</td><td>Assignment</td><td>Numerical problems</td><td>12 Sessions</td></tr>
<tr><td colspan="5">Topics:
Design of sections for flexure, axial tension, compression and bending.</td></tr>
<tr><td colspan="5">Targeted Application & Tools that can be used:
Application area includes infrastructure developing companies, Design and construction companies, Structural consultancy servicing firms, Central and State Public Works Department.

Professionally Used Software: SAP2000, STAAD Pro-RCDC, ETABS, ProConcrete, PRE-Stress, RAM Concept and ADAPT-Floor Pro.</td></tr>
<tr><td colspan="5">Project work/assignment:
Numerical problems: Solve analysis and design problems provided as assignment in two parts viz. Assignment 1 and Assignment 2.</td></tr>
<tr><td colspan="5">Text Book
T1. N.Krishna Raju, “Prestressed concrete”, 6th Edition, 2018, McGraw Hill Publishers.</td></tr>
<tr><td colspan="5">References
R1. T.Y.Lin and Ned H. Burns, “Design of Pre-stressed concrete structures”, 3rd Edition, 1981, John Wiley and sons, New York.
R2. K.U. Muthu, Ibrahim Azmi, Janardhana Maganti and Vijayanand M, “Prestressed Concrete”, 2016, Prentice Hall India Learning.

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc25_ce89/preview
PU e-Library Resources:

1. https://research-ebsco-com-presiuniv.knimbus.com/c/n5guci/search/details/qu3byeuf7z?db=e000xww&isDashboardExpanded=true&limiters=None&q=prestressed%20concrete</td></tr>
<tr><td colspan="5">Topics relevant to “SKILL DEVELOPMENT”: Analysis of losses of pre-stressing force in Pre-stressed concrete beams, Determination of short term and long term deflections in Pre stressed concrete beams, Analysis and Design of Pre stressed concrete members subjected to Flexure, Tension, Compression and Shear for Skill Development through Problem Solving methodologies.</td></tr>
<tr><td>Catalogue prepared by</td><td colspan="4">Ms. Anju Mathew/Mr. Ajay H A</td></tr>
<tr><td>Recommended by the Board of Studies on</td><td colspan="4">BOS Meeting No: 20, Dated: 6th June 2025</td></tr>
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</table>

Course Code: CIV2510	Course Title: Design of Structural Steel Elements Type of Course: Professional Core & Theory only	L-T-P-C	3	0	0	3
Version No.	1.2					
Course Pre-requisites	CIV2506 Analysis of Determinate Structures					
Anti-requisites	NIL					
Course Description	The objective of the course is to develop the knowledge in design of the various structural steel elements using limit state method conforming to codal provision. The design methodology is based on the latest Indian Standard Code of Practice for general construction (IS 800:2007). The course covers all the necessary components such as material specifications, connections and elementary design of structural members for designing steel structures. The behavior and design of tension members, compression members will be discussed. Design of compression members, built-up compression members along with the batten and lacing systems will also be explained.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Design of Structural Steel Elements and attain Skill Development through Problem Solving methodologies.					
Course Outcomes	On successful completion of this course the students shall be able to: 1. Apply IS 800:2007 provisions and limit state concepts to design structural steel connections. 2. Choose structural steel sections to withstand tension 3. Apply the design principles to design of compression members.					
Course Content:						
Module 1	Introduction to Steel Structures and Design of Connections	Assignment	Numerical problems	15 Sessions		
Topics: Advantages and Disadvantages of Steel Structures, Limit state method Limit State of Strength, Structural Stability, Serviceability Limit states, Failure Criteria of steel, Design Consideration, Loading and load combinations, IS code provisions, Specification and Section classification. Design of bolted and welded joints – Eccentric connections - Efficiency of joints.						
Module 2	Design of Tension members	Assignment	Numerical problems	15 Sessions		
Introduction, Types of Tension members, Slenderness ratio, Modes of Failure, Factors affecting the strength of tension members, Design of Tension members and design concept of Lug angles and Splices						
Module 3	Design of Compression Members	Assignment	Numerical problems	15 Sessions		
Introduction, Failure modes, Behavior of compression members, Sections used for compression members, Effective length of compression members, Design of compression members and built-up Compression members, Introduction to design concept of Laced and Battened Systems. Types of column bases and column splice.						
Targeted Application & Tools that can be used:						

Design and construction of steel structures such as industrial buildings, warehouses, transmission towers, bridges, and high-rise buildings. It is particularly relevant for roles in structural design consultancies, steel fabrication companies, infrastructure firms, and software-based structural analysis
Professionally Used Software: StaadPro/TEKLA

Project Work/ Assignment:

1. Numerical problems on connection design
2. Numerical problems on tension member design
3. Numerical problems on compression member design

Text Books:

1. S.K.Duggal, Limit state Design of steel Structures, McGraw Hill Education (India) Pvt. Ltd.
2. Subramanian N, *Steel Structures- Design and practice*, Oxford University Press, New Delhi

References

1. Dr.Ramachandra & Virendra Gehlot, Limit State Design of Steel Structures, Scientific Publishers
2. S.S.Bhavikatti, Design of Steel Structures by Limit State Method, I.K. International publishing house.
3. Bureau of Indian Standards, IS 800-2007, IS 875-1987 SP- 6 (Part 1) or "Steel Tables"

PU Web Resources:
https://archive.nptel.ac.in/courses/105/105/105105162/

Topics relevant to "Skill Development": Design of Tension and Compression Members for Skill Development through Problem Solving methodologies. This is attained through assessment component mentioned in course plan.

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Course Code: CIV2511	Course Title: Construction Materials Testing Lab Type of Course: 1] Professional Core 2] Laboratory only	L-T-P-C	0	0	2	1
Version No.	1.1					
Course Pre-requisites	CIV2500 Strength of Materials, CIV2100 Building Materials and Concrete Technology					
Anti-requisites	NIL					
Course Description	The primary objective of this Course is to make the students gain knowledge about the mechanical properties of engineering materials. It is a practical oriented Course dealing with how to calculate the mechanical properties of materials such as tensile strength, compressive strength, flexural strength, shear strength, torsion, hardness, toughness and tests on fine and coarse aggregates as per relevant Indian Standard Codes.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Basic Material Testing Lab and attain Skill Development through Experiential Learning techniques.					
Basic skill sets required for the laboratory:	The students shall be able to develop: 1) An attitude of enquiry. 2) Ability to interpret events and results. 3) Ability to work as a leader and as a member of team. 4) Observe and measure physical phenomenon. 5) Write Reports. 6) Select suitable equipment, instrument and materials. 7) Locate faults in systems. 8) The ability to follow standard test procedures.					
Course Outcomes	On successful completion of the course the students shall be able to: 1] Compute the basic physical properties of aggregates required for mix design of concrete and design of pavements 2] Interpret the strength and quality of building materials subjected to various loading conditions					
Course Content:	**Task 01: Test on Fine Aggregates: Sieve Analysis, Specific Gravity and Water Absorption** Level No 01: To determine the fineness modulus, specific gravity and percentage water absorption of the given sample of fine aggregates Level No. 02: Plot the particle size distribution curve for a sample of soil and classify it. **Task 02: Test on Coarse Aggregate: Sieve Analysis, Specific Gravity and Water Absorption** Level No 01: To determine the fineness modulus and percentage water absorption of the given sample of coarse aggregates Level No. 02: Plot the particle size distribution curve for a sample of soil and classify it. **Task 03: Test on Fine and Coarse Aggregate: Bulk Density** Level No 01: To determine the bulk density of the given sample of fine aggregates Level No. 02: Collect fine and coarse aggregate samples from various sources and compare the properties. Do a comparative study on the variation of bulk density based on change in the amount of compaction.					

	Task 04: Shape test on Aggregates Level No. 01: Conduct shape test and estimate the percentage of flaky and elongated aggregates. Level No. 02: Discuss reasons for not using flaky and elongated aggregates in pavement construction. Further, compare workability of different concrete mixes with different flakiness and elongation indexed aggregates. **Task 05: Tension Test** Level No 01: To conduct tension test on given metal specimen and determine the following: Young's Modulus, Yield Stress, Ultimate Stress, Percentage elongation in length and Percentage reduction in cross-sectional area Level No. 02: Perform tension test on different materials and identifying the ductile or brittle nature of the material by interpreting the graph results. **Task 06: Compression Test** Level No 01: To calculate the ultimate compressive strength, percentage reduction in length and percentage increase in cross-sectional area of the given metal specimen. Level No. 02: Vary the dimensions and material of the test specimen and study the effect of buckling in slender members. **Task 07: Flexure Test** Level No 01: To determine the Modulus of elasticity in bending and Modulus of rupture of the given specimen. Level No. 02: Create different types of beams with different support conditions and loading, and study the variation in maximum bending moment. **Task 08: Shear Test** Level No 01: To conduct shear test on mild steel and calculate its ultimate single and double shear strength. Level No. 02: Varying the material and cross-sectional shape and dimension of the test specimen and study the variation in shear strength. **Task 09: Torsion Test** Level No 01: To calculate the modulus of rigidity of the given specimen. Level No. 02: Varying the material and cross-sectional shape and dimension of the test specimen and study the variation in modulus of rigidity. **Task 10: Impact Test: Izod and Charpy** Level No 01: To calculate the impact strength of the given specimen. Level No. 02: Study the effect of notch dimensions and shape on the impact strength of different materials **Task 11: Hardness Test: Rockwell, Brinell and Vicker's** Level No 01: To calculate the hardness numbers of the given specimen. Level No. 02: Establishing a co-relation between size of indentor, load applied and the Hardness Number obtained for different materials
Targeted Application & Tools that can be used: Material Testing Consultancy, Quality and Safety Inspection.	

Text Book 1. "Basic Material Testing Lab Manual", Presidency University. 2. Relevant BIS Codes as mentioned in the Lab Manual.	
References 1. "Civil Engineering Materials: Introduction and Laboratory Testing" By Rashad Islam, 2020, CRC Press 2. "Concrete Technology Theory and Practice" 8th Edition, by MS Shetty, 2022, S Chand Publishers. E-Resources 1. Virtual Lab by NITK: https://sm-nitk.vlabs.ac.in/	
Topics relevant to "SKILL DEVELOPMENT": Tests on Fine and Coarse Aggregates, Tests on metals for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Ms. Anju Mathew/ Mr. Ajay H A
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Course Code: CIV2512	Course Title: Geotechnical Engineering Type of Course: Professional Core Theory	L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CIV2500 Strength of Materials and CIV2503 Fluid Mechanics					
Anti-requisites	Nil					
Course Description	Soil is considered by civil engineers as the complex engineering material. Geotechnical engineering is the study of the engineering properties, soil-water interactions and behavior of soils under various loads. This knowledge significantly influences the ability to design the foundations, pavement, underground and earth retaining structures, earth dams, embankments and landfills.					
Course Objective	This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies.					
Course Outcomes	On successful completion of this course the students shall be able to: CO.1 Describe soil formation, index properties of soil, clay mineralogy and soil classification. CO.2 Discuss the permeability, seepage and effective stress concepts. CO.3 Solve the problems on shear strength, compaction and consolidation parameters.					
Course Content:						
Module 1	Introduction to geotechnical engineering and basic properties of soil.	Assignment	Memory Recall based Quiz	14 Sessions		
Definition, civil engineering problems related to soil, origin and formation of soil, regional soil deposits in India, phase diagram, volumetric relationships, water content, densities, unit weights, specific gravity and their inter-relationships, numerical. Index properties of soil and their determination - water content, in-situ density, specific gravity, particle size distribution, relative density, consistency limits; soil structure and clay minerals; soil classification, numerical and activity and thixotropy of clay.						
Module 2	Permeability, Effective Stresses and shear strength of soil	Assignment	Numerical solving task	17 Sessions		
Flow through Soils: Darcy's law - assumption and validity, coefficient of permeability and its determination, factors affecting permeability, Seepage velocity, discharge velocity and coefficient of percolation, permeability of stratified soils, Effective Stress: Total stress, effective stress and Pore-water pressure, numerical, Shear strength- Concept of shear strength, Mohr circle of stresses, Mohr-Coulomb failure criterion, measurement of shear strength parameters.						
Module 3	Compaction and Consolidation of soil	Assignment	Numerical solving task	11 Sessions		
Compaction: Definition, Standard and Modified proctor's compaction tests, factors affecting compaction, numerical. Consolidation: Definition, mass-spring analogy, Terzaghi's one dimensional consolidation theory - assumption and limitations, normally consolidated,						

under consolidated and over consolidated soils, -consolidation characteristics of soil (Cc, av, mv and cv) and numerical. Project Work/ Assignment:	
Assignment: Memory Recall based Quiz is assigned to from Module 1 Numerical solving task is assigned from Module 2 and 3.	
Textbooks T1. Gopal Ranjan and Rao, "*Basic and applied soil Mechanics"*, New Age International (P) Ltd., New Delhi. Reprint 2005 T2. Dr. B. C. Punmia and Ashok Kumar Jain, "Soil Mechanics and Foundations*"*, Laxmi Publication (P) Ltd., New Delhi. 16th Edition 2005.	
References R1. V. N. S. Murthy, "Geotechnical Engineering", CBS Publishers and Distributors, 2018 edition. R2. K.R. Arora, "Soil Mechanics and Foundation Engineering", Standard Publishers New Delhi, reprint 2004. R3. Craig, R. F, "Soil Mechanics", English Language Book Society and V N Reinhold Co. Ltd., London, 7th Edition. R4: Bureau of Indian Standards, "Indian Standard, Methods of test for soils, IS 2720: Part 1 to 41" Website: https://nptel.ac.in/courses/105103097 Notes/PPT: https://nptel.ac.in/courses/105103097	
Topics relevant to "SKILL DEVELOPMENT": Index properties of soil, Soil classification, Determination of shear strength, compaction characteristics, permeability of soil and consolidation parameters of soil for Skill Development through Problem Solving methodologies. This is attained through assessment component mentioned in course handout	
Catalogue prepared by	Dr. Madhavi T
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Course Code: CIV2513	Course Title: Geotechnical Engineering Laboratory Type of Course: Professional Core Laboratory	L-T-P-C	0	0	2	1
Version No.	1.0					
Course Pre-requisites	CIV2512 Geotechnical Engineering					
Anti-requisites	NIL					
Course Description	This Course is aimed to perform common soil mechanics tests for better understanding of soils behaviour. The Course includes experiments on moisture content, Specific gravity, liquid and plastic limit, and analysis of grain size distribution including both sieve analysis and hydrometer, field density tests, hydraulic conductivity test including both constant and falling head tests, one dimensional consolidation test, direct shear test, unconfined compressive strength and UU triaxial test. The Course develops an ability to design and conduct experiments, as well as to analyze and interpret the data.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Geotechnical Engineering Laboratory and attain Skill Development through Experiential Learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: CO.1 Outline the physical and index properties of the soil. CO.2 Determine the coefficient of permeability and compaction parameters of soil. CO.3 Determine shear strength parameters of soil by direct shear test, unconfined compression test and triaxial shear tests. CO.4 Determine the coefficient of consolidation of soil.					
Course Content:	List of Laboratory tasks Task 01: Water content determination by oven drying method Task 02: Specific gravity test using pycnometer and density bottle method on the graph. Task 03: Grain size analysis. Level 01- Sieve analysis. Level 02- Hydrometer analysis (only demonstration). Task 04: In-situ density tests Level 01- Core-cutter method Level 02- Sand replacement method. Task 05: Consistency limits Level 01- Liquid limit test and Plastic limit test Level 02- Shrinkage limit test Task 06: Standard proctor compaction test Task 07: Co-efficient of permeability test Level 01- Constant head permeability test (only demonstration Level 02- Variable head permeability test Task 08: Shear strength tests					

	Level 01-Unconfined compression test and Direct shear test Level 02- Triaxial shear test (unconsolidated undrained) Task 09: Consolidation test: Determination of compression index and coefficient of consolidation
Targeted Application & Tools that can be used: Soil testing tasks and result interpretation could help students in future consulting work and even research by using Excel	
Project Work/ Assignment:	
Assignment: The students must conduct the experiments and interpret the data using graph sheet. For each of the experiment, students must write the results and inferences in the record.	
Text Book (s) 3. "Soil Mechanics Laboratory Manual", Presidency University. 4. Lambe T.W., "Soil Testing for Engineers", Wiley Eastern Ltd., New Delhi.	
References 1. Bureau of Indian Standards, "Indian Standard, Methods of test for soils, IS 2720: Part 1 to 41" 2. https://sm-nitk.vlabs.ac.in/	
Topics relevant to "SKILL DEVELOPMENT": Consolidation test: Determination of compression index and coefficient of consolidation, In-situ density tests for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in the course handout.	
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Course Code: CIV2514	Course Title: CIV2514 Foundation Engineering Type of Course: Professional Core		L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CIV2512 Geotechnical Engineering					
Anti-requisites	NIL					
Course Description	The course applies and extends the fundamental understanding of geotechnical engineering for analysis of stress distribution in soil, slope stability, earth pressures theories, stability analysis of retaining walls, design of shallow and pile foundations, bearing capacities of shallow and deep foundations.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Foundation Engineering and attain Skill Development through Problem Solving methodologies.					
Course Outcomes	On successful completion of the course the students shall be able to: CO.1 Compute the factor of safety for slope stability and the stress distribution in soils. CO.2 Compute the lateral earth pressure of soil. CO.3 Compute the load carrying capacity of shallow foundation and pile foundation.					
Course Content:						
Module 1	Stability Analysis of Slopes and Stress Distribution in soil	Assignment	Numerical solving Task	15 Sessions		
Topics: Stability Analysis of Slopes: Infinite and Finite slopes, Types of failure of finite slopes, types of factors of safety, Taylor's stability number and numerical. Stress Distribution in soil: Stress due to self-weight, Boussinesq's Theory for Concentrated Load and Uniformly distributed Load, Wetergaard's Theory and numerical.						
Module 2	Lateral Earth pressure estimation for the construction of retaining wall	Assignment	Numerical solving Task	15 Sessions		
Topics: Lateral Earth pressure: Introduction, types of earth pressure (At rest, active, passive), Rankine's earth pressure theory: Active earth pressure; Passive Earth pressure for horizontal & inclined backfill for cohesive & Cohesion less soils, Coulomb's Wedge Theory: Active earth pressure; Passive Earth pressure conditions and numerical.						
Module 3	Shallow, pile foundations and Subsoil Investigation	Assignment	Numerical solving Task	15 Sessions		
Topics: Shallow foundations: Safe bearing capacity and allowable bearing pressure, Terzaghi's bearing capacity, Types of shear failures. Effect of Water table on Bearing Capacity, Bearing capacity from field plate load tests, Standard Penetration Test and numerical. Pile Foundations: Classification, load carrying capacity of single pile – Dynamic Formula, Static formula, Load carrying capacity of pile groups, settlement of pile groups, Negative skin friction, numerical. Subsoil Investigation: Importance of exploration program, Methods of						

exploration: Boring, Types of samples -undisturbed, disturbed and representative samples, Samplers, sample disturbance, area ratio, Recovery ratio, clearance, Typical bore log. Number and soil exploration report.
Project Work/ Assignment:
Assignment: Numerical solving Task assigned from Module 1,2 and 3.
Targeted Application & Tools that can be used: The application of the principles are made in both the design and construction areas. Topics used to illustrate these aspects include site investigation techniques and new foundation design and construction. This field of engineering not only establishes the physical qualities and quantities needed for the construction of foundations but establishes the necessary design parameters needed for such construction. Such parameters are established by evaluating factors such as the bearing capacity of a particular soil, allowable soil pressure, and the influence of slopes and adjacent foundations.
Text Book: T1. V. N. S. Murthy, "Geotechnical Engineering", CBS Publishers and Distributors, 2018 edition.
References: R1. Das, B. M. "Principles of Foundation Engineering", Thomson India Edition, New Delhi. R2. J.E. Bowles, "Foundation Analysis and Design", McGrawHill Pub. Co. New York. R3. Craig, R. F. (1983), "Soil Mechanics", English Language Book Society and Van Nostrand Reinhold Co. Ltd., London. R4. IS Code: IS 1904 -1986: "General Requirements for Design and Construction of Foundations. Website: https://nptel.ac.in/courses/105/105/105105176/ E-book: https://www.usb.ac.ir/FileStaff/5495_2020-1-25-11-9-53.pdf Notes/PPT: https://nptel.ac.in/courses/105/105/105105176/ E Resources Presidency University: https://web.s.ebscohost.com/ehost/resultsadvanced?vid=2&sid=5c2a6e67-f72e-4930-a9aa-2967a5662539%40redis&bquery=soil+mechanics+and+foundation+engineering&bdata=JmRiPWlpaCZ0eXBlPTEmc2VhcmNoTW9kZT1TdGFuZGFyZCZzaXRlPWVob3N0LWxpdmU%3d
Topics relevant to "Skill Development": Shallow and Deep Foundation design; Stability analysis of slopes for Skill Development through Problem Solving methodologies. This is attained through the assessment component mentioned in the course handout.

Catalogue prepared by	Dr. Madhavi T
Recommended by the Board of Studies on	BOS Meeting No: 20, Dated: 6th June 2025
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<table>
<tr><td>Course Code:
CIV2515</td><td colspan="3">Course Title: Water Infrastructure Systems
Type of Course: Professional Core Theory</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="8">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="8">CIV2503 Fluid Mechanics - Properties of fluids, Flow through pipes.</td></tr>
<tr><td>Anti-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Course Description</td><td colspan="8">The purpose of this course is to illustrate the need for water treatment and distribution systems and to develop the basic abilities of analysing the quality of water. The course is both conceptual and analytical in nature and needs fair knowledge of chemistry and mathematics. The course develops the critical thinking and analytical skills.</td></tr>
<tr><td>Course Objective</td><td colspan="8">The objective of the course is to familiarize the learners with the concepts of Water Infrastructure Systems and attain Skill Development through Problem Solving methodologies.</td></tr>
<tr><td>Course Outcomes</td><td colspan="8">On successful completion of this course the students shall be able to:
1) Illustrate the water demand and water quality characteristics.
2) Demonstrate the relevant treatment units/process for surface and subsurface water treatment.
3) Interpret suitable advanced water treatment and water distribution system for the locality.</td></tr>
<tr><td>Course Content:</td><td colspan="8"></td></tr>
<tr><td>Module 1</td><td colspan="2">Water demand and Water quality</td><td colspan="2">Assignment</td><td colspan="2">Memory recall and Numerical solving task</td><td colspan="2">15 Sessions</td></tr>
<tr><td colspan="9">Topics: Demand of Water: Types of water demands - Factors affecting per capita demand, Variations in demand of water, Peak factor, Design period and factors governing design period. Different methods of population forecasting. Surface and subsurface sources – Factors to be considered for selecting particular source of water. Water quality characteristics: Physical, chemical and biological characteristics of water, Drinking water standards –BIS & WHO</td></tr>
<tr><td>Module 2</td><td colspan="2">Water treatment</td><td colspan="2">Assignment</td><td colspan="2">Memory recall and Numerical solving task</td><td colspan="2">20 Sessions</td></tr>
<tr><td colspan="9">Topics: Water Treatment: Objectives of water Treatment, Treatment flow chart. Sedimentation, Sedimentation aided with Coagulation, optimum dosage of coagulant, design of clariflocculator. Filtration: mechanism -theory of filtration, types of filters, slow sand, rapid sand and pressure filters. Design of slow and rapid sand filter. Disinfection: types of disinfection, break point chlorination, chlorine demand, residual chlorine. Aeration and its types, Water Softening: methods for removal of hardness.</td></tr>
<tr><td>Module 3</td><td colspan="2">Collection, Conveyance and water distribution</td><td colspan="2">Seminar</td><td colspan="2">Presentation on relevant topic.</td><td colspan="2">10 Sessions</td></tr>
<tr><td colspan="9">Topics: Advanced water treatment: Ion exchange, electro-dialysis, Reverse Osmosis, Ultra filtration. Fluoridation and de-fluoridation - Principles and design. Distribution system: Layout of distribution network, Methods of distribution and systems of supply.</td></tr>
<tr><td colspan="9">Targeted Application & Tools that can be used:
Application Area is water sample collection and analysis, water treatment and distribution
Professionally Used Software: Auto cad</td></tr>
<tr><td colspan="9">Project Work/Assignment:</td></tr>
</table>

3. Assignment: Students will submit in written Memory recall and Numerical solving task on module 1 and 2. 4. Seminar: Students will give presentation on relevant topics in group.
Text Book(s): 1. S.K. Garg, "Water Supply Engineering", Khanna Publishers, 37th latest edition, March 2024. 2. B.C. Punmia, Ashok Jain & Arun Jain, "Water Supply Engineering, Vol. I", Laxmi Publications Pvt. Ltd, New Delhi, 2010.
Reference Book(s): 1. GS Birdie JS Birdie, "Water supply and Sanitary engineering", Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 1 January 2010. 2. "Manual on Water supply and Treatment", CPHEEO, 1999. Web Source: https://archive.nptel.ac.in/courses/105/106/105106119/
Topics relevant to "Skill Development": Design of water distribution system and Water quality analysis for Skill Development through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mr. Bhavan Kumar
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<table>
<tr><td>Course Code:
CIV2516</td><td colspan="5">Course Title: Wastewater Treatment and Disposal Systems
Type of Course: Professional core Theory</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="10">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="10">CIV2503 Fluid Mechanics - Properties of fluids, Flow through pipes, CIV2515 Water infrastructure systems.</td></tr>
<tr><td>Anti-requisites</td><td colspan="10">NIL</td></tr>
<tr><td>Course Description</td><td colspan="10">The purpose of this course is to illustrate the need for wastewater treatment and disposal systems and to develop the basic abilities of analysing the characteristics of wastewater. The course is both conceptual and analytical in nature and needs fair knowledge of chemistry and mathematics. The course develops the critical thinking and analytical skills.</td></tr>
<tr><td>Course Objective</td><td colspan="10">The objective of the course is to familiarize the learners with the concepts of Wastewater Treatment and Disposal Systems and attain Employability Skills through Problem Solving methodologies.</td></tr>
<tr><td>Course Outcomes</td><td colspan="10">On successful completion of this course the students shall be able to:
4) Determine the sewage discharge, diameter of sewer and wastewater characteristics
5) Demonstrate the relevant treatment units/process for wastewater treatment
6) Illustrate the appropriate disposal methods for sewage effluent and sludge</td></tr>
<tr><td>Course Content:</td><td colspan="10"></td></tr>
<tr><td>Module 1</td><td>Sewer design and Wastewater characterization</td><td colspan="3">Assignment</td><td colspan="3">Memory recall and Numerical solving task</td><td colspan="2">18 Sessions</td></tr>
<tr><td colspan="11">Topics: Necessity for sanitation, estimating of dry weather flow and wet weather flow, factors affecting dry weather flow. Hydraulic design of sewers, sewer appurtenances. Wastewater characteristics: sampling, physical, chemical and biological characteristics. Types of oxygen demand, Population equivalent and relative stability. Numerical on determination of quantity of wastewater for separate, combined and partially separate systems</td></tr>
<tr><td>Module 2</td><td>Treatment of sewage</td><td colspan="3">Assignment</td><td colspan="3">Memory Recall and Numerical solving task</td><td colspan="2">15 Sessions</td></tr>
<tr><td colspan="11">Topics: Flow diagram for municipal wastewater treatment. Preliminary & Primary treatment: Theoretical principles and design: screens, grit chamber, skimming tank, Sedimentation tanks - Design criteria & Design examples. Secondary treatment: Trickling filter –operation and designs, Activated sludge process- operation and design.</td></tr>
<tr><td>Module 3</td><td>Disposing of Sewage Effluents</td><td colspan="3">Seminar</td><td colspan="3">Participative learning</td><td colspan="2">12 Sessions</td></tr>
<tr><td colspan="11">Topics: Digestion and disposal of primary and secondary sludge, Sludge digestion, Sludge digestion tanks. Disposal of sewage effluents, disposal standards, Disposal of Effluents by dilution – Disposal of wastewater in rivers and self-purification of natural streams, oxygen sag curve, zones of purification.</td></tr>
<tr><td colspan="11">Targeted Application & Tools that can be used:
Application Area is Wastewater sample collection and analysis, wastewater characteristics, disposal of sewage effluents and wastewater treatment
Professionally Used Software: Auto cad</td></tr>
</table>

Project Work/Assignment: 1. Assignment: Students will submit in written Memory recall and Numerical solving task on module 1 and 2. 2. Seminar: Students will give presentation on relevant topics in group.
Text Book(s): 1. S.K. Garg, "Sewage disposal and Air pollution engineering", Khanna Publishers, 19th September 2018.
Reference Book(s): 1. Metcalf and Eddy, "WasteWater Engineering, Collection, Treatment and Disposal", Tata McGraw Hill, Inc., New York, 1 July 2017. 2. B.C.Punmia, Ashok Jain and Arun Jain, "Wastewater Engineering", Laxmi Publications Pvt. Ltd, New Delhi, 1 January 2016. Web source: https://archive.nptel.ac.in/courses/105/106/105106119/
Topics relevant to "EMPLOYABILITY SKILLS": Monitoring of wastewater treatment process, Disposal standards for wastewater for developing Employability Skills through Problem Solving methodologies.

Catalogue prepared by	Mr. Bhavan Kumar
Recommended by the Board of Studies on	BOS Meeting No: 20, Dated: 6th June 2025
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Course Code: CIV2517	Course Title: Environmental Engineering Lab Type of Course: 1] Program Core 2] Laboratory only	L-T-P-C	0	0	2	1
Version No.	1.2					
Course Pre-requisites	CIV2515 Water infrastructure systems					
Anti-requisites	NIL					
Course Description	This course demonstrates analysis of water samples and experimental techniques, normally used in support of water and wastewater treatment facilities. This course emphasizes data acquisition and analysis, and engineering report writing. It is a practical oriented course provide an overview of physico-chemical properties of water and waste water. Based on the analytical results, source of contamination can be found and degree of treatment will be decided. This laboratory Course helps students to monitor the quality of surface, ground water and sewage water in terms of contaminants concentrations.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Environmental Engineering Lab and attain Skill Development through Experiential Learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: 1] Discuss the concepts of water quality parameters and their analytical tools. 2] Analyze the various quality characteristics of water and wastewater. 3] Interpret the result in comparison with public health considerations.					
Course Content:	Mention the List of Laboratory tasks proposed to be conducted. Task 01: Determination of pH of a given water sample Task 02: Determination of Electrical conductivity of given water sample Task 03: Determination of Total Dissolved solids of given water sample Task 03: Determination of Turbidity of given water sample. Task 04: Determination of acidity of given water sample. Task 05: Determination of alkalinity of given water sample. Task 06: Determination of total hardness of given water sample. Task 07: Determination of Residual chlorine in given water sample. Task 08: Determination of optimum dosage of coagulant using jar test Task 09: Determination of total Solids in a given water sample. Task 10: Determination of dissolved oxygen content in given water sample. Task 11: Determination of BOD in a given water sample. Task 12: Determination of COD in a given water sample.					

Targeted Application & Tools that can be used:
Application area is water sample collection and analysis, Water treatment and distribution.
SKILL DEVELOPMENT & EMPLOYABILITY: Analytical skill of water and wastewater.
Professional Software: SPSS, Aquachem

Text Books

1. Metcalf & Eddy, *Wastewater Engineering Treatment and Reuse (4th edition) (2004), mcgraw-hill publication, 1988.*
2. Santhosh Kumar Garg, *Environmental Engineering (Vol. I) Water Supply Engineering, Khanna publishers. 1977, Reprint 2016.*

References:

1. APHA Standard Methods for the Examination of Water and Wastewater, APHA, 2011
2. "Manual of water and wastewater analysis" NEERI Publication"

Virtual lab Link:

https://ee1-nitk.vlabs.ac.in/
https://ee2-nitk.vlabs.ac.in/

Topics relevant to "SKILL DEVELOPMENT Determination of Total Dissolved solids, dissolved oxygen content, BOD and COD of a given water sample for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mr. Santhosh M.B., Dr. Venkatesha Raju K and Mr. Bhavankumar M
Recommended by the Board of Studies on	BOS Meeting No: 20, Dated: 6th June 2025
Date of Approval by the Academic Council	Academic Council Meeting No 26 dated __ June 2025

Course Code: CIV2518	Course Title: Quantity Surveying, Estimation and Valuation Type of Course: Professional Core Theory	L-T-P-C	3	1	0	4
Version No.	1.0					
Course Pre-requisites	CIV2103-Building Planning and Drawing and CIV2508- Design of RCC Structural Elements					
Anti-requisites	NIL					
Course Description	This subject covers the various aspects of estimating quantities of items of works involved in buildings, water supply and sanitary works, road works and irrigation work. This also covers the rate analysis, valuation of land and buildings, and preparation of reports for estimation of various items of work.					
Course Objective	This course is designed to improve the learner's EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies.					
Course Outcomes	On successful completion of this course the students shall be able to: CO.1 Describe the principles of estimation and units of measurement for various items of work. CO.2 Compute the quantity of materials required for various civil engineering works with specification. CO.3 Prepare the rate analysis for various building works. CO.4 Determine the valuation of various building works.					
Course Content:						
Module 1	Introduction to estimation	Assignment	Memory Recall based Quiz	10 Sessions		
Topics: General introduction to Quantity surveying/estimation – purpose/objectives of estimates, Different types of estimates, detailed estimate, approximate estimate, Units of measurement for various items of work, Principles of units of measurement for various items of works –earth work, cement/lime concrete in foundation, masonry work, Damp proof course, masonry work in superstructure walls, wood work, steel work, IS: 1200 – 1974- Parts 1 to 25, data sheets, contracts-types of contracts						
Module 2	Method of building estimate	Assignment	Numerical solving task	25 Sessions		
Topics: Methods of estimation -various items of work to be included in estimates-long wall short wall method and centreline method for various structures. Reinforcement bar bending and bar requirement schedules, Specifications – Types of specifications, General specification of various items of work, Detailed specification for various items of work. Reports, Report on estimates for the construction of various items						
Module 3	Earthwork estimation and Rate Analysis	Assignment	Numerical solving task	12 Sessions		
Topics: Road estimating, earthwork, mid sectional area method, Mean sectional area method, prismoidal formula method, Purpose of rate analysis, Analysis of rates for various building works, labour Estimation of Earthworks and Rate Analysis with Standard schedule of rates.						

Module 4	Valuation of buildings	Assignment	Numerical solving task	13 Sessions
Topics: Valuation introduction, Purpose of valuation, Gross Income, Net income, Outgoings, Municipal taxes, Scrap value, Salvage value, Market value, Book value, Obsolescence, Annuity, Capitalized value, Depreciation, Valuation of land and building.				
Targeted Application & Tools that can be used: Estimation of the material quantities, prepare a bill of quantities, make specifications and prepare tender documents. The student should also be able to prepare value estimates. Professionally Used Software: Excel				
Project Work/ Assignment:				
Assignment: Memory Recall based Quiz is assigned to from Module 1 Numerical solving task is assigned from Module 2,3 and 4.				
Text Book: 1. B.N. Dutta, "*Estimating and Costing in Civil Engineering Theory and Practice"*, UBS Publishers and Distributors Limited New Delhi, 24th Edition.				
References 1. M. Chakraborti, "*Estimating, Costing, Specification and Valuation on Civil Engineering"* National Halftone Co, Calcutta, 1992. 2. BIS: 1200 – 1974- Parts 1 to 25, "Methods of Measurement of Building and Civil Engineering Works", Bureau of Indian Standards, New Delhi Website: https://nptel.ac.in/courses/105/108/105108075/ Notes/PPT: W1 https://nptel.ac.in/courses/105103093/14				
Topics relevant to "SKILL DEVELOPMENT": Preparing the bill of quantities for various items of buildings and valuation of buildings for Skill Development through Problem Solving methodologies. This is attained through the assessment component mentioned in the course handout.				
Catalogue prepared by	Dr. Madhavi T			
Recommended by the Board of Studies on	BOS Meeting No: 20, Dated: 6th June 2025			
Date of Approval by the Academic Council	Academic Council Meeting No 26 dated __ June 2025			

Course Code: CIV2519	Course Title: Construction Project Management Type of Course: Professional Core Theory	L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	[1] Construction Techniques and process [2] Probability and statistics Basic Understanding of construction techniques and Process of different civil engineering projects, Basics of beta distribution and normal distribution of probability with their Mean, Standard deviation and variance.					
Anti-requisites	NIL					
Course Description	The purpose of this course is to deal with the need for management in civil engineering and to develop the basic understanding of project planning and scheduling along with quality and safety standards for any project. The course is both conceptual and analytical in nature and needs fair knowledge of Mathematics and skills of logical reasoning. The course develops critical thinking and basic skills required for a project manager. The course also enhances the analytical skills through assignments.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Construction Project Management and attain Skill Development through Problem Solving techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: CO.1 Describe the basic concepts of project development. CO.2 Prepare project plan, network and schedule for various projects. CO.3 Explain the risks in construction projects.					
Course Content:						
Module 1	Basics of Construction Project	Quiz	Memory recall based quiz	15 Sessions		
Topics: Introduction to Construction Project, Phases of a Construction Project, Stake holders of a Project, Structure of a Construction Organization, Traits of a Project Manager, Cost estimate: Client's and contractors perspective, Construction Contract: types of contracts, General Conditions of Contract, Special Conditions of Contract, Bill of Quantities, and Introduction to FIDIC Contracts.						
Module 2	Project Planning and Scheduling	Assignment	Numerical solving tasks	20 Sessions		
Topics: Work breakdown structure, Planning techniques – Event & Activity, Network diagram, Network logic, Duration of an activity, Forward & Backward pass, Float or Slack Time, Path and Critical Path, Program Evaluation and Review Technique (PERT), Critical Path Method (CPM), Bar Charts, Advantages of Network Techniques. Resource Management, Time-cost trade-off, Project control: S-curve, Earned value analysis.						
Module 3	Risk Management	Article Review	Article review on Construction Risks	10 Sessions		
Topics: Certainty, Risk and Uncertainty Reasons for the risks, Types of Risks, Risk Management Identification and Nature of Construction Risks, Minimizing risks and mitigating losses, Risk mitigation.						
Targeted Application & Tools that can be used: Application area is Construction Project management consultancies, Construction companies, Entrepreneurship. Professionally used software: MS Project, Oracle Primavera.						

Project Work/ Assignment: 1. Quiz: - Multiple choice questions on Phases of projects, stake holders, contract estimates 2. Assignment:-Problems pertaining to CPM and PERT Network analysis 3. Article review: - Article review on Construction risks
Textbooks: 1. Kumar Neeraj Jha, "Construction Project Management – Theory and Practice",Second ed. Pearson, 2015 2. Jimmie W. Hinze "Construction Planning and Scheduling" (4th Ed.), Tata McGraw Hill, 2011.
References: 1. Sengupta B. and Guha H,(2015) "Construction Management and Planning", First Ed.,Tata McGraw Hill, New Delhi. 2. Moder J.J. and Phillips C.R., "Project Management with CPM and PERT", 3rd Ed,Van Nostrand Publications, 1983. Website: Scheduling techniques in Projects: https://swayam.gov.in/nd1_noc19_ce24/preview Project Planning and Control: https://swayam.gov.in/nd1_noc19_ce30/preview Project Management: https://swayam.gov.in/nd1_noc19_mg30/preview.
Topics relevant to "SKILL DEVELOPMENT ": Project planning and techniques, Project monitoring and control techniques, Application of project management techniques using software, Quality and safety standards in construction for Skill Development through Problem solving techniques. This is attained through assessment component mentioned in Course Plan.

Catalogue prepared by	Mrs. Divya Nair
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 8th July 2023
Date of Approval by the Academic Council	Academic Council Meeting No: 21, dated on 28th August 2023

Course Code: CIV2520	Course Title: Construction Project Management Lab Type of Course: Professional Core Laboratory	L-T-P-C	0	0	2	1
Version No.	1.1					
Course Pre-requisites	[1] Construction Techniques and process [2] Probability and statistics Basic Understanding of construction techniques and Process of different civil engineering projects, Basics of beta distribution and normal distribution of probability with their Mean, Standard deviation and variance.					
Anti-requisites	NIL					
Course Description	The purpose of this course is to provide an opportunity to validate the planning and scheduling concepts that enhances the ability to visualize the real system performance. This laboratory course in Construction Project Management provides a hands-on experience with project planning, scheduling, budgeting, resource allocation, risk analysis, and execution using the industry-standard tools and techniques via using the MSP software. The course aims to bridge theoretical knowledge with practical applications to enhance students' ability to manage real-world construction projects effectively. The course is both conceptual and analytical in nature.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Construction Project Management and attain Skill Development through Experiential Learning techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: CO.1 Prepare schedule of projects in MS Project/ Primavera software and perform various operations to optimize the schedule.					
Course Content:						

List of Laboratory Tasks:

Experiment No. 1: Creating project tasks in MS Project or Primavera.
Level 1: Define project tasks and its duration associated with construction of a Two storied residential Building with Conventional RCC construction.
Level 2: Define project tasks and its duration associated with construction of a Two storied residential Building with Conventional RCC construction including services such as electrical, plumbing and sanitary works.

Experiment No. 2: Defining Milestones and Dependencies among the project tasks in MS Project or Primavera.
Level 1: Define Milestones and assign logical relationships between project tasks for a Two storied residential Building with Conventional RCC construction.
Level 2: Define Milestones and assign logical relationships between project tasks for a Two storied residential Building with Conventional RCC construction including services such as electrical, plumbing and sanitary works.

Experiment No. 3: Creating and assigning resources in MS Project or Primavera
Level 1: Creating required resources for the project and assigning them to project tasks involved in construction of a Two storied residential Building with Conventional RCC construction.

Level 2: Creating required resources for the project and assigning them to project tasks involved in construction of a Two storied residential Building with Conventional RCC construction including services such as electrical, plumbing and sanitary works.

Experiment No. 4: Creating Project Baseline and Generating reports in MS Project or Primavera.
Level 1: Create project baseline and generate resource reports, cost reports and progress reports for a Two storied residential Building with Conventional RCC construction.
Level 2: Create project baseline and generate resource reports, cost reports and progress reports for a Two storied residential Building with Conventional RCC construction including services such as electrical, plumbing and sanitary works.

Experiment No. 5: Preparation of Project plan and schedule on MS Project or Primavera.
Level 1: Prepare a comprehensive project plan for one of the infrastructure project mentioned in the theory lecture using all the skills acquired in previous lab sessions.
Level 2: Prepare a comprehensive project plan for one of the infrastructure project mentioned in the theory lecture using all the skills acquired in previous lab sessions and perform resource optimization on the prepared plan.

Targeted Application & Tools that can be used:
Application area is Construction Project management consultancies, Construction companies, Entrepreneurship.
Professionally used software: MS Project, Oracle Primavera.

Textbooks:
1. Kumar Neeraj Jha, "Construction Project Management – Theory and Practice",Second ed. Pearson, 2015
2. Jimmie W. Hinze "Construction Planning and Scheduling" (4th Ed.), Tata McGraw Hill, 2011.

References:
1. Sengupta B. and Guha H,(2015) "Construction Management and Planning", First Ed.,Tata McGraw Hill, New Delhi.
2. Moder J.J. and Phillips C.R., "Project Management with CPM and PERT", 3rd Ed,Van Nostrand Publications, 1983.

Website:
Scheduling techniques in Projects: https://swayam.gov.in/nd1_noc19_ce24/preview
Project Planning and Control: https://swayam.gov.in/nd1_noc19_ce30/preview
Project Management: https://swayam.gov.in/nd1_noc19_mg30/preview.

Topics relevant to "SKILL DEVELOPMENT": Project planning and techniques, Project monitoring and control techniques, Application of project management techniques using software, Quality and safety standards in construction for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in Course Plan.

Catalogue prepared by	Mrs. Divya Nair
Recommended by the Board of Studies on	BOS Meeting No: 20, Dated: 6th June 2025
Date of Approval by the Academic Council	Academic Council Meeting No 26 dated __ June 2025

Course Code: CIV2521	Course Title: Building Information Modelling Lab Type of Course: Professional Core and Laboratory	L-T-P-C	0	0	2	1
Version No.	1.1					
Course Pre-requisites	CIV2103 - Building Planning and Drawing					
Anti-requisites	NIL					
Course Description	This hands-on lab course introduces students to Building Information Modelling (BIM) using Autodesk Revit. Through a series of practical tasks, students learn to model, visualize, and document building elements including walls, doors, windows, floors, stairs, and roofs. The course equips learners with industry-relevant skills in BIM-based planning, design, and construction documentation, making them job-ready for roles in architecture, engineering, and construction firms.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Building Information Modelling and attain Employability Skills through Experiential Learning techniques					
Course Outcomes	On successful completion of the course the students shall be able to: CO.1 Implement projects using REVIT Architectural Template CO.2 Demonstrate competency in documenting small building projects using REVIT					
Course Content:						
List of Laboratory Tasks:	List of Laboratory tasks Task 01: Introduction to Autodesk Revit Architecture Level No. 01: Overview of the Interface, Starting Projects, Viewing Commands Level No. 02: Develop an independent building model Task 02: Basic Drawing and Modify Tools Level No. 01: Using General Drawing Tools, Editing Elements, Working with Basic Modify Tools Level No. 02: Develop an independent building model Task 03: Setting Up Levels and Grids, Modelling Walls Level No. 01: Setting Up Levels, Creating Structural Grids, Adding Columns, Modelling Walls, Modifying Walls Level No. 02: Develop an independent building model Task 04: Working with Doors and Windows, modelling curtain walls Level No. 01: Inserting Doors and Windows, Loading Door and Window Types from the Library, Creating Additional Door and Window Sizes, Creating Curtain Walls, Adding Curtain Grids, Working with Curtain Wall Panels, Attaching Mullions to Curtain Grids Level No. 02: Develop an independent building model					

	Task 05: Working with Views Level No. 01: Adding Callout Views, Elevations and Sections Level No. 02: Develop an independent building model Task 06: Adding Components Level No. 01: Adding Components, Modifying Components Level No. 02: Develop an independent building model Task 07: Modelling Floors, Ceilings and Roofs Level No. 01: Modelling Floors, Creating Shaft Openings, Creating Sloped Floors, Modelling Ceilings, Adding Ceiling Fixtures, Modelling Roofs, Creating Roofs by Footprint, Creating Roofs by Extrusion Level No. 02: Develop an independent building model Task 08: Modelling Stairs, Railings, and Ramps Level No. 01: Creating Component Stairs, Modifying Component Stairs, Working with Railings, Sketching Custom Stairs, Creating Ramps Level No. 02: Develop an independent building model Task 09: Creating Rendering, Animations Level No. 01: Solar Study, Rendering in Revit Architecture, Creating a Walkthrough Level No. 02: Develop an independent building model. Task 10: Creating Construction Documents Level No. 01: Setting Up Sheets, Placing and Modifying Views on Sheets, Printing Sheets Level No. 02: Develop an independent building model
Targeted Application & Tools that can be used: This course prepares students for roles in architecture, construction, and infrastructure firms where BIM is used for design coordination, clash detection, quantity estimation, and construction documentation. Proficiency in tools like Autodesk Revit is highly valued for positions such as BIM Engineer, Architectural Designer, and Project Coordinator, enabling efficient project planning, visualization, and execution across the building lifecycle.	
Text Book 1. Eastman, "BIM Handbook: A Guide to Building Information Modelling for Owners, Managers, Designers, Engineers and Contractors". 2. "Mastering Autodesk Revit 2020" by Robert Yori, Markus Kim and Lance Kirby	
References 1. "Basics of BIM: Introduction to Building Information Modelling" by VV Talapov 2. https://www.coursera.org/learn/bim-fundamentals 3. https://www.udemy.com/course/bim-training/	
Topics relevant to "EMPLOYABILITY SKILLS": BIM Modelling of Buildings using REVIT for developing Employability Skills through Experiential Learning techniques. This is attained through assessment component mentioned in course plan.	

Catalogue prepared by	Ms. Anju Mathew
Recommended by the Board of Studies on	BOS Meeting No: 20, Dated: 6th June 2025
Date of Approval by the Academic Council	Academic Council Meeting No 26 dated __ June 2025

<table>
<tr><td>Course Code:
CIV2522</td><td>Course Title: Computer Aided Analysis & Detailing Lab
Type of Course: 1] Professional Core
2] Lab only</td><td>L-T-P-C</td><td>0</td><td>0</td><td>2</td><td>1</td></tr>
<tr><td>Version No.</td><td colspan="6">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="6">CIV2508 – Design of RCC Structural Elements
CIV2510 – Design of Structural Steel Elements</td></tr>
<tr><td>Anti-requisites</td><td colspan="6">NIL</td></tr>
<tr><td>Course Description</td><td colspan="6">This course offers study of structural elements and building frame analysis, with a focus on reinforcement detailing of reinforced concrete and steel components. It covers the analysis and design of structural systems such as Portal Frames, Trusses, and Isolated Footings, along with detailing of reinforced concrete elements and steel connection detailing such as beam-to-beam and beam-to-column joints. Modeling and analysis are conducted using software tools like STAAD.Pro and ETABS, while detailing is performed using AutoCAD. The course equips students with the skills to interpret structural behavior through software simulations and to prepare accurate construction drawings for on-site execution.</td></tr>
<tr><td>Course Objective</td><td colspan="6">The objective of the course is to familiarize the learners with the concepts of Computer Aided Analysis & Detailing Lab and attain Employability Skills through Experiential Learning techniques</td></tr>
<tr><td>Course Outcomes</td><td colspan="6">On successful completion of the course the students shall be able to:
CO.1 Apply concepts learnt in fundamental structural engineering courses for modelling and analysis of structures using commercial software packages.
CO.2 Demonstrate competency in using commercial structural analysis and design software packages.
CO.3 Sketch the reinforcement detailing for various structures in compliance with SP-34 IS code using commercial drafting packages.
CO.4 Design the structural components such as beams, columns and foundation for the given specifications using commercial software packages.
CO.5 Prepare detailed drawing for structural steel elements with bolted and welded connections</td></tr>
<tr><td>Basic skill sets required for the laboratory:</td><td colspan="6">The students shall be able to develop:
1) An attitude of enquiry.
2) Confidence and ability to tackle new problems.
3) Ability to interpret results.
4) Assess errors and eliminate them.
5) Write Reports.
6) The ability to follow codal provisions.</td></tr>
<tr><td>Course Content:</td><td colspan="6">Task 01: To design a given frame with different loading conditions
Level No 01: To design a 2D portal frame with different loading conditions and varying column heights using STAAD. Pro
Level No. 02: To design a 3D portal frame with different loading conditions and same column heights using STAAD. Pro

Task 02: To design a given truss with different loading conditions
Level No 01: To design a 2D truss system using STAAD.Pro</td></tr>
</table>

	Level No. 02: To design a 2D truss system with different support conditions using STAAD.Pro **Task 03: Analysis and Design of Isolated Footing** Level No 01: To design an isolated footing with uniform thickness excluding self- weight with the help of STAAD Advanced Foundation. Level No. 02: To design an isolated footing with sloped thickness including self –weight with and without pedestal with the help of STAAD Advanced Foundation **Task 04: Detailing of Beams** Level No 01: To draw the reinforcement detailing for a simply supported beam using AutoCAD as per SP34. Level No. 02: To draw the reinforcement detailing for a continuous/fixed beam using AutoCAD as per SP34. **Task 05: Detailing of Slabs** Level No 01: To draw the reinforcement detailing for a simply supported one-way/two-way slab using AutoCAD as per SP34. Level No. 02: To draw the reinforcement detailing for a two-way slab with continuous /discontinuous edges using AutoCAD as per SP34. **Task 06: Detailing of Columns** Level No 01: To draw the reinforcement detailing for a rectangular column using AutoCAD as per SP34. Level No. 02: To draw the reinforcement detailing for a circular column (spiral ties) using AutoCAD as per SP34. **Task 07: Detailing of isolated footing** Level No 01: To draw the reinforcement detailing for a square isolated using AutoCAD as per SP34. Level No. 02: To draw the reinforcement detailing for a rectangular isolated footing using AutoCAD as per SP34. **Task 08: Detailing of Staircase** Level No 01: To draw the reinforcement detailing for a dog legged staircase using AutoCAD as per SP34. Level No. 02: To draw the reinforcement detailing for a Open Newel staircase using AutoCAD as per SP34. **Task 09: Steel Connections – Beam to beam** Level No 01: To detail Beam to beam connection using cleat angle by bolted connections for given data. Level No. 02: To detail Beam to beam connection using cleat angle by welded connections for given data. **Task 10: Steel Connections – Beam to Column** Level No 01: To detail Beam to Column by unstiffened and stiffened bolted connections for given data. Level No. 02: To detail Beam to Column by unstiffened and stiffened welded connections for given data.

Targeted Application & Tools that can be used: Design Consultancy Firms as Structural Engineers involved in Analysis, Design and Detailing of Structural elements for building projects.
Tools used in profession: Software such as STAAD Pro., ETABS, STAAD Advanced Foundation software, TEKLA, AutoCAD

Text Book

1. T. S. Sarma "Design of RCC Buildings using STAAD Pro. V8i with Indian Examples – Static and Dynamic Methods", Educreation Publishing, 2017
2. Sham Tickoo, "Exploring Bentley STAAD Pro. V8i (SELECT Series 6)", BPB publications, 2017.
3. S.K.Duggal, Limit state Design of steel Structures, 3rd Edition, McGraw Hill Education (India) Pvt. Ltd, 2019.
4. SP 34: Handbook on Concrete Reinforcement and Detailing, Bureau of Indian Standards
5. IS 800 (2007): General Construction in Steel - Code of Practice

References

1. P C Varghese, "*Limit State Design of Reinforced Concrete"*, Vol-II, 2008, Prentice Hall of India (P) Ltd.
2. B C Punmia, "*Reinforced Concrete Structures"*, Vol-II, Laxmi Publications (P) Ltd, New Delhi.
3. STAAD Pro. / ETABS / AutoCAD user manuals.

E-resources

1. https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1523718&site=ehost-live
2. https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1538234&site=ehost-live

Topics relevant to "EMPLOYABILITY SKILLS": Analysis, Design and Detailing of Frames, Columns, Isolated Footing, Combined Footing and Cantilever Retaining wall for developing Employability Skills through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mrs. Divya Nair/Mr. Ajay H A
Recommended by the Board of Studies on	BOS Meeting No: 20, Dated: 6th June 2025
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<table>
<tr><td>Course Code: CIV2523</td><td colspan="3">Course Title: Design of Irrigation Water Resources Systems
Type of Course: Professional Core Theory</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="8">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="8">CIV2505 - Hydrology and Irrigation Systems
Fundamentals of hydrology, crop water requirements, and soil–plant–water relations</td></tr>
<tr><td>Anti-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Course Description</td><td colspan="8">This course focuses on the principles and methodologies required to plan, analyse, and design irrigation water resources systems. It begins with fundamentals of hydrology, then progresses to the design of diversion and impounding structures (weirs, barrages, and dams), conveyance networks as design of canals, canal head works, regulation works, and cross-drainage works. Design principles of hydraulic structures like Gravity Dam, Earth Dam, and Spillway are included. Emphasis is placed on sustainable use of water, efficiency, and modern management practices.</td></tr>
<tr><td>Course Objectives</td><td colspan="8">The objective of the course is to familiarize the learners with the concepts of Design of Irrigation Water Resources Systems and attain Skill Development through Problem Solving techniques.</td></tr>
<tr><td>Course Out Comes</td><td colspan="8">On successful completion of the course the students shall be able to:
CO.1 Explain the crop water requirements and Soil–Plant–Water Relation
CO.2 Use the empirical and analytical methods for failure criteria and design of hydraulic structures
CO.3 Apply Kennedy’s and Lacey’s theories to design irrigation channels</td></tr>
<tr><td>Course Content:</td><td colspan="8"></td></tr>
<tr><td>Module 1</td><td colspan="2">Fundamentals and Hydrology</td><td>Quiz</td><td colspan="3">Memory recall questions</td><td colspan="2">8 Sessions</td></tr>
<tr><td colspan="9">Introduction to Water Resources and Irrigation, Hydrologic Cycle and Surface Water Assessment, Crop Water Requirements and Soil–Plant–Water Relation.</td></tr>
<tr><td>Module 2</td><td colspan="2">Design of Reservoirs, Diversion Works, and Dams</td><td>Assignment</td><td colspan="3">Problem solving</td><td colspan="2">20 sessions</td></tr>
<tr><td colspan="9">Reservoir Planning and Storage, Diversion head works- layout and functions of components, Weir and barrage- Causes of failure of weirs on permeable soils - Bligh’s theory. Determination of uplift pressure- Various Correction Factors –Design principles of weirs on permeable foundations using Creep theories - exit gradient, U/s and D/s Sheet Piles. Dam Engineering- Classification and selection of dams, Gravity dam analysis: stability, stresses, uplift, seismic considerations; seepage control & drainage galleries, Spillways and Energy Dissipation.</td></tr>
<tr><td>Module 3</td><td colspan="2">Canal Systems and Conveyance</td><td>Seminar</td><td colspan="3">Activity based learning</td><td colspan="2">19 sessions</td></tr>
<tr><td colspan="9">Canal categorization, Design of canals: Alluvial and non-alluvial canals. Canal Regulation and Control Structures: Canal intake structures, regulators, canal drops. Cross drainage works: aqueducts, siphons, super passages, level crossings; selection based on site conditions. Canal Lining and Losses: Types of linings, criteria for selection; economic depth of lining</td></tr>
<tr><td colspan="9">Targeted Application & Tools that can be used:
Application Area is Dam break analysis, Channel design, Energy dissipation, river training.
Professionally Used Software: Auto Cadd, Excel</td></tr>
</table>

Project Work/ Assignment:	
Quiz: Surprise quiz will be conducted in regular class based on Fundamentals and Hydrology **Assignment:** Practice problems based on Diversion Works, and Dam **Seminar:** Students in group give presentation on important dams and Canal systems: Planning Design and maintenance.	
Textbook(s): 3. Punmia B.C. Ashok K Jain, Arun K Jain, B. B. L Pande, Irrigation and Water Power Engineering, Laxmi Publications (P) Ltd. 17th edition 2022. 4. Irrigation Engg. and Hydraulic Structures by S.K. Garg, Khanna Publishers. 38th Edition 2023	
Reference Book(s) 4. BASAK Irrigation Engineering, Mc Graw Hill Education. 2017 Web resources: W1:https://presiuniv.knimbus.com/user#/searchresult?searchId=Knimbus%20Open%20ebooks&curPage=0&layout=grid&sortFieldId=doc_title_str&topresult=false&search_within=water%20resources%20engineering W2: https://archive.nptel.ac.in/courses/105/105/105105110/	
Topics relevant to "SKILL DEVELOPMENT": Design of canal, and Diversion Works for Skill Development through Problem Solving techniques. This is attained through assessment component mentioned in course plan.	
Catalogue prepared by	Mr. Santhosh M B
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3109	Course Title: Remote Sensing and Geographical Information System Type of Course: Professional Elective Theory	L-T-P-C	2	0	2	3
Version No.	1.0					
Course Pre-requisites	CIV2101 – Surveying CIV2102 – Surveying Lab					
Anti-requisites	NIL					
Course Description	This course introduces students to remote sensing techniques for acquiring geospatial information that is accurate, timely, and accessible. It covers emerging technologies like imaging radar, LiDAR, hyperspectral sensors, and UAV/Drone-based remote sensing. Students will learn digital image processing methods and their applications. The course also explores the fundamentals of GIS, spatial data analysis, and the integration of remote sensing with GIS. Emphasis is placed on real-world applications in environmental monitoring and urban planning at local, regional, and global levels.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Remote Sensing and Geographical Information System and attain Employability Skills through Problem Solving methodologies.					
Course Outcomes	On successful completion of this course the students shall be able to: CO.1 Explain the significance of remote sensing, spectral signatures of surface features such as rocks, soils, vegetation, and water bodies. CO.2 Explain image classifications using earth observation satellites. CO.3 Recognize Drone / UAV techniques and its application in solving Civil Engineering problems. CO.4 Prepare geospatial data and integrate it with a GIS to Create maps and images, to communicate spatial data and non-spatial information in a meaningful way to others.					
Course Content:						
Module 1	Introduction to Remote Sensing	Assignment	Numerical solving tasks	10 sessions		
Topics: Overview to remote sensing and its classification. Remote sensing sensors and its types; platforms, EMR interaction with earth surface material incident, reflected, absorbed and transmitted energy – reflectance – specular and diffused reflection surfaces – spectral signature – spectral signature curves. Elements of Image interpretation and processing techniques. Landsat, WorldView, Cartosat, Sentinel, GeoEye, ERS, RADARSAT Satellites and their sensors, geometry and radiometry, Orbital characteristics, Data products						
Module 2	Digital image Processing and interpretation techniques	Assignment	Numerical solving tasks	8 Sessions		
Topics: Introduction to digital image: Image classification - Supervised, Unsupervised and its various applications, Ground truth data and training set manipulation, Classification accuracy assessment. Interpretation of Multispectral Imagery and High-resolution data.						
Module 3	Introduction to UAV remote sensing and its applications	Case study	Presentations	6 Sessions		
Topics: Introduction to UAV remote sensing, techniques and prospects used in data collection. Applications in Civil Engineering projects						

Module 4	Geographical Information System	Case study	Presentations	6 Sessions

Raster and vector data.
Map projection, Topology creation, Overlay analysis, Data structure and Digital cartography

List of laboratory Tasks:

Task 01: Geotagging UAV images and initial analysis.
Level No 01: Geotagging UAV images using Fixed reference points.
Level No. 02: Geotagging UAV images with DGPS Reference points.
Task 02: Initial Photogrammetry and result analysis.
Level No 01: Process of initial photogrammetry and result analysis.
Level No. 02: Process of initial photogrammetry and result analysis by Modifying ellipsoidal and MSL data.
Task 03: Georeferencing and Calibration.
Level No 01: Georeference the Initial Photogrammetry data.
Level No. 02: Georeference and calibration of images using Initial Photogrammetry data.
Task 04: Generate DSM and ORI.
Level No 01: Generate ORI and DSM using the georeferenced Photogrammetry data.
Level No. 02: Generate ORI and DSM using software code in Open-source software.
Task 05: Understanding ArcGIS pro Software modules.
Level No 01: Understand the various module options in ArcGIS pro for GIS Analysis.
Level No. 02: Understand the various module options in ArcGIS pro for GIS Analysis with case study.
Task 06: Develop Cadastral maps.
Level No 01: Develop Cadastral Maps using ORI.
Level No. 02: Develop Cadastral Maps using Toposheet ORI, Satellite image.
Task 07: Develop Feature maps.
Level No 01: Develop Feature maps using Cadastral Maps.
Level No. 02: Feature Extraction using python code in Arc GIS.

Targeted Application & Tools that can be used:

- The students can work in the multi-national companies, Government Departments, Private industries as specialists to supports Scientists by designing and conducting remote sensing gathering efforts. They can also become entrepreneurs.

Professionally used software: ARCMap / QGIS, MS Office.

Project Work/ Assignment:

1. Assignment 1: - Image interpretation and processing techniques.
2. Assignment 2 - Ground truth data and training set manipulation.
3. Case Study:- Students should give presentations on case studies relevant to Geographical Information System.

Text Books

T1. Thomas M. Lillesand, Ralph W. Kiefer, Jonathan W. Chipman, Remote Sensing and Image Interpretation, Wiley, 7th Edition, 2020.
T2 Kang-Tsung Chang, *Introduction to Geographic Information Systems*, McGraw Hill, 9th Edition, 2023.

References

R1. Emilio Chuvieco, Fundamentals of Satellite Remote Sensing: An Environmental Approach, CRC Press, 3rd Edition, 2020.

R2. George Joseph, C. Jeganathan, Fundamentals of Remote Sensing, Orient Blackswan, 4th Edition, 2018.
R3. Satheesh Gopi, Global Positioning System: Principles and Applications, Tata McGraw Hill, 2nd Edition, 2020.
R4. Erik Westra, Python Geospatial Analysis Essentials, Packt, 2nd Edition, 2021.

Websites:
https://www.iirs.gov.in/

https://bhuvan.nrsc.gov.in/ http://edc.usgs.gov/ http://www.cr.usgs.gov/ http://www.earthsat.com/ https://www.gislounge.com/ https://www.esri.com/en-us/what-is-gis/overview https://www.usgs.gov/products/data-and-tools/gis-data https://www.qgis.org/ https://www.qgistutorials.com/ E-resources: https://onlinecourses.nptel.ac.in/noc22_ce26/preview https://onlinecourses.nptel.ac.in/noc22_ce78/preview https://www.worldcat.org/title/remote-sensing-and-gis/oclc/768076807 https://onlinecourses.nptel.ac.in/noc21_ce61/preview https://onlinecourses.swayam2.ac.in/aic20_ge05/preview	
Topics related to development of "EMPLOYABILITY": Map projection, Topology creation, Overlay analysis, Data structure and Digital cartography for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Dr. Shwetha A
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3110	Course Title: Construction Technology and Processes Type of Course: Professional Elective Theory	L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The course is an introductory course in Civil Engineering and covers various aspects of construction along with a brief overview to construction equipment, Construction 4.0 and sustainable construction. The course is conceptual in nature with an introduction to different aspects of construction technology and processes. An interest to understand the fundamental concepts of construction and a desire to be a successful Civil Engineer are key to enable students to complete the course successfully.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Construction Technology and Processes and attain Employability Skills through Participative Learning techniques.					
Course Outcomes	On successful completion of the course the students shall be able to: CO.1 Describe the various components of a building. CO.2 Choose appropriate construction equipment based on site requirements and conditions. CO.3 Explain sustainability concepts, green buildings, and emerging construction technologies.					
Course Content:						
Module 1	Overview of Construction Technology	Assignment	Market Survey	16 Sessions		
Topics: Introduction to various types of Civil Engineering Structures, Framed and Load bearing structures. Components of building and their functions – Beams, Columns, Walls, Foundations. Overview of Masonry, Concrete and steel construction, Floors and roofs, Lintels and staircases, Types of Doors and windows. Overview of NBC code and its provisions. Formwork, scaffolding, Slip forming and Shoring.						
Module 2	Basics of Construction Equipment	Assignment	Report on Field Visit	12 Sessions		
Topics: Equipment for Earthwork Operation, Equipment for Compaction, Erection Equipment, Forklifts, Cranes and related equipment. Equipment for Production of aggregate and concreting; Materials handling Equipment – Portable Material Bins – Conveyors – Hauling Equipment.						
Module 3	Introduction to Sustainable Construction and Construction 4.0	Assignment	Article Review from E-resources	17 Sessions		
Topics: Relevance and importance of sustainability, Building life cycle, Introduction to Green building concepts, net-zero energy buildings. Precast Construction, Pre-fabricated Structures, Overview of Construction Automation - Robots in Construction, 3D Printing.						
Targeted Application & Tools that can be used: Concepts used in the course can be used for Site Engineer, Construction Project Manager, Planning Manager						

Project Work/ Assignment:

1. Market survey report on different types of flooring material, roofing sheets, Doors and Windows available in the market
2. Report on Field visit to Construction Machinery Manufacturing Facility or Construction Machinery Expo.
3. Case studies on Precast Structures, Pre-fabricated structures, Green buildings, 3D printed buildings in India

Text Book

T1. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, "Building Construction", Laxmi Publications, 11th Edition, 2019.
T2. J. K. Yates, Daniel Castro-Lacouture, "Sustainability in Engineering Design and Construction", CRC Press, 2018.
T4. Anil Sawhney, Michael Riley, Javier Irizarry, "Construction 4.0: An Innovation Platform for the Built Environment", Routledge Publication, 2020.

References

R1. Roy Chudley, "Construction Technology - Volume 1 to 4", Pearson Education India, 2014.
R2. Edward Allen and Joseph Iano, "Fundamentals of Building Construction: Materials and Methods", 5th Edition, John Wiley & Sons Inc., Wiley Publishers, 2019.
R3. Edmundas Kazimieras Zavadskas, Jonas Šaparauskas, Jurgita Antuchevičienė, "Sustainability in Construction Engineering, MDPI AG, 2018.
R4. National Building Code, BIS, New Delhi

Web Based Resources and E-Resources:

W1. NPTEL Course on "Construction methods and equipment management", Prof. Indu Siva Ranjani Gandhi, https://nptel.ac.in/courses/105103206

W2. NPTEL Course on "Construction Planning and Management", Prof. Arbind Kumar Singh https://nptel.ac.in/courses/105103093

W3. Hanizzam Awang & Md. Azree Othuman Mydin, "Construction Methods and Technology", Penerbit USM (USM Press), 2016 https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1487204&site=ehost-live

W4. Doyle, Sophie G., "Construction and Building: Design, Materials, and Techniques", Nova Science Publishers, 2011 https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=780870&site=ehost-live

Topics relevant to "EMPLOYABILITY SKILLS": Components of building and their functions, Various Construction Equipment used for excavation and concrete production for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course plan

Catalogue prepared by	Mr. Gopalakrishnan N
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
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<table>
<tr><td>Course Code:
CIV3111</td><td colspan="3">Course Title: Advanced Concrete Technology
Type of Course: Professional Elective
Theory Only Course</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="8">1.1</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="8">CIV2100 Building Materials and Concrete Technology
CIV2502 Infrastructure Materials Testing Lab</td></tr>
<tr><td>Anti-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Course Description</td><td colspan="8">This course enables the students to study the composition and microstructure of concrete along with their influence on strength and deformation characteristics of concrete. The course will also focus on serviceability of concrete as well as various tests to assess the durability of concrete. Students will learn about different methods of placing and curing concrete in different conditions. Students will also be exposed to the material requirements, mix proportioning and application of special concretes namely, HPC, SCC, GPC and HPFRC.</td></tr>
<tr><td>Course Objectives</td><td colspan="8">The objective of the course is to familiarize the learners with the concepts of Advanced Concrete Technology and attain Employability Skills through Participative Learning techniques.</td></tr>
<tr><td>Course Out Comes</td><td colspan="8">On successful completion of the course the students shall be able to:
CO.1 Interpret the influence of the concrete components and admixtures on the properties of concrete
CO.2 Predict the properties and durability of hardened concrete
CO.3 Identify the correct concreting methods in the field depending upon the site condition
CO.4 Choose the suitable concrete for different structures considering the on-site/client’s requirements.</td></tr>
<tr><td>Course Content:</td><td colspan="8"></td></tr>
<tr><td>Module 1</td><td>Concrete Composition and their Influence on Concrete Properties</td><td>Market Survey</td><td colspan="4">Different cements as well chemical admixtures available in the market</td><td>9 Sessions</td></tr>
<tr><td colspan="9">Topics:
Cement and its composition, types and grades of cement, Micro-structure of hydrated cement, Special cements, Aggregates for concrete, Chemical and Mineral Admixtures and their influence on properties of concrete.</td></tr>
<tr><td>Module 2</td><td>Serviceability and Durability of concrete</td><td>Article Review</td><td colspan="4">Durability assessment of existing concrete structures.</td><td>10 Sessions</td></tr>
<tr><td colspan="9">Topics:
Elasticity, Stress Strain MOE – relationship, Shrinkages – Types, Factors affecting Shrinkage, Mechanism of Shrinkage, Creep- Factors Influencing Creep, Relation Between Creep and Time, Mechanism of Creep, Effect of Creep, Durability of concrete, Permeability of Concrete, physical and chemical causes for distress in concrete - Chloride Diffusion, Carbonation, Acid attack on concrete, Sulfate attack on concrete, Efflorescence, Effects of sea water on concrete, Disruption by alkali–silica reaction, Abrasion of concrete, Erosion resistance, Cavitation resistance, Types of cracking, Thermal Properties (fire and temperature), Resistance to Wear and other Properties.</td></tr>
<tr><td>Module 3</td><td>Placing and Curing of concrete</td><td>Project</td><td colspan="4">NDT Tests on Presidency University buildings</td><td>9 Sessions</td></tr>
<tr><td colspan="9">Topics:
Fresh and hardened concrete properties, Special concreting techniques (Placing), Sprayed concrete, underwater concrete, grouting, slip form construction, pumped concrete, concrete for liquid retaining structures, vacuum process, concrete coatings and</td></tr>
</table>

surface treatments, concreting in hot and cold weather, mass concreting, RMC, Compacting, Curing-methods, QC and QA of concrete, Repair and maintenance, Non-destructive testing methods.				
Module 4	Special Concretes	Programming Assignment	Program for mix design of Special Concrete	9 Sessions
Topics: High strength concrete, high performance concrete, self-compacting concrete, light weight concrete, autoclaved aerated concrete, fibre reinforced concrete, foam concrete, geopolymer concrete, mix design for self-compacting and high-performance concrete, Factors influencing mix proportions.				
Targeted Application & Tools that can be used: Applications include all types of construction industries and infrastructure projects during as well as in RMC Plants. Tools: MS Excel/ C/ Python Programming				
Project Work/ Assignment:				
Market Survey: Survey and analysis of different cements as well chemical admixtures available in the market **Article review:** Article review on durability assessment of existing concrete structures. **Project:** Carry out and report the results of Non-destructive tests on structural elements in the buildings of Presidency University Campus **Programming Assignment:** Write a program to carry out mix design of High performance concrete and Self compacting concrete as per IS 10262:2019 for a given set of input data.				
Text Book 1. Neville A.M., "Properties of Concrete", Prentice Hall, 5th Edition 2012. 2. M.S Shetty and A.K Jain, "Concrete Technology Theory and Practice", S.Chand & Company Pvt. Ltd.2019. 3. Santhakumar A.R., "Concrete Technology", Oxford University Press India, 2006.				
References 1. Mehta, P.K. (1983), Concrete – Structure, Properties and Materials, Prentice Hall, New Jersey, USA. 2. Pierre-Claude Aitcin, "High Performance Concrete", Taylor & Francis, 2011. 3. Mary Krumboltz Hurd, "Formwork for Concrete", American Concrete Institute, 2005. 4. IS: 10262 (2019), Concrete Mix Proportioning – Guideline, BIS, New Delhi E-Resources 1. https://nptel.ac.in/courses/105/106/105106176 - Advanced Concrete Technology NPTEL Course by Dr. Manu Santhanam 2. N V Nayak, A K Jain, "Handbook on Advanced Concrete Technology", Alpha Science International Ltd., Oford, UK, 2012. https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1752766&site=ehost-live				
Topics relevant to development of "EMPLOYABILITY": Mix Design procedure for Special Concrete, Knowledge of Durability and Non-destructive Tests, Placing and curing Techniques for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.				
Catalogue prepared by	Mr. Gopalakrishnan N			
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025			
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025			

Course Code: CIV3112	Course Title: Alternative building materials Type of Course: Professional Elective & Theory only	L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CIV2100 Building Materials and Concrete Technology					
Anti-requisites	NIL					
Course Description	The objective of the course is to understand the environmental issues due to building materials and the energy consumption in manufacturing them. The course involves the study of various masonry blocks, masonry mortar and structural behaviour of masonry under compression. It focuses on analyses of different alternate building materials, which will be suitable for specific climate in an environmentally sustainable manner and suggestion for suitable agro and industrial wastes as a building material. The students can able to understand the alternate building technologies, which are followed in present construction field.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Alternative building materials and attain Employability Skills through Participative Learning techniques.					
Course Outcomes	On successful completion of the course the students shall be able to: CO.1 Select alternative building material with lower embodied energy. CO.2 Assess and Rate a building as per IGBC & LEED ratings manual. CO.3 Evaluate the strength properties of the masonry blocks in compression and bond strength of masonry mortar in flexure and shear. CO.4 Suggest suitable alternative construction technique for building and roofing systems.					
Course Content:						
Module 1	Alternative Building Materials	Assignment	Theory based questions	10 Sessions		
Topics: Lime, Pozzolana cements, Raw materials, Manufacturing process, Properties and uses. Fibers - metal and synthetic, Properties and applications. Fiber reinforced plastics, Matrix materials, Fibers organic and synthetic, Properties and applications. Low carbon concrete, Modern composite concrete, Building materials from agro and industrial wastes, Types of agro wastes, Types of industrial and mine wastes, Properties and applications.						
Module 2	Green building techniques and ratings	Presentation	Presentation on case study of green rated buildings	13 Sessions		
Topics: Energy in building materials, Environmental issues concerned to building materials, Embodied energy and life-cycle assessment, Sustainability framework, Global warming and construction industry, Green concepts in buildings, Green building ratings - IGBC and LEED manuals – mandatory requirements, Rainwater harvesting & solar passive architecture. Environmentally friendly and cost-effective building technologies, Requirements for buildings of different climatic regions. Case Study – Energy management in Building						
Module 3	Masonry blocks and mortars	Quiz	Theory based question	10 Sessions		
Topics:						

Elements of Structural Masonry: Elements of Structural Masonry, Masonry materials, requirements of masonry units' characteristics of bricks, stones, clay blocks, concrete blocks, stone boulders, laterite Blocks, Fal- G blocks and Stabilized mud block. Manufacturing of stabilized blocks.
Structural Masonry Mortars: Mortars, cementitious materials, sand, natural & manufactured, types of mortars, classification of mortars as per BIS, characteristics and requirements of mortar, selection of mortar.
Uses of masonry, masonry bonding, Compressive strength of masonry elements, Factors affecting compressive strength, Effect of brick bond on strength, Bond strength of masonry: Flexure and shear, Elastic properties of masonry materials and masonry.

Module 4	Alternative building technologies	Presentation	Presentation on case study of alternative construction methods	12 Sessions

Topics:
Alternative Building Technologies: Use of arches in foundation, alternatives for wall constructions, composite masonry, confined masonry, cavity walls, rammed earth, Ferro cement and ferroconcrete building components, Materials and specifications, Properties, Construction methods, Applications. Top-down construction, Mivan Construction Technique.
Alternative Roofing Systems: Concepts, Filler slabs, Composite beam panel roofs, Masonry vaults and domes

Targeted Application & Tools that can be used:
The Course enables the students to suggest alternative material which has a lower embodied energy and aims at providing guidelines for green construction techniques and manuals for green ratings. This course also enables students to understand the bond strength of masonry mortar and suggest alternate technologies in construction of building and roofing systems.

Project work/Assignment:
Assignment: Questions will be based alternative and sustainable construction materials, its properties and suitability.
Quiz: Multiple choice based questions on the topics covered in Module 3.
Presentation: Students are required to prepare a report and present case studies on green buildings and alternative construction methods.

Text Books:
1. KS Jagadish, B V Venkatarama Reddy and K S Nanjunda Rao, "Alternative Building Materials and Technologies", New Age International Publications, 2017
2. P C Varghese, "Buliding Materials", 2nd Edition, 2015, PHI Learning Pvt. Ltd

References
1. Arnold W Hendry, "Structural Masonry", Macmillan Publishers.
2. RJS Spence and DJ Cook, "Building Materials in Developing Countries", Wiley Publications

PU e-Library Resources
1. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DOAB_1_06082022_17209

Web resources
1. https://nptel.ac.in/courses/124105013

Topics relevant to "EMPLOYABILITY SKILLS": Green building ratings using IGBC and LEED manuals.
Alternate construction techniques for designing an energy efficient building. Alternate roofing techniques for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mr. Ajay H A
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025

Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

<table>
<tr><td>Course Code: CIV3113</td><td colspan="4">Course Title: Design concepts of Building Services
Type of Course: Professional Elective Theory</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="9">1.1</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="9">-</td></tr>
<tr><td>Anti-requisites</td><td colspan="9">NIL</td></tr>
<tr><td>Course Description</td><td colspan="9">This introductory course deals with the concepts of building services which include ventilation and lighting(HVAC), fire protection and safety measures, vertical transportation (Lifts / Elevators), water distribution services within the structure. Apart from this, the course covers in-depth fundamentals of electrical services to be provided in a building as per NBC.</td></tr>
<tr><td>Course Objective</td><td colspan="9">The objective of the course is to familiarize the learners with the concepts of Design concepts of Building Services and attain Employability Skills through Participative Learning techniques.</td></tr>
<tr><td>Course Outcomes</td><td colspan="9">On successful completion of this course the students shall be able to:
CO.1 Identify various types and purposes of ventilation that can be provided for a structure.
CO.2 Choose the different types of services required for structure.
CO.3 Analyze the types of building maintenance to be provided for a structure.</td></tr>
<tr><td>Course Content:</td><td colspan="9"></td></tr>
<tr><td>Module 1</td><td colspan="2">Building services</td><td>Case studies</td><td colspan="3">Data Analysis task AutoCAD</td><td colspan="2">12 Sessions</td></tr>
<tr><td colspan="10">Topics:
Basics of building services, Types of buildings, Classification and types of building services. Apply various types of services as per needs of building.
Lighting - Natural and artificial lighting, Principles and factors, Lighting provisions as per NBC
Ventilation – Natural and Mechanical. Principles and factors to be considered in the design of Ventilation</td></tr>
<tr><td>Module 2</td><td colspan="2">Water and Electrical services</td><td>Case Study</td><td colspan="3">AutoCAD to study electrical Layouts</td><td colspan="2">17 Sessions</td></tr>
<tr><td colspan="10">Topics:
Cold and Hot water distribution system, Electrical services in the building per NBC, Prepare electrical services requirement and Layout of a given building (Eg. Residence, small work shop, show room, school building)</td></tr>
<tr><td>Module 3</td><td colspan="2">Lifts and Fire safety</td><td>Assignment</td><td colspan="3">Data Collection and Analysis</td><td colspan="2">16 Sessions</td></tr>
<tr><td colspan="10">Topics:
Types of Elevators / Lifts, Design Considerations, Location, Sizes as per NBC 2005 , Types of Escalators, Types of Conveyors, Fire Safety – Materials and Systems / Services, Fire escape, Lightning protection</td></tr>
<tr><td colspan="10">Targeted Application & Tools that can be used:
Sustainability engineer, Building Manager, Facilities Manager,
Revit Architecture, AutoCAD, OpenBuildings Designer</td></tr>
<tr><td colspan="10">Textbooks:
1. R. Udaykumar "A text book on Building Services " Eswar Press, ISBN-13,9788178740638, Chennai</td></tr>
</table>

2 . S. M. Patil "Building Services", Seema Publication, ISBN-13,1234567121246, Mumbai Revised edition	
References: 1. Dr. B. C. Punmia "Building Construction ", Laxmi Publications (P) Ltd., 2. P. S. Gahlot "Building repair and Maintenance Management ", CBS Publishers & Distribution(P) Ltd, DEC-2010 3. "National Building Code of India - 20016", Bureau of Indian Standards, BIS, New Delhi E-Resources: 1. Bernhard Lenz, Jürgen Schreiber, Thomas Stark, "Sustainable Building Services : Principles - Systems – Concepts", Edition Detail Green Books, 2011 https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=642066&site=ehost-live	
Topics relevant to "EMPLOYABILITY SKILLS": Basics of Building Services, Lifts, Electrical Services for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Mr. Harshith Jagadish Gupta / Dr. Nakul R
Recommended by the Board of Studies on	BoS No. 14 held on 30 July 2022
Date of Approval by the Academic Council	Academic Council Meeting No. 18 held on 03 August 2022

Course Code: CIV3114	Course Title: Integration of SDGs in Civil Engineering Type of Course: Professional Elective Theory	L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course helps the students to learn to integrates 4 of the 17 SDGs proposed by the 2030 Agenda: 1. It ensures the availability and sustainable management of water and sanitation (SDG 6). 2. It develops resilient infrastructures (SDG 9). 3. It promotes inclusive, safe, resilient, and sustainable cities (SDG 11). 4. It combats climate change and its effects (SDG 13).					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Integration of SDGs in Civil Engineering and attain Employability Skills through Participative Learning techniques					
Course Out Comes	On successful completion of the course the students shall be able to: CO.1 Identify the latest technology-enabled systems for the management availability and sustainable management of water and sanitation (SDG6) CO.2 Interpret the dynamic behavior of the resilient infrastructures system in context to physical appearance and by focusing on representations, properties and impact factors (SDG9) CO.3 Demonstrate the infrastructure systems to benefit the citizens, based on SDGs 11 &13 concept as responsive cities.					
Course Content:						
Module 1	Sustainable management of water and sanitation	Quiz	Quiz on SDG6		15 Sessions	
Topics: Concepts of Sustainable Development Goals, Components of sustainable management of water and sanitation: Concepts, Challenges, Evolution of sustainable management of water and sanitation. Participatory Planning Process and Policies. Integrating SDG6						
Module 2	Development of resilient infrastructures	Case Study	Study based on Literature review and Presentations		15 Sessions	
Topics: Understanding resilient infrastructures: Definition and components; strategic planning, good governance, civic engagement and citizenship, security. planning framework for actions, process of drafting the plan, key considerations. Case studies integrating SDG 9						
Module 3	Development of resilient infrastructures	Case Study	Study based on Literature review and Presentations		15 Sessions	
Topics: Inclusive, safe, resilient, and sustainable cities: Concepts and challenges. Urban design and decision-making; city transport for all; water supply and sanitation, urban disaster management, management through decentralization. Case Studies integrating SDG11 and 13.						
Targeted Application & Tools that can be used: Application areas: Decision Support for Sustainable management of water and sanitation Professionally used software/Platform: MATLAB/GIS/Python/IoT						
Project Work/ Assignment						

1. Quiz: Multiple choice questions on SDG6 2. Case Study based on Literature: Literature review and collect relevant data, Literature and Define problem and make presentation 3. Case Study: students identify the local site, prepare a DPR based on the case study and make presentation on suggested practical solution	
Text Books 1. National Academy of Engineering, "14 Grand Challenges for Engineering in the 21st Century,"2020. [Online]. Available: http://www.engineeringchallenges.org/challenges.aspx. 2. Joseph N. Pelton; Indu B. Singh (2018) "Smart Cities of Today and Tomorrow: Better Technology, Infrastructure and Security" publication: Copernicus; 1st ed. 2019 edition.	
References United Nations. Sustainable Development Goals Report. United Nations. 2020. Available online: https://unstats.un.org/sdgs/report/2020/The-Sustainable-Development-Goals-Report-2020.pdf	
Topics relevant to "EMPLOYABILITY SKILLS": Inclusive, safe, resilient, and sustainable cities for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout	
Catalogue prepared by	Prof. Jagdish H Godihal
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3115	Course Title: Optimization Methods for Civil Engineering Type of Course: Professional Elective Theory Only Course	L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	MAT2503					
Anti-requisites	NIL					
Course Description	The purpose of this course is to introduce the students the fundamentals of classical optimization techniques and also exposing them to the theory of different non-classical optimization methods and algorithms developed for solving various types of civil engineering optimization problems. The course will also enable the students to apply the various classical and non-classical optimization techniques in solving real-world optimization problems by using MATLAB and MS Excel. The nature of the course is theory based and it discusses the concept of optimization and problem solving in Civil Engineering.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Optimization Methods for Civil Engineering and attain Employability Skills through Problem Solving methodologies					
Course Outcomes	On successful completion of the course the students shall be able to: 1) Discuss methods of optimization. 2) Analyze basic civil engineering problems using classical method of optimization. 3) Perform non-linear optimization problems using MATLAB.					
Course Content:						
Module 1	Introduction to Optimization	Assignment	Theory based	8 sessions		
Introduction, Objective function; Constraints and Constraint surface; Formulation of design problems as mathematical programming problems, Optimization methods, solution techniques for linear and integer problems, Linear Programming Problem, Introduction to linear problem, General system of equations, Simplex method, Minimization versus maximization problems.						
Module 2	Introduction to classical optimization methods	Assignment	Data collection and analysis	12 sessions		
Classical optimization, Classification of optimization problems, Optimization techniques – classical and advanced techniques, Convexity and concavity of functions of one and two variables, Examples for transportation, assignment, water resources, structural and other optimization problems.						
Module 3	Introduction to Non-Linear Optimization	Assignment	Data collection and analysis	10 sessions		
Introduction to non-linear problems; Introduction to non-traditional optimization methods, Case studies from Civil Engineering, Engineering application using MATLAB and Excel solver for solving linear optimization problems using graphical and simplex methods						
Targeted Application & Tools that can be used: This Course helps student to apply the fundamentals of optimization techniques in civil engineering discipline and help to formulate objective functions under given set of constraints.						
Project Work/Assignment: 1. Assignment: Theory based questions on the introductory topics in optimization. 2. Data collection and analysis a. Collect data on a transportation network and apply classical optimization techniques (e.g., linear programming, dynamic programming) to optimize Transportation routes for minimizing costs or travel time.						

b. Obtain water resource data (e.g., rainfall patterns, reservoir capacities) and Apply classical optimization techniques to optimize Water resource allocation for minimizing shortages.
c. Explore non-traditional optimization methods and apply them to solve civil engineering problems using MATLAB and Excel Solver.

Textbook

T1. S. S. Rao, "Engineering Optimization: Theory and Practice", Wiley, 2008.
T2. K. Deb, "Optimization for Engineering design algorithms and Examples", Prentice Hall, 2005

References

R1. S. R. F. Bennis, and R. K. Bhattacharjya, "Nature-Inspired Methods for Metaheuristics Optimization: Algorithms and Applications in Science and Engineering", Springer Inc.
R2. Kumar, "Multicriterion Analysis in Engineering and Management", Prentice Hall, 2010.

Web Source:

1. NPTEL course – Optimization methods for Civil Engineering: https://archive.nptel.ac.in/courses/105/103/105103210/

PU eResources

1. Optimization Techniques by Cornelius T. Leondes, Academic Press, San Diego, 1998. https://research-ebsco-com-presiuniv.knimbus.com/c/n5guci/search/details/3lvox6zmlr?db=e000xww

Topics relevant to "EMPLOYABILITY SKILLS": Engineering application using MATLAB and Excel solver for solving linear optimization problems, Minimization versus maximization problems for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mr. Ahamed Sharif
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3116	Course Title: Development and Applications of Special Concrete Type of Course: Professional Elective and Theory only	L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CIV2100 - Building Materials and Concrete Technology					
Anti-requisites	NIL					
Course Description	This course deals with the unified view of concrete materials, different types of special concretes and construction environment. The course is conceptual in nature and examines the parameters such as quality control methods for each type of concrete. The purpose of the course is to explain how some commonly used special concretes have been developed and how they are used in different conditions. The course compares different concrete types and encourages the students to apply the most suitable one for the construction scenario.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Development and Applications of Special Concrete and attain Employability Skills through Participative Learning techniques.					
Course Outcomes	On successful completion of the course the students shall be able to: CO.1 Recall the basic properties, methods and specifications of concrete. CO.2 Explain the properties of self- compacting concrete, fibre-reinforced concrete and high strength concretes. CO.3 Discuss the properties of shotcrete. CO.4 Describe the use of different types of polymers in concrete					
Course Content:						
Module 1	Review of Normal concrete	Assignment	Theory based	15 Sessions		
Topics: Basic properties of a concrete – Fresh concrete, Hardened concrete, Proportioning of Normal Concrete Mixes, Concrete Mix proportions, Admixtures in concrete, Curing of Concrete, Cold weather and Hot weather concreting, Importance of Right Methods and Specifications, Heat of hydration of cement and thermal stresses, Concreting Underwater, Roller Compacted Concrete.						
Module 2	Special Concrete	Assignment	Theory based	15 Sessions		
Topics: Self- Compacting concrete- Introduction, Basic ingredients, Characteristics, advantages, Super- plasticizers, Viscosity modifying admixtures, Powder Type SCC, Viscosity modifying Type SCC. Fibre- reinforced Concrete- Matrix concrete and Fibres, Classification of FRCs based on the Fibre Volume, Types of Fibres, Fibre-balling in Steel FRC, Mixing of Concrete- Batching, Types of Drum Mixers, Applications of FRC.						

Shotcrete- Definition, Typical Applications of Shotcrete/ Gunite, Characteristics of Shotcrete, Curing, Shotcrete for seismic retrofitting.				
Module 3	Polymer impregnated Concrete	Presentation	Case study	15 Sessions

Topics:
Introduction, Using Polymers in Concrete, Advantages and Disadvantages, Latex modified concrete, Applications.
Compaction of concrete- Process of compaction, Effect on fresh concrete, Effect on Hardened concrete, Effect of Over compaction, types of Compaction.

Targeted Application & Tools that can be used:
Application of Special concretes: in extreme weather conditions in larger structures such as power plants, off-shore buildings, docks, aerodromes etc

Tools used: -

- FRCcalc – Software for design of fiber reinforced concrete elements according to MC2010 recommendations
- MATLAB

Project work/Assignment:
Assignment: Theory based questions on the topics covered in Module 1 and module 2.
Presentation: Presentation on the case studies of application of special concrete in construction.

Text Book:
T1. Mehta, P.K., and Monteiro P.J.M., Concrete – Microstructure, Properties and Materials, 3 rd Edition, McGraw Hill Education (India) Private Limited, New Delhi, Prentice-Hall, Inc., 2006.
T2. Mohajerani A. etal, Amazing Types, Properties and Applications of Fibres in Construction Materials, Volume 12, 2019.
T3. JSCE subcommittee, Standard specifications for concrete structures – 2007 "Materials and construction", Report: JSCE guidelines for concrete (No. 16), Japan Society of Civil Engineers, Tokyo, Japan, 2010.

References:
R1. IS 1199(Part-6):2018, Fresh Concrete- Methods of Sampling, Testing and Analysis.
R2. Recommendation for Self-Compacting Concrete, JSCE Newsletter.
R3. IS 9012:1978, 'Recommended Practice for Shotcreting'.

Weblinks:
https://onlinecourses.nptel.ac.in/noc22_ce09/preview

E-BOOKS:

1. Special Concrete and Composites 2017 (Sustainable concrete and Composites) https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1690704&site=ehost-live&ebv=EB&ppid=pp_169
2. High Performance Concrete – Innovation & Utilization https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=862193&site=ehost-live&ebv=EB&ppid=pp_389
3. Developments in Fiber-Reinforced Polymer (FRP) Composites for Civil Engineering https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=675924&site=ehost-live&ebv=EB&ppid=pp_178

Topics relevant to "EMPLOYABILITY SKILLS": Compaction of concrete- Process of compaction, Effect on fresh concrete, Effect on Hardened concrete, Effect of Over compaction, types of Compaction. Typical Applications of Shotcrete/ Gunite,

Characteristics of Shotcrete, Importance of Right Methods and Specifications, Heat of hydration of cement and thermal stresses, Concreting Underwater, Roller Compacted Concrete for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Mrs. Divya Nair
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

<table>
<tr><td>Course Code:
CIV3117</td><td colspan="4">Course Title: Advanced Geomatics
Type of Course: Professional Core Theory</td><td>L-T-P-C</td><td>2</td><td>0</td><td>2</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="9">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="9">CIV2101 – Surveying
CIV2102 – Surveying Lab</td></tr>
<tr><td>Anti-requisites</td><td colspan="9"></td></tr>
<tr><td>Course Description</td><td colspan="9">This course will demonstrate the application of geometric principles to solve surveying problems, incorporating DGPS and UAV Survey techniques for enhanced accuracy and efficiency. Students will analyze spatial data using appropriate computational and analytical methods, applying advanced data capture techniques essential for modern engineering practice. The course covers advanced surveying concepts, including Geodetic Surveying, Field Astronomy, Aerial Photogrammetry, DGPS Surveying, and UAV Surveying, alongside the use of modern surveying instruments to provide practical skills for real-world applications.</td></tr>
<tr><td>Course Objectives</td><td colspan="9">The objective of the course is to familiarize the learners with the concepts of Advanced Geomatics and attain Employability Skills through Problem Solving methodologies.</td></tr>
<tr><td>Course Out Comes</td><td colspan="9">On successful completion of the course the students shall be able to:
CO.4 Recall the fundamental concepts of geodetic surveying and theory of errors used in the measurement of distances and angles.
CO.5 Explain the basic principles and functions of Differential GPS (DGPS) and its role in high-precision surveying.
CO.6 Apply the knowledge of UAV components, flight planning, and ground control setup to perform geodetic surveying tasks effectively.</td></tr>
<tr><td>Course Content:</td><td colspan="9"></td></tr>
<tr><td>Module 1</td><td colspan="2">Geodetic Surveying and Introduction to Field Astronomy</td><td>Assignment</td><td colspan="3">Theory based questions</td><td colspan="2">10 Sessions</td></tr>
<tr><td colspan="10">Topics:
Geodetic Surveying: Principle and Classification of triangulation system, Selection of base line and stations, Orders of triangulation, Triangulation figures, Reduction to Centre.

Earth, celestial sphere, earth and celestial coordinate systems, spherical triangle, astronomical triangle, Napier’s rule and related Numerical.</td></tr>
<tr><td>Module 2</td><td colspan="2">Introduction to DGPS Survey</td><td>Assignment</td><td colspan="3">Theory based questions</td><td colspan="2">10 Sessions</td></tr>
<tr><td colspan="10">Topics:
Fundamentals of GPS and DGPS systems, error sources and correction methods, real-time kinematic (RTK) and post-processing kinematics (PPK) surveying, data analysis software, and field data correction techniques.</td></tr>
<tr><td>Module 3</td><td colspan="2">UAV Surveying and Aerial Photogrammetry</td><td>Case study</td><td colspan="3">Presentations</td><td colspan="2">10 Sessions</td></tr>
<tr><td colspan="10">Topics:
UAV Survey - Different parts and the concepts of UAV working mechanism followed by in depth practical exercise, which helps to gain practical understanding and essential skill sets required for present Surveying industry.</td></tr>
</table>

Aerial Photogrammetry: Introduction, Uses, Aerial photographs, Definitions, Scale of vertical and tilted photograph, Ground Co-ordinates, Relief Displacements, Ground control, Procedure of aerial survey, overlaps and mosaics, Stereoscopes, Parallax.

List of Laboratory Tasks:	**Task-01: Base Station and Rover Setup** **Level No 01:** Setting up a basic DGPS system with a base station and rover in a controlled environment. **Level No 02:** Configuring multi-frequency base and rover systems for high-precision surveys. **Task-02: Real-Time Data Collection and Processing** **Level No 01:** Collecting GPS data using DGPS for simple distance measurements between two points. **Level No 02:** Collecting and processing real-time GPS data from base and rover stations for dynamic measurement. **Task-03: Basic Differential Correction** **Level No 01:** Applying differential corrections to GPS data using a local base station. **Level No 02:** Implementing advanced correction algorithms (e.g., Least Squares) and applying corrections in post-processing. **Task-04: Boundary Survey Exercise** **Level No 01:** Performing a boundary survey using DGPS, marking key points with minimal correction techniques. **Level No 02:** Conducting a topographic and construction layout survey with DGPS, including stakeout, data corrections, and validation against design plans.

Targeted Application & Tools that can be used:

Application area of surveying is for data collection for construction of various structures. Construction companies, Public works department, Irrigation department, Railway department and Survey of India etc.

Professionally used software: Mission Planner, DGPS, Pix4d, QGIS, ArcGIS.

Project Work/ Assignment:

4) Assignment 1: - Selection of base line and stations, Orders of triangulation.
5) Assignment 2: - GIS softwares.

Case Study:- Drone techniques in Geospatial technologies.

Textbook(s):

5. B.C. Punmia, Surveying Vol.2, Laxmi Publications Pvt. Ltd., New Delhi, 2009.
6. A.M. Chandra, Plane Surveying and Higher Surveying, New Age International (P) Limited Publishers, Chennai, 2006.
7. Dr. E. V. Raghava Rao, Advance Methods and Techniques in Drone Surveying, PRASHAS RESEARCH CONSULTING PVT. LTD.
8. Jan Van Sickle, GPS for Land Surveyors, CRC Press, 3rd Edition, 2008.

Reference Book(s)

5. T.P. Kanetkar, S.V. Kulkarni, Surveying and Levelling Part 2, Pune Vidyarthi Griha Prakashan, 2009.

Web resources:

https://onlinecourses.nptel.ac.in/noc20_ce16/preview

https://search.ebscohost.com/login.aspx?direct=true&db=e000xww&AN=1227289&site=ehost-live

Topics relevant to "Employability Skills":

Concepts of geodetic Surveying, aerial Photogrammetry and Total station for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mr. Nakul R

Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3400	Course Title: Matrix methods of Structural analysis Type of Course: Professional Elective & Theory only	L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CIV2506 - Analysis of Determinate Structures CIV2507 - Analysis of Indeterminate Structures					
Anti-requisites	NIL					
Course Description	This course introduces formulation of an otherwise complex structural beam, frame or a truss problem into simple matrices and obtain the solutions in terms of Axial force, Shear force, Bending moment, Slope and Deflection by simplifying them. The course will help in analyzing both determinate and indeterminate beams, plane frames and trusses by Flexibility (force) as well as Stiffness (displacement) approach to draw the Shear force diagram and Bending moment diagrams.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Matrix methods of Structural analysis and attain Employability Skills through Problem Solving methodologies.					
Course Outcomes	On successful completion of the course the students shall be able to: CO.1 Interpret the formation of flexibility and stiffness matrices for beam and truss elements. CO.2 Apply the force transformation and global flexibility matrices to analyze continuous beams, rigid frames, and trusses. CO.3 Apply the displacement transformation and global stiffness matrices to analyze continuous beams, rigid frames, and trusses. CO.4 Apply the direct stiffness method using global stiffness matrices and the principle of contra gradience to analyze structural elements.					
Course Content:						
Module 1	Introduction to Matrix Method of Structural analysis	Quiz	MCQ based quiz		10 Sessions	
Topics: Structural systems, geometric and material non-linearity, principle of superposition, equilibrium and compatibility conditions, static and kinematic indeterminacy, principle of minimum potential energy and minimum complementary energy, concepts of stiffness and flexibility, flexibility and stiffness matrices of beam and truss elements.						
Module 2	Element Flexibility Method	Assignment	Numerical problem solving and validate using STAAD Pro/ ETABS		13 Sessions	
Topics: Force transformation matrix, global flexibility matrix, analysis of continuous beams, rigid frames and trusses.						
Module 3	Element Stiffness Method	Assignment	Numerical problem solving and validate using STAAD Pro/ ETABS		12 Sessions	
Topics: Displacement transformation matrix, global stiffness matrix, analysis of continuous beams, rigid frames and trusses.						
Module 4	Direct Stiffness Method	Assignment	Numerical problem solving and validate using STAAD Pro/ ETABS		10 Sessions	
Topics: Local and global coordinates systems, principle of contra gradience, global stiffness matrices of beam and truss elements, analysis of continuous beams and trusses.						

Targeted Application & Tools that can be used:

The Course enables the students to analyse continuous beams, plane trusses and frames using flexibility method, stiffness method and direct stiffness method. This course will also enable them to draw the force diagram for trusses and shear force and bending moment diagrams for continuous beams and plane frames after the analysis.

The data obtained after analysis can be verified by using professionally used software tools such as STAAD Pro and ETABS.

Project work/Assignment:

1. **Quiz:** Quiz will be MCQ type based on the topics covered in Module 1.
2. **Assignment:** Numerical based question on force, displacement and direct stiffness method of analysis of structures. (Module 2,3,4)

Text Books:

1. Weaver W and Gere J H, "Matrix Analysis of Framed Structures", 3rd Edition, 1990, CBS publications, New Delhi.
2. Rajasekaran S, "Computational Structural Mechanics", 2001, PHI, New Delhi.
3. Madhujit Mukhopadhay and Abdul Hamid Sheikh, "Matrix and Finite Element Analysis of Structures", 2009, Ane Books Pvt. Ltd.

References

1. Godbole P N et.al, "Matrix Method of Structural Analysis", PHI ltd, New Delhi.
2. Pundit and Gupta, "Theory of Structures Vol II", TMH publications, New Delhi
3. A K Jain, "Advanced Structural Analysis", Nemchand Publications, Roorkee

Web Links

1. Matrix Method of Structural Analysis - https://nptel.ac.in/courses/105105180

PU e-Library Resources

1. Structural Analysis - https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1227287&site=ehost-live
2. Methods of matrix algebra - https://research.ebsco.com/c/n5guci/search/details/m274mgfn7v?db=nlebk&limiters=None&q=matrix%20method

Topics relevant to Employability Skills: Structural systems, concepts of stiffness and flexibility, analysis by flexibility and stiffness matrices for beam, frame and truss elements for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout

Catalogue prepared by	Mr. Ajay H A
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3401	Course Title: Theory of Elasticity Type of Course: Professional Elective & Theory Only	L-T-P- C	3	0	0	3
Version No.	1.1					
Course Pre-requisites	CIV2500 - Strength of Materials					
Anti-requisites	NIL					
Course Description	This course equips students with advanced knowledge of the mechanical behavior of deformable solids using the principles of elasticity. Through conceptual understanding and analytical methods, students will gain the ability to model and solve complex structural problems in both rectangular and polar coordinate systems. By the end of the course, students will be capable of applying elasticity theory to structural analysis and finite element methods, enhancing both their technical proficiency and employability.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Theory of Elasticity and attain Employability Skills through Problem Solving methodologies.					
Course Outcomes	On successful completion of the course the students shall be able to: CO.1 Apply basic concepts of stress, strain, and equilibrium to plane stress and strain problems. CO.2 Analyze stress and strain using Cartesian tensor notation and transformations. CO.3 Solve structural problems in rectangular coordinates using analytical and computational methods. CO.4 Apply elasticity principles in polar coordinates to analyze curved bars and rotating disks.					
Course Content:						
Module 1	Basic concepts of deformation of bodies	Assignment	Problem Solving Assignment	11 Sessions		
Topics- Introduction to the mathematical theory of elasticity: Elasticity, stress, strain, Hooke's law, two-dimensional idealisations, plane stress and plane strain problems, equations of equilibrium, strain-displacement relations, constitutive relations, compatibility conditions, displacement and traction boundary conditions.						
Module 2	Introduction to Cartesian Tensors	Assignment	Problem Solving Assignment	12 Sessions		
Topics- Transformation laws of cartesian tensors, special tensors and tensor operations, the Kronecker's delta, the permutation tensor, the e-d identity, symmetry and skew-symmetry, contraction, derivatives and the comma notation, Gauss' theorem, the base vectors and some special vector operations, eigenvalue problem of a symmetric second order tensor, equations of elasticity using index notation.						
Module 3	Problems in 2D rectangular coordinate	Assignment	Problem Solving Assignment	11 Sessions		

Topics- Solution by polynomials, Saint Venant principle, bending of a cantilever loaded at the end, bending of a beam by uniformly load, another case of the continuously loaded beam.				
Module 4	Problems in 2D Polar coordinate	Assignment	Problem Solving Assignment	11 Sessions
Topics- General equation in polar coordinates, stress distribution symmetrical about an axis, pure bending of a curved bar, strain component in polar coordinates, displacement for symmetrical stress distributions, rotating disks				
Targeted Application & Tools that can be used: The concepts from this course are widely used in structural design to analyze and ensure the safety of buildings and bridges. They also play a crucial role in fracture mechanics to predict material failure and form the foundation of finite element analysis (FEA), a key tool in engineering simulations across industries. Professionally used software- MS-Excel, MATLAB.				
Project Work/ Assignment: 1. Problem solving assignment on stress-strain problems. 2. Problem solving assignment on tensors 3. Problem solving assignment on deflection of beams 4. Problem solving assignment on curved deflection of beams				
Text Book 1. Timoshenko and Goodier, Theory of Elasticity and Plasticity, McGraw-Hill, 2017. 2. L. S. Srinath, Advanced Mechanics of Solids, McGraw-Hill, 2017.				
References 1. C. T Wang, Applied Elasticity, McGraw-Hill, 1953. 2. Sadhu Singh, Theory of Elasticity, Khanna Publishers, 1978. 3. https://archive.nptel.ac.in/courses/105/105/105105177/				
Topics relevant to the development of Employability SKILLS: Transformation of stress and strain in 2D and 3D fields, use of Cartesian tensors, and stress functions. Practical applications like solving problems in rectangular and polar coordinates for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course plan.				
Catalogue prepared by	Ms. Anju Mathew			
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025			
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025			

Course Code: CIV3400	Course Title: Structural Dynamics Type of Course: Professional Elective & Theory only	L-T-P-C	3	0	0	3
Version No.	1.2					
Course Pre-requisites	[1] MAT2501 Calculus and Linear Algebra [2] CIV2506 Analysis of Determinate Structures [3] CIV2507 Analysis of Indeterminate Structures					
Anti-requisites	NIL					
Course Description	This course equips students with the ability to model and analyze structures subjected to dynamic loads such as wind, machinery, and earthquakes. Through the study of single and multi-degree of freedom systems, vibration behavior, and shear building models, students gain practical skills in dynamic analysis—preparing them for structural design roles.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Structural Dynamics and attain Employability Skills through Problem Solving methodologies.					
Course Outcomes	On successful completion of the course the students shall be able to: CO.1 Analyze free vibration in SDOF systems. CO.2 Produce the response spectra for forced vibration of SDOF system. CO.3 Determine natural frequencies and mode shapes for free vibrations of MDOF systems CO.4 Examine the dynamic response of shear building models					
Course Content:						
Module 1	Introduction to Structural dynamics and free vibration of SDOF systems	Assignment	Problem Solving Assignment	10 Sessions		
Topics: Introduction to structural dynamics, brief history of vibration, Basic definitions, vibration of SDOF (Single Degree of Freedom) systems, undamped, Damped, Free vibrations, equivalent viscous damping, Logarithmic decrement.						
Module 2	Forced vibration of SDOF systems	Assignment	Problem Solving Assignment	12 Sessions		
Topics: Forced vibrations of SDOF system, Response of undamped and damped system subjected to harmonic loading, response to SDOF subject to harmonic base excitation, Duhamel's integral, response to general system of loading, dynamic load factor, response spectrum.						
Module 3	Vibration of MDOF systems	Assignment	Problem Solving Assignment	12 Sessions		
Topics: Free vibration of MDOF (Multi Degree Freedom System), Natural frequencies, Normal modes, Orthogonality of normal modes, Eigen Values. Free vibrations, Natural frequencies.						
Module 4	Shear modelling of buildings	Assignment	Problem Solving Assignment responses	11 Sessions		
Topics:						

Forced vibrations, Shear buildings modelled as MDOF systems, Motion of shear buildings, Model Superposition Method, Response to shear buildings, Base motion, Harmonic fixed excitation. Damped motion of shear buildings, Equations for damped shear buildings, uncoupled damped equations, conditions for damping uncoupled.
Targeted Application & Tools that can be used: Knowledge of structural dynamics is essential in designing buildings, bridges, and towers to withstand dynamic loads such as earthquakes, wind, and machine-induced vibrations. It is widely applied in seismic design and retrofitting, vibration control in tall structures, and dynamic analysis of infrastructure for transportation and industrial facilities.
Project Work/ Assignment: 1. Problem solving assignment on natural frequency and damping ratio 2. Problem solving assignment on response spectrum for an SDOF system 3. Problem solving assignment on natural frequencies and mode shapes 4. Problem solving assignment on response of a shear building
Text Books: 3. Mario Paz, Structural Dynamics, CBS publishers. 4. M. Mukhopadhaya, Structural Dynamics: Vibrations & Systems, Anne Books Pvt. Ltd.
References 3. Clough & Penzien, Structural Dynamics, Tata Mc Graw Hill. 4. Anil K. Chopra, Dynamics of Structures – Theory and Application to Earthquake Engineering, Pearson Education. 5. https://archive.nptel.ac.in/courses/105/106/105106151/
Topics related to Employability Skill: Analysis of single and multi-degree of freedom structural system subjected to free and forced vibrations. Analysis of shear buildings modelled as multi-degree of freedom systems for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Ms. Anju Mathew
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
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<table>
<tr><td>Course Code: CIV3403</td><td colspan="4">Course Title: Finite Element Method
Type of Course: Professional Elective & Theory</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="9">1.1</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="9">1] CIV2500 Strength of Materials 2] CIV2507 Analysis of Indeterminate Structures</td></tr>
<tr><td>Anti-requisites</td><td colspan="9">NIL</td></tr>
<tr><td>Course Description</td><td colspan="9">This course equips students with the theoretical and practical understanding of the Finite Element Method (FEM), enabling them to model, analyze, and solve complex engineering problems in structures and thermal systems. By the end of the course, students will be able to develop element equations, apply boundary conditions, interpret results, and use FEM tools confidently—preparing them for roles in design, consultancy, and research within the infrastructure and construction industries.</td></tr>
<tr><td>Course Objective</td><td colspan="9">The objective of the course is to familiarize the learners with the concepts of Finite Element Method and attain Employability Skills through Problem Solving methodologies.</td></tr>
<tr><td>Course Outcomes</td><td colspan="9">On successful completion of the course the students shall be able to:
CO.1 Apply FEM principles and solution methods to simple structural problems.
CO.2 Solve 1D FEM models for structural and thermal analysis.
CO.3 Analyze FEM models for 2D scalar problems like heat transfer and torsion.
CO.4 Analyze 2D vector problems such as plane stress and strain using FEM.</td></tr>
<tr><td>Course Content:</td><td colspan="9"></td></tr>
<tr><td>Module 1</td><td colspan="2">Theory of finite Element Method</td><td colspan="2">Assignment</td><td colspan="2">Problem Solving Assignment</td><td colspan="2">12 Sessions</td></tr>
<tr><td colspan="10">Topics: Equilibrium, Boundary conditions, Strain Displacement relations, Stress – strain relations, One Dimensional Problems Finite element modeling coordinates, Assembly of Global stiffness matrix and load vector, Finite element equations, Treatment of boundary conditions, shape functions. Direct stiffness method, Galerkin’s method, Virtual work method, Variational method, Principles of Minimum potential energy, Rayleigh-ritz method</td></tr>
<tr><td>Module 2</td><td colspan="2">One-Dimensional Problems</td><td colspan="2">Assignment</td><td colspan="2">Problem Solving Assignment</td><td colspan="2">12 Sessions</td></tr>
<tr><td colspan="10">Topics: One Dimensional Second Order Equations – Discretization – Element types- Linear and Higher order Elements – Derivation of Shape functions and Stiffness matrices and force vectors- Assembly of Matrices – Solution of problems from solid mechanics and heat transfer. Longitudinal vibration frequencies and mode shapes. Fourth Order Beam Equation – Transverse deflections and Natural frequencies of beams.</td></tr>
<tr><td>Module 3</td><td colspan="2">Two-Dimensional Scalar Variable Problems</td><td colspan="2">Assignment</td><td colspan="2">Problem Solving Assignment</td><td colspan="2">11 Sessions</td></tr>
<tr><td colspan="10">Second Order 2D Equations involving Scalar Variable Functions – Variational formulation – Finite Element formulation – Triangular elements – Shape functions and element matrices and vectors. Application to Field Problems – Thermal problems – Torsion of Non-circular shafts –Quadrilateral elements – Higher Order Elements.</td></tr>
<tr><td>Module 4</td><td colspan="2">Two-Dimensional Vector Variable Problems</td><td colspan="2">Assignment</td><td colspan="2">Problem Solving Assignment</td><td colspan="2">10 Sessions</td></tr>
<tr><td colspan="10">Equations of elasticity – Plane stress, plane strain and axisymmetric problems – Body forces and temperature effects – Stress calculations – Plate and shell elements.</td></tr>
<tr><td colspan="10">Targeted Application & Tools that can be used:
The concepts learned in this course are widely used in industries for structural analysis, design optimization, and failure prediction of buildings, bridges, and mechanical components.</td></tr>
</table>

Professionally Used Software: MS- Excel, MATLAB, ANSYS, STAAD Pro, and SAP2000
Project Work/ Assignment: 1. Problem solving assignment on global stiffness matrix 2. Problem solving assignment on transverse deflection and natural frequencies 3. Problem solving assignment on temperature distribution in a 2D plate 4. Problem solving assignment on stress analysis for a rectangular plate
Text Book 1. C.S. Krishnamoorthy, Finite Element Analysis, McGraw Hill Education, 2017 2. R.D. Cook, D.S. Malkus, M.E. Plesha, Concepts and Applications of Finite Element Analysis, Wiley, 2007 3. Daryl L Logan, A first course on Finite element Method, Nelson Engineering, 2010
References 1. K.J. Bathe, Finite Element Procedures, PHI Learning Pvt. Ltd., 1996 2. Desai C. & Abel J.F., Introduction to the Finite Element Method, CBS, 2010 3. S. Rajasekaran, Finite Element Analysis in Engineering Design, S Chand & Company, 2006 4. https://archive.nptel.ac.in/courses/112/104/112104193/
Topics relevant to "EMPLOYABILITY SKILLS": Formulation and assembly of stiffness matrices, boundary condition application, and stress-strain analysis in structural elements like bars, beams, and trusses. Modules on 2D scalar and vector problems, including thermal and plane stress/strain analysis, align with real-world applications in infrastructure, mechanical systems, and materials engineering for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course plan.

Catalogue prepared by	Ms. Anju Mathew
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
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Course Code: CIV3404	Course Title: Masonry Structures Type of Course: Professional Elective Theory	L-T-P-C	3	0	0	3
Version No.	1.1					
Course Pre-requisites	Basic Knowledge of Concrete technology and design of RC structures					
Anti-requisites	NIL					
Course Description	The objective of this course is to understand properties of masonry units, design criteria of various types of wall subjected to different load system and to provide knowledge in analysis and design of masonry elements. This course is a basic course on design of masonry structures. It deals with the properties of masonry units, strength properties, behavior of masonry walls under different loading conditions. The course also deals with the design of masonry walls subjected to axial, eccentric and transverse load. The students having basic knowledge of structural analysis and strength of materials can easily understand this course. This Course helps students to understand the concept of analysis and design of masonry elements.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Masonry Structures and attain Employability Skills through Problem Solving methodologies.					
Course Outcomes	On successful completion of this course the students shall be able to: CO.1 Summarize the properties of masonry units, strength and factors affecting strength CO.2 Infer codal provisions applicable to design of masonry structures CO.3 Illustrate the design principles for design of a masonry wall subjected to axial and eccentric load					
Course Content:						
Module 1	Introduction to Masonry	Assignment	Data Collection	14 Sessions		
Topics: Masonry Units, Materials, types and masonry construction: Bricks, Stone and Block masonry units- strength, modulus of elasticity and water absorption of masonry materials – classification and properties of mortars. Defects and Errors in masonry construction – cracks in masonry, types, reason for cracking, methods of avoiding cracks. Strength and Stability: Strength and stability of axially loaded masonry walls, effect of unit strength, mortar strength, joint thickness, rate of absorption, effect of curing, effect of ageing, workmanship. Compressive strength formulae based on elastic theory and empirical formulae.						
Module 2	Codal Provisions and Design Considerations	Assignment	Data Collection	15 Sessions		
Topics: Permissible stresses: Types of walls, permissible compressive stress, stress reduction and shape modification factors, increase in permissible stresses for eccentric vertical and lateral load, permissible tensile stress and shear stresses. Design Considerations: Effective height of walls and columns, openings in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action in lintels. Problems on design considerations for solid walls and cavity walls.						
Module 3	Design of Masonry Walls	Assignment	Data collection	16 Sessions		
Topics: Load considerations and design of Masonry subjected to axial loads: Design criteria, design examples of walls under UDL.						

Design of walls subjected to concentrated axial loads: Solid walls, cavity walls, design of wall with openings. Design of walls subjected to eccentric loads: Design criteria – stress distribution under eccentric loads – problems on eccentrically loaded solid walls.	
Targeted Application & Tools that can be used: Inspection and Design of Masonry Structures, Rehabilitation of historical structures Staad Pro, Excel, Matlab	
Textbooks: T1. Henry, A.W., "Structural Masonry", Macmillan Education Ltd., 1990. T2. Dayaratnam P, "Brick and Reinforced Brick Structures", Oxford & IBH, 1987. T3. M. L. Gambhir, "Building and Construction Materials", Mc Graw Hill education Pvt. Ltd.	
References: R1. IS 1905–1987 "Code of practice for structural use of un-reinforced masonry- (3rd revision) BIS, New Delhi. R2. SP 20 (S&T) – 1991, "Hand book on masonry design and construction (1st revision) BIS, New Delhi. Additional web-based resources W1. NPTEL Course – Design of Masonry Structures, Arun Menon https://nptel.ac.in/courses/105106197/	
Topics related to "Employability Skills": Design of Masonry Walls for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Dr. Nakul R
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3405	Course Title: Advanced RCC Structures Type of Course: Professional Elective	L-T-P-C	3	0	0	3
Version No.	1.2					
Course Pre-requisites	CIV2507 Analysis of Indeterminate Structures CIV2508 Design of RCC Structural Elements					
Anti-requisites	NIL					
Course Description	This course enables understanding of the concepts for designing special RC structural elements for different loading conditions. The course is both conceptual and analytical in nature which enable applying mathematical and engineering knowledge to understand the behavior of the structure. The course focuses on computing the internal forces which are required to determine the required cross-sectional dimensions and reinforcement to carry the external load or to resist the induced internal forces.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Advanced RCC Structures and attain Employability Skills through Problem Solving.					
Course Outcomes	On successful completion of the course the students shall be able to: CO.1 Illustrate the design concepts of building frames by limit state approach. CO.2 Sketch the reinforcement details for RC flat slabs with or without drops. CO.3 Compute the required cross-sectional area of steel for a combined foundation as per BIS codal provisions. CO.4 Compute the required cross-sectional area of steel for a water tank as per BIS codal provisions.					
Course Content:						
Module 1	Concepts of Limit State Design and Design concepts of Portal Frames	Assignment	Numerical problems with Software Programming	10 Sessions		
Topics: Basic concept of R.C. design and behavior of R.C members under different loading conditions. Transmission of Load path in rigid frames, Analysis of Portal frames with different end conditions and design concepts of portal frame as per BIS codal provisions.						
Module 2	Flat Slabs	Assignment	Numerical problems with Software Programming	10 Sessions		
Topics: Introduction of flat slab, components of flat slab, classification and behavior of flat slabs, BIS codal provisions, design methods- Direct design and equivalent frame method, design concept for flat slabs with and without drops.						
Module 3	Combined foundation	Assignment	Numerical problems with Software Programming	13 Sessions		
Topics: Combined Foundations - Introduction to combined foundations, Types of combined foundations, Design concept of rectangular and trapezoidal combined footings.						

Module 4	Water Tanks	Assignment	Numerical problems with Software Programming	12 Sessions

Topics:
Design of Water tanks – Design Requirements, Design of a Circular Tank resting on the ground, Design of a Rectangular tank resting on the ground

Targeted Application & Tools that can be used:
The knowledge acquired by the students help in designing the structural components which are provided in Warehouses, Hangars, Factories, Large retail units etc. Flat slab will be provided in commercial buildings for longer spans and also to enhance the aesthetic appearance of the structure. The Mat and combined foundation are adopted for multistoried buildings and where soil is soft.
Professionally Used Software: STAAD Pro, ETABS, MATLAB, SAP 2000 and Auto CAD Software.

Project Work/ Assignment:

Text Book:
1. P. C. Varghese, *Advanced Reinforced Concrete Design, PHI Learning Private Ltd., New Delhi, 2011*
2. P. C. Varghese, *Design of Reinforced Concrete Foundations, PHI Learning Private Ltd., New Delhi, 2010*

References:
1. Varghese P C, *Limit State Design of Reinforced Concrete*, Prentice Hall of India, New Delhi
2. Thomas Paulay, R. Park, *Reinforced Concrete Structures, John Wiley and sons New York*.
3. Krishna Raju. N., *Advanced Reinforced Concrete Design, CBS Publishers & Distributors*
4. SP-16: IS 456 Design hand book
5. IS 456 :2000 Code of Practice for Plain and Reinforced Concrete

Web Resources/ E-Books:
6. http://www.digimat.in/nptel/courses/video/105105105/L10.html
7. https://www.youtube.com/watch?v=undsd92MM8w
8. Advanced R.C.C. Design (RCC Volume- II) https://web.p.ebscohost.com/ehost/detail/detail?vid=5&sid=985d933d-b358-4a32-870e-f536d9bd0e8c%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=2706885&db=nlebk
9. Reinforced Concrete: Design, Performance and Applications https://web.p.ebscohost.com/ehost/detail/detail?vid=8&sid=985d933d-b358-4a32-870e-f536d9bd0e8c%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=1488063&db=nlebk

Topics relevant to development of "EMPLOYABILITY SKILL":
Design concept for flat slabs with and without drops, Design concept of rectangular and trapezoidal combined footings, Design concept of water tanks for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mrs. Divya Nair/ Dr. S.B. Anadinni
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025

Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3406	Course Title: Design of Retaining Structures Type of Course: Professional Elective Theory	L-T-P-C	3	0	0	3
Version No.	1.1					
Course Pre-requisites	CIV2514 Foundation Engineering CIV2508 Design of RCC structural Elements					
Anti-requisites	NIL					
Course Description	The course will enable the students to understand effect of the lateral earth pressure on the cantilever retaining walls for different soil conditions and suggesting a suitable type of retaining wall. The course also helps the students to calculate the hydrostatic pressure distribution on the walls of rectangular and circular water tanks resting on the ground. The students can apply the analytical skill and design concepts to draw the structural details.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Design of Retaining Structures and attain Employability Skills through Problem Solving methodologies.					
Course Outcomes	On successful completion of the course the students shall be able to: CO.1 Compute the lateral earth pressure on a cantilever retaining walls. CO.2 Sketch the reinforcement details for components of retaining structures as per IS456:2000. CO.3 Compute the hydrostatic pressure on the walls of rectangular and circular tanks resting on ground. CO.4 Demonstrate the structural details for circular water tank with flexible and rigid bases resting on the ground as per IS3370:2009.					
Course Content:						
Module 1	Cantilever retaining wall	Assignments	Numerical problems and validating the results by using STAAD pro	15 Sessions		
Topics: Introduction to retaining wall, Lateral earth pressure, earth retaining structures, retaining walls, types. Cantilever retaining wall - Stability of retaining wall, structural action, factor of safety, shear key, design concept of components of cantilever retaining wall as per IS456:2000.						
Module 2	Circular water tank resting on ground	Assignment	Numerical problems and validating the results by using STAAD pro	15 Sessions		
Topics: Circular water Tank: Types of tanks, hydrostatic pressure distribution on walls, Design concepts of circular tanks resting on ground with flexible base and rigid base as per IS:3370:2009.						
Module 3	Rectangular water tank resting on ground	Assignment	Numerical problems and validating the results by using STAAD pro	15 Sessions		
Topics: Rectangular water tank: Types of tanks, hydrostatic pressure distribution on walls, Design concepts of rectangular tanks resting on ground as per IS:3370:2009.						
Targeted Application & Tools that can be used: The Couse enable the students to decide a suitable type of retaining structure to retain the earth in construction of roads in hilly regions and to provide the wing walls in bridges and						

culverts. The course also helps the students in adopting a suitable water tank in water supply scheme for rural and urban areas. Professionally Used Software: STAAD pro/SAP.	
Project Work/ Assignment:	
Text Books: 1. Unnikrishnan Pillai and Devdas Menon., "Reinforced concrete Design", Tata McGraw Hill Publishers Company Ltd., New Delhi, 2006 2. P. C. Varghese, "Advanced Reinforced Concrete Design", PHI Learning Private Ltd., New Delhi, 2011	
References 1. Thomas Paulay, R. Park, "Reinforced Concrete Structures", John Wiley and sons New York. 2. B.C. Punmia, "Reinforced Concrete Structures", Laxmi Publishing Co. 3. Krishna Raju. N., "Advanced Reinforced Concrete Design", CBS Publishers & Distributors E-Resources 1. https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=iih&AN=21603100&site=ehost-live 2. https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=iih&AN=6786140&site=ehost-live 3. https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=iih&AN=148750142&site=ehost-live	
Topics relevant to "EMPLOYABILITY SKILLS": Suitability and structural action of cantilever retaining wall. Suitability and structural action of circular and rectangular water tanks, Topics related to Employability, Design concepts of cantilever retaining wall, Design concepts of circular and rectangular water tanks for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Dr. S. B. Anadinni Mr. Ajay H A
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3407	Course Title: Repair and Rehabilitation of Structures Type of Course: Professional Elective Theory	L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CIV2508 Design of RCC structural Elements					
Anti-requisites	NIL					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Advanced RCC Structures and attain Employability Skills through Participative Learning techniques.					
Course Description	This course helps learn how to identify various deterioration mechanisms or damage mechanisms in concrete structures. Use of various non-destructive, partially-destructive tools to assess the condition of the structure will be discussed. Tips on selecting measurable parameters that are useful in deciding the further repair and maintenance practices will be provided. Typical practices for near-surface repair, corrosion protection, structural strengthening, structural stabilization, etc. will be discussed in detail. The course helps to suggest evaluation and repair/retrofitting methods for extending the service life of concrete structures. Importance for preventive maintenance practices (instead of corrective maintenance practices) will be discussed throughout the coursework.					
Course Outcomes	On successful completion of the course the students shall be able to: 1. Explain the causes for deterioration of structures. 2. Describe the Non-Destructive Test (NDT) methods available for conditional field assessment of a structure 3. Discuss repair materials to retrofit a deficient member. 4. Demonstrate appropriate method for strengthening a distressed structure.					
Course Content:						
Module 1	Deterioration causes	Assignment	Theory based	10 Sessions		
Topics: Introduction - Permeability of concrete, aggressive chemical agents, concrete defects, durability aspects, distress identification and repair management - Causes of distress in concrete structures - Holistic Models for deterioration of concrete.						
Module 2	Inspection and NDT	Project	NDT assesment	12 Sessions		
Topics Condition Survey- Definition, objectives, different stages - Preliminary inspection, planning stage, visual inspection, field and laboratory testing. Non-Destructive evaluation tests - Concrete strength assessment- Rebound hammer test - Ultrasonic pulse velocity tests, penetration resistance, pull out tests, core sampling and testing - Chemical Tests - Carbonation and chloride content, Corrosion potential assessment- cover meter survey, half-cell potentiometer test, resistivity measurement, Evaluation of reserve strength of existing structures.						
Module 3	Repair Materials	Quiz	MCQ type	9 Sessions		
Topics: Selection of repair materials for concrete - performance requirements of repair systems, Strength and durability aspects, cost and suitability aspects, Materials for repair - Premixed cement concrete and mortars, polymer modified mortars and concrete, epoxy systems including epoxy mortars and concrete, polyester resins, coatings.						

Module 4	Repair Methods and Case studies	Presentation	Case study on RCC jacketing techniques	14 Sessions

Topics

Repair methods - Chemical and electrochemical method of repair, Guniting, shotcreting, Resin/polymer modified slurry injection, polymer concrete system, reinforcement replacement, plate bonding technique, polymer and epoxy overlays, fiber-wrap technique, ferrocement jacketing, RCC jacketing, propping and supporting, foundation rehabilitation methods, NSM method.

Discussion of case studies of RCC buildings, water tanks, industrial structures subjected to distress, Contracts and Specification.

Targeted Application & Tools that can be used:

The Course enables the students to identify the cause of deterioration and distress in the structures. Use of appropriate NDT equipment for obtaining the data such as reserve strength and corrosion penetration and estimation of extent of chemical attack. The course also enables the students to choose an appropriate material for repair of structures and suitable methods of strengthening the structures.

Project work/Assignment:

Assignment: Theory based questions based on the topics covered in Module 1.
Project work: Conducting a case study of a Block in the University to obtain the data such as surface hardness of different components using Rebound Hammer.
Quiz: MCQ type questions based on the topics covered in Module 3.
Presentation: Presentation on the case studies of rehabilitation methods used for various structures.

Text Books:

1. "CPWD Handbook on Repair and Rehabilitation of RCC buildings", Govt of India Press, New Delhi, 2002.
2. R.N. Raika, "Learning from failures - Deficiencies in Design, Construction and Service" Rand Centre (SDCPL), Raikar Bhavan, Bombay, 1987
3. Dr. B. Vidivelli, "Rehabilitation of Concrete Structures", Standard Publishers, 2009.

References

1. Santhakumar A.R., "Concrete Technology" Oxford University Press, New Delhi, 2007
2. J.G. Teng, J.F. Chen, S.T. Smith, L. Lam, "FRP: Strengthened RC Structures", Wiley Publications.
3. 440.2R-10/17: Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures.

E-Resources

1. Bonded Repair and Retrofit of Concrete Structures Using FRP Composites -- Recommended Construction Specifications and Process Control Manual - https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=NAP_1_29062023_2870
2. Recommended Construction Specifications and Process Control Manual for Repair and Retrofit of Concrete Structures Using Bonded FRP Composites (2008) - https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=NAP_1_29062023_3657
3. Refurbishment and Repair in Construction - https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_81127

Topics relevant to development of "EMPLOYABILITY SKILL": NDT tests, Selection of suitable materials for repairs, Methods of repair, Retrofitting/Jacketing techniques for developing Employability Skills through Participative Learning Techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Dr. Nakul R/ Mr. Gopalakrishnan N
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

<table>
<tr><td>Course Code:
CIV3408</td><td colspan="4">Course Title: Structural Health Monitoring
Type of Course: Professional Elective Theory</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="9">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="9">Basics of Concrete Technology and Design of Reinforced Concrete Structures</td></tr>
<tr><td>Anti-requisites</td><td colspan="9">NIL</td></tr>
<tr><td>Course Description</td><td colspan="9">The objective of the course is to develop the knowledge about structural health monitoring of concrete structures. The course also includes the topics to understand the various causes, factors responsible for various defects in structures. It also includes the assessment of health of structures using static field and dynamics field testing methods. The introduction to repair and rehabilitation of strictures is also included for better understanding of structural health monitoring concepts.</td></tr>
<tr><td>Course Objectives</td><td colspan="9">The objective of the course is to familiarize the learners with the concepts of Structural Health Monitoring and attain Employability Skills through Participative Learning techniques.</td></tr>
<tr><td>Course Outcomes</td><td colspan="9">On successful completion of this course the students shall be able to:
CO.1 Diagnose the distress in the structure by understanding the causes and factors
CO.2 Assess the health of structure using static and dynamic field methods
CO.3 Carryout repairs and rehabilitation measures of the structure</td></tr>
<tr><td>Course Content:</td><td colspan="9"></td></tr>
<tr><td>Module 1</td><td colspan="3">Structural Health Monitoring</td><td>Assignment</td><td colspan="3">Case study</td><td colspan="2">15 sessions</td></tr>
<tr><td colspan="10">Topics:
Structural Health–Factors affecting Health of Structures–Repair and Rehabilitation – Facets of Maintenance – importance of Maintenance – Various aspects of Inspection – Assessment procedure
for evaluating a damaged structure – causes of deterioration.
Structural Health Monitoring–Concepts, Various Measures, Structural Safety in Alteration
Structural Audit–Assessment of Health of Structure- Assessment by NDT equipment‘s, SHM Procedures</td></tr>
<tr><td>Module 2</td><td colspan="3">Static and Dynamic Field Testing</td><td>Assignment</td><td colspan="3">Numerical problems and validate by software</td><td colspan="2">15 sessions</td></tr>
<tr><td colspan="10">Topics:
Static Field Testing– Types of Static Tests, Static Testing- Static field testing- types of static tests loading methods- Behavioral/ Diagnostic tests - Proof tests -Static response measurement – strain gauges, LVDTs, dial gauges - case study .
Dynamic Field Testing–Types of dynamic tests - Stress history data -Dynamic load allowance tests - Ambient vibration tests – Forced Vibration Method - Dynamic response methods - Impact hammer testing- Shaker testing - Periodic and continuous monitoring</td></tr>
<tr><td>Module 3</td><td colspan="3">Introduction to Repairs and Rehabilitations of Structures</td><td>Assignment</td><td colspan="3">Numerical problems and validate by software</td><td colspan="2">15 sessions</td></tr>
<tr><td colspan="10">Introduction to Repairs and Rehabilitations of Structures– Case Studies(Site Visits), piezo–electric materials and others materials, electro mechanical impedance (EMI) technique, adaptations of EMI technique</td></tr>
<tr><td colspan="10">Targeted Application & Tools that can be used:
Application area is understanding of static and dynamic field testing of structures.</td></tr>
</table>

Text Books:

1. Structural Health Monitoring, Daniel Balageas, Claus Peter Fritzen, Alfredo Güemes, John Wiley and Sons, 2006.
2. Health Monitoring of Structural Materials and Components Methods with Applications, Douglas E Adams, John Wiley and Sons, 2007.

References

1. Structural Health Monitoring and Intelligent Infrastructure, Vol1, J. P. Ou, H. Li and Z. D. Duan, Taylor and Francis Group, London, UK, 2006.
2. Structural Health Monitoring with Wafer Active Sensors, Victor Giurglutiu, Academic Press Inc, 2007

PU Web Resources

https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=2325554&site=ehost-live

Topics relevant to "EMPLOYABILITY SKILLS": Dynamic Field Testing–Types of dynamic tests - Stress history data -Dynamic load allowance tests - Ambient vibration tests – Forced Vibration Method - Dynamic response methods for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mr. Dayalan J
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3409	Course Title: Advanced Design of Steel Structures Type of Course: Professional Elective Theory	L-T-P-C	3	0	0	3
Version No.	1.1					
Course Pre-requisites	CIV2507 - Analysis of Indeterminate structures CIV2510 - Design of Structural Steel Elements					
Anti-requisites	NIL					
Course Description	The objective of this course is to understand the plastic behavior of structures and the principles of plastic analysis of Structures as well as to expose students to design of steel trusses and gantry girder. The main objective of this course is to provide civil engineering students with the knowledge of plastic analysis and behavior as well as design of steel structures. This course is a second level course on steel structures. It deals with the plastic behavior of structures, plastic analysis, and development of plastic hinges. It also deals with the design of steel trusses and gantry girders as per limit state of design following the Indian codal provisions. The basic knowledge of structural analysis and design of steel structures is essential to easily understand this course. This Course helps to design steel trusses for supporting the roof of industrial structures, railway stations and to design gantry girders used in factories and manufacturing industries to lift and move heavy machinery/equipment.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Advanced Design of Steel Structures and attain Employability Skills through Problem Solving methodologies.					
Course Outcomes	On successful completion of this course the students shall be able to: CO.1 Demonstrate the design procedure for Laterally Unrestrained Beams CO.2 Explain the concept of plastic analysis and fire resistance for structural steel elements. CO.3 Demonstrate the design concept of Cold formed Steel sections. CO.4 Choose appropriate steel sections for different components of a steel roof truss.					
Course Content:						
Module 1	Laterally Unrestrained Beams	Assignment	Numerical problems from E-resources	12 sessions		
Lateral Buckling of Beams, Factors affecting lateral stability, IS 800 code provisions, Design Approach. Lateral buckling strength of Cantilever beams, continuous beams, Mono-symmetric and non- uniform beams – Design Examples. Concepts of Shear Center, Warping, Uniform and Non-Uniform torsion						
Module 2	Plastic Analysis and Fire Resistance of Structural Steel	Assignment	Case study on fire protection measures in various steel structures	10 Sessions		
Introduction to plastic behaviour of Structural steel, Plastic theory, Plastic hinge concept, Plastic collapse load, load factor, Shape factor, Theorem of plastic collapse, Methods of Plastic analysis, conditions of plastic analysis, Plastic analysis of Beams. Fire resistance level, Period of Structural Adequacy, Properties of steel with temperature, Limiting Steel temperature, Protected and unprotected members, Methods of fire protection, Fire resistance Ratings. Numerical Examples.						
Module 3	Design of Cold formed steel sections	Assignment	Numerical problems	10 Sessions		
Techniques of manufacture and properties of Cold formed steel sections, Advantages, Typical profiles, Stiffened and unstiffened elements, Local buckling effects, effective section						

properties, IS 801 & 811 code provisions for Design of Cold Form sections. Numerical examples on beam design and column design.				
Module 4	Design of Steel Roof Truss	Assignment	Numerical problems	13 Sessions
Introduction and Types of Roof Trusses, Selection of type of trusses, Types of member sections and selection of sections, Loads on roof trusses and load combinations, Deflection of Trusses, Design procedure for a Roof Truss, Design of Rafter, purlins and ties, Connections in trusses.				
Targeted Application & Tools that can be used: Application area is application of design of steel trusses and gantry girders as per limit state of design following the Indian codal provisions and design of steel trusses for supporting the roof of industrial structures, railway stations and to design gantry girders used in factories.				
Project Work/ Assignment:				
Text Book (s): 1. Duggal S.K, *"Limit State Design of Steel Structures"*, Tata Mac Graw Hill, New Delhi, 2010. 2. N. Subramanian "Design of Steel Structures"- Oxford, 2008.				
Reference Book(s): 1. Ramachandra, "Limit State of Design of Steel Structures" Standard Book House - 2012. E-Resources: 1. NPTEL Course on "Design of Steel Structures II", Prof. S.R.Satish Kumar and Prof. A.R.Santha Kumar. https://nptel.ac.in/courses/105/106/105106113/ 2. https://search.ebscohost.com/login.aspx?direct=true&db=e000xww&AN=210034&site=ehost-live				
Topics relevant to "Employment Skill": Selection of members for roof truss, cold formed steel design using software for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.				
Catalogue prepared by	Mr. Gopalakrishnan N			
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025			
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025			

Course Code: CIV3410	Course Title: Earthquake Resistant Design of Structures Type of Course: Professional Elective Theory		L-T-P-C	3	0	0	3
Version No.	1.1					
Course Pre-requisites	CIV3402 – Structural Dynamics					
Anti-requisites	NIL					
Course Description	The objective of this course is to teach how to design a structure resistant to the natural force of an earthquake. This course includes the ductile detailing using Indian standard codes, concepts, types and design of shear wall Masonry and Steel structures under seismic loading. Also, a glimpse earthquake resistant design of special structures like water tank, chimney and bridges will be studied.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Earthquake Resistant Design of Structures and attain Employability Skills through Problem Solving Methodologies.					
Course Outcomes	On successful completion of the course the students shall be able to: CO.1 Describe the basic concepts of engineering seismology. CO.2 Apply the Indian Standard codal provisions for the seismic analysis of reinforced concrete structures. CO.3 Apply the Indian Standard codal provisions for the seismic design of reinforced concrete structures.					
Course Content:						
Module 1	Introduction to Engineering Seismology	Seminar	Earthquake Tips	15 Sessions		
Topics: Causes of Earthquake – Elastic Rebound Theory, Theory of Plate Tectonics; Types of Seismic waves; Basic terms, Magnitude and intensity of Earthquake; Characteristics of Ground Motion; Classification of Earthquakes; Seismic zoning; Vertical irregularity and plan configuration problems, Conceptual Design - Building configuration – building characteristics – Quality of construction and materials.						
Module 2	Code Based Seismic Analysis Methods	Assignment	Problem Based Assignment	15 Sessions		
Topics: Seismic design philosophy, Design Earthquake Loads and Load Combinations; Basic Assumptions, Methods of Elastic Analysis – Equivalent lateral force method, response spectrum method. Step-by-step Procedure for Seismic Analysis of a Multi-storeyed RC Building.						
Module 3	Code Based Seismic Design Principles	Assignment	Problem Based Assignment	15 Sessions		
Topics: Principles of Earthquake Resistant Design of RC Buildings; Ductile Detail Considerations; Design of Special Confining Reinforcement; Concept and types of Shear Walls.						
Targeted Application & Tools that can be used: This course has direct applications in structural engineering consultancies, construction firms, and infrastructure development agencies focused on seismic safety. Skills gained are useful for designing earthquake-resistant buildings, bridges, water tanks, chimneys, and retaining walls in compliance with Indian codes. It prepares students for roles in disaster-resilient infrastructure projects,						

government bodies, and organizations involved in urban planning and retrofitting of existing structures. Tools: ETABS, Staad Pro. , LS-Dyna	
Project Work/ Assignment: 1. Seminar on Earthquake Tips 2. Problem based assignment on Seismic Analysis 3. Problem based assignment on Seismic Design	
Text Book 1. Pankaj Agarwal and Manish Shrikande, "Earthquake Resistant Design of Structures", Prentice Hall of India Private Ltd, New Delhi 2. Duggal S K, "Earthquake Resistant Design of Structures". Oxford University Press, New Delhi	
References 1. Anil K Chopra, "Dynamics of Structures", Pearson Education, Asia, New Delhi 2. Dr. Vinod Hosur, "Earthquake-Resistant Design of Building Structures", Wiley Precise Textbook, New Delhi E-Resources 1. https://nptel.ac.in/courses/105/101/105101004/	
Topics relevant to "EMPLOYABILITY SKILLS": Seismic Zoning and Building Configuration Design, Code-Based Seismic Analysis Methods, Equivalent Lateral Force Method & Response Spectrum Method, Ductile Detailing of RC Structures for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout	
Catalogue prepared by	Ms. Anju Mathew
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3411	Course Title: Advanced Prestressed Concrete Design Type of Course: Professional Elective Theory		L-T-P- C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CIV2509 Analysis and Design of Pre-Stressed Concrete Elements					
Anti-requisites	NIL					
Course Description	The main objective of this course is to provide civil engineering students with the advanced knowledge of pre-stressed concrete structures. This course deals with mainly design of composite beams and tension members, compression members, slab and grid floors, precast elements. It also focuses on anchorage zone stresses in post tensioned members and shear and torsional resistance of the PSC sections. It covers the analysis of indeterminate beams.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Advanced Prestressed Concrete Design and attain Employability Skills through Problem Solving methodologies.					
Course Outcomes	On successful completion of this course the students shall be able to: 1. Illustrate design principles of prestressed concrete sections under shear and torsion. 2. Understand the variation of anchorage zone stress and design of anchorage reinforcement. 3. Realize the basic concepts and design of tension, compression members and PSC slabs. 4. Possess the ability to understand the design concepts of composite beams.					
Course Content:						
Module 1	Shear and Torsional reinforcement	Assignment	Numerical problems	10 classes		
Topics: Shear and Torsional Resistance: Shear and principal stresses, ultimate shear resistance, design of shear reinforcement, Torsion, Design of reinforcement for torsion. Anchorage Zone Stresses in Post-Tensioned Members: Introduction, stress distribution in end block, investigations on Anchorage zone stresses, Magnel and Guyon's Methods, Comparative Analysis, Anchorage zone reinforcement.						
Module 2	Design of Tension and compression members	Assignment	Numerical problems	12 classes		
Topics: Tension Members: Introduction, Ties, Pressure pipes – fabrication process, analysis, design and specifications. Design of prestressed concrete cylindrical water tanks - Design of prestressed concrete pipes. Compression Members: Introduction, Columns, short columns, long columns, biaxially loaded columns, Design specifications, Design of prestressed concrete piles.						
Module 3	Statically indeterminate Structures and PSC slabs	Assignment	Numerical problems	12 classes		
Topics: Statically indeterminate Structures: Introduction, Advantages of continuous members, effect of prestressing in indeterminate structures, methods of analysis for secondary moments, concordant cable profile, Guyon's theorem, Ultimate load analysis, Design of continuous beams and portal frames. PSC Slabs: Types of prestressed concrete slab - design of one-way slab - design of two-way slab - design of simple flat slab.						

Module 4	Composite Beams and Precast Elements	Assignment	Numerical problems and validate by software	11 classes
Topics: Composite Beams: Composite construction with precast PSC beams and cast-in-situ R.C. Slab - Analysis and Design - Ultimate Strength - their applications - Special Structures like folded plates, prestressed cylindrical shells, spherical shells, partial prestressing - Principles, analysis and design concepts.				
Targeted Application & Tools that can be used: Prestressed concrete is used in a wide range of building and civil structures where its improved performance can allow for longer spans, reduced structural thicknesses, and material savings compared with simple reinforced concrete. Professionally Used Software: SAP2000, STAAD Pro-RCDC, ETABS, ProConcrete, PRE-Stress, RAM Concept and ADAPT-Floor Pro.				
Project work/Assignment:				
Text Books: 1. Krishna Raju N "Prestressed Concrete", N. Krishna Raju, TataMcgrawhill, 3rd edition, 1995. 2. Lin T.Y. and H. Burns "Design of Prestressed concrete structures", John Wiley & Sons, 1982.				
References 1. Pandit.G.S and Gupta.S.P "Prestressed Concrete", CBS Publishers, 1993. 2. Dayaratnam.P "Prestressed Concrete Structures", Oxford & IBH, 5th Edition, 1991 Web Resource: https://onlinecourses.nptel.ac.in/noc25_ce89/preview PU Resources: 1. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=CUSTOM_PACKAGE_EBSCO_29052023_257638				
Topics relevant to "Employment": Stress distribution in end block and anchorage zone stresses. Design of tension and compression members. Design of slabs and grid floors for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.				
Catalogue prepared by	Mr. Dayalan J/Mr. Ajay H A			
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025			
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025			

Course Code: CIV3412	Course Title: Bridge Design Type of Course: Professional Elective Theory	L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	1] CIV2506 Analysis of Determinate Structures 2] CIV2507 Analysis of Indeterminate Structures 2] CIV2508 Design of RCC Structural Elements					
Anti-requisites	NIL					
Course Description	The purpose of this course is to enable the students to appreciate the need for Structural Analysis and Design of Road Bridges as per Indian Road Congress Code. The course will enable the students to learn the knowledge of various types of bridge systems and the Basic Concepts in Design of Road Bridges. The knowledge of bridge design is useful for designing bridges across highway or waterway. After successful completion of the Course, the students would acquire knowledge on the various types of bridge systems, Specification of Design of Road bridges, Various types of rolling loads as per IRC code, Design of RCC slab culvert, Design of RCC T-beam bridge System and PSC Bridge girders. The course is both conceptual and analytical in nature and needs fair knowledge of Strength of Materials, Structural Analysis and Design of RCC Structural Elements. The course develops the critical thinking and analytical skills.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Bridge Design and attain Employability Skills through Problem Solving methodologies					
Course Outcomes	On successful completion of the course the students shall be able to: CO.1 Summarize basic concepts in the selection of type of bridge for a given topography and functions of different components of bridges. CO.2 Identify the standard loadings on Road bridges as per IRC6 Code. CO.3 Illustrate the design procedure for RCC Slab culvert, Box Culvert and RCC T beam as per IRC Codal provisions. CO.4 Analyze the abutment and piers for stability under different forces as per IRC.					
Course Content:						
Module 1	Introduction and Standard Load Specifications	Presentation	Case Studies on different types of bridges	12 Sessions		
Topics: Introduction: Components of Bridges, classification of bridges, masonry, arches, RCC, PSC, Steel and composite, brief description of different types and proportionate sketching. Importance of bearings and Types of bearings Choice of bridge type - Importance of proper investigation. Standard Specifications of Road bridges: Indian Road Congress Bridge Code, Width of carriageway, Clearances, loads to be considered- Dead load, IRC Standard live loads, Impact effect, Review of IRC loadings.						
Module 2	Design of RCC Slab Culvert and Box Culvert	Assignment	Numerical problems	10 Sessions		
Application of live loads on deck slabs. Design of RCC Slab Culvert: Design of RCC slab culvert for IRC Class AA tracked vehicle and IRC Class 70 R loadings. Design of Box culvert (Single vent only) - Different Loading Cases IRC Class AA Tracked, Wheeled and Class A Loading, working out the worst combination of loading, Moment Distribution, Calculation of BM & SF						

Module 3	Design of RCC T- beam Bridge	Assignment	Numerical problem	12 Sessions
Design of T- beam Bridge system- Design of Deck slab, Design of Cross Girders and Longitudinal Girders, Reinforcement detailing in Deck, cross and Main Girders.				
Module 4	Substructures and Foundation	Assignment	Numerical problem	11 Sessions
Types of Abutments and Pier. General features of Abutments, forces acting on abutments and Stability analysis of abutments. Forces acting on piers and Stability analysis of piers. Wing walls and types, Types of Bridge foundation.				
Targeted Application & Tools that can be used: Application Area is Infrastructure developing companies, Design and Construction Companies, Structural Consultancy Servicing Firms, Central and State Public Works Department. Professionally Used Software: Excel, MATLAB, SAP 2000, STAAD Pro, CSI Bridge, MIDAS.				
Project Work/Assignment: 1. **Presentation:** Presentation on case studies on different types of bridges. 2. **Assignment:** Numerical problems solving based on the topics covered in Module 2,3, and 4.				
Text Book T1. Johnson D Victor, "Essentials of Bridge Engineering", 6th Edition, 2021, Oxford and IBH Publishing Co New Delhi. T2. Krishna Raju N, "Design of Bridges", 5th Edition, 2019, Oxford and IBH Publishing Co New Delhi.				
References R1. S P Bindra, "Principles and Practice of Bridge Engineering", Dhanpat Rai and Sons New Delhi. R2. "IRC 6 – 2014 Standard Specifications and Code of Practice for Road Bridges Section II Loads and Stresses", the Indian Road Congress, New Delhi. R3. "IRC 112 – 2011 Standard Specifications and Code of Practice for Road Bridges Section III, Cement Concrete (Plain and Reinforced), the Indian Road Congress, New Delhi. E-Resources W1. Lin Weiwei, Teruhiko Yoda, "Bridge Engineering: Classifications, Design Loading, and Analysis Methods", Oxford: Butterworth-Heinemann. 2017 https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1144690&site=ehost-live W2. Bridge Engineering - https://onlinecourses.nptel.ac.in/noc25_ce112/preview				
Topics relevant to development of "Employability": Determination of design discharge-Linear water way, Economical span, Design of RCC slab culvert for IRC Class AA tracked vehicle and IRC Class 70 R loadings, Design of RCC T- beam and deck slab Bridge system, for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.				
Catalogue prepared by	Mr. Ramachandra Gollar/Mr. Gopalakrishnan N			
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025			
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025			

Course Code: CIV3413	Course Title: Design of Industrial Structures Type of Course: Professional Elective Theory	L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CIV2510 Design of Structural Steel Elements CIV2507 Analysis of Indeterminate Structures CIV2508 Design of RCC Structural Elements					
Anti-requisites	NIL					
Course Description	This course deals with requirements, planning and design of industrial structures. It covers the different types of industrial structures and planning of Industrial Structures including the requirements regarding Lighting, Ventilation and Fire Safety – Protection against noise and vibration –as per Guidelines of Factories Act. It also include the design of auxiliary structures like Bunkers & Silos, Chimneys and Pipes. The course also focus on large span roof structures and structural aspects of foundation for industrial structures.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Design of Industrial Structures and attain Employability Skills through Problem Solving methodologies					
Course Outcomes	On successful completion of this course the students shall be able to: 1] Identify the planning and functional requirements of various industries. 2] Demonstrate about the materials used and design of industry structural elements 3] Realize the basic concepts and design of power plant structures and design of power transmission structures. 4] Possess the ability to understand the design concepts of chimneys, bunkers and silos.					
Course Content:						
Module 1	Planning and functional requirements of Industrial Structures	Assignment	Numerical problems	12 sessions		
Topics: Classification of Industries and industrial structures - Planning for Layout requirements regarding lighting, ventilation and fire safety - Protection against noise and vibration - Guidelines of Factories Act.						
Module 2	Industrial Buildings	Assignment	Numerical problems	10 sessions		
Topics: Roofs for industrial buildings - Steel and RCC - Gantry girders - Design of corbels and nibs – Machine foundations						
Module 3	Power Plant & Power Transmission Structures	Assignment	Numerical problems	12 sessions		
Topics: Types of power plants – Design of turbo generator foundation – Containment structures, Principles of analysis and design of lattice towers - Transmission towers - Tower foundations – Testing Towers						
Module 4	Auxiliary Structures	Assignment	Numerical problems and validate by software	11 sessions		
Topics: Design of steel and RCC Chimneys – Bunkers and silos.						
Targeted Application & Tools that can be used:						

Application area is design of industrial structures along with the planning and functional requirements of Industries. Design of Industrial structures like power plant and power transmission towers, steel and RCC chimneys.
Professionally Used Software: StaadPro/Rivet

Project Work/ Assignment:

Text Books:

1. Advanced Reinforced Concrete Design, By N. Krishna Raju (CBS Publishers & Distributors), 3rd Edition, 2020
2. Design of Steel Structures, By Ram Chandra, Scientific publishers, 2019
3. Manohar S.N, "Tall Chimneys - Design and Construction", Tata McGraw Hill, 1985
4. Dunham, C.W., Planning of Industrial Structures, John Wiley and Sons(2001).
5. Santhakumar A.R. and Murthy S.S., "Transmission Line Structures", Tata McGrawHill, 1992.

References

1. Srinivasulu P and Vaidyanathan.C, "Handbook of Machine Foundations", Tata McGraw Hill, 1976.
2. Jurgen Axel Adam, Katharria Hausmann, Frank Juttner, Klauss Daniel, "Industrial Buildings: A Design Manual", Birkhauser Publishers, 2004. 5.
3. Procs. of Advanced course on "Industrial Structures", Structural Engineering Research Centre, Chennai, 1982
4. https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=iih&AN=143717050&site=ehost-live
5. https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=iih&AN=143771675&site=ehost-live

Topics relevant to "Employability" :
Design of turbo generator foundation, design of lattice towers, transmission towers, testing Towers for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mr. Dayalan J
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3414	Course Title: Railway Engineering & Tunnelling Type of Course: Professional Elective Theory	L-T-P-C	3	0	0	3
Version No.	1.1					
Course Pre-requisites	CIV2101 Surveying CIV2501 Transportation Engineering					
Anti-requisites	NIL					
Course Description	The course will be an introduction to the railway engineering and rail infrastructures. The course includes the railway track components and its geometric design. Concepts of railway traction, points and crossings, stations are also touched upon. The latter half deals with tunnel engineering and its various aspects and components. Tunnel lining, drainage and ventilation systems along with tunnel construction safety is also discussed in detail.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Railway Engineering & Tunnelling and attain Employability Skills through Participative Learning techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: CO.1 Explain about the railway track and its component functions. CO.2 Calculate the various parameters for geometric design of railway track. CO.3 Describe the various components of rail transportation. CO.4 Discuss the basic features of tunnel engineering and its safety features.					
Course Content:						
Module 1	Introduction to Railway Engineering	Assignment	Research Assignment	12 Sessions		
Topics: Introduction to Railway Engineering, Railway Gauge, Railway Alignment, Railway Line Survey, Track and Track Stresses, Components of a Railway Track, Coning of Wheels and Tilting of Rails, Rails, Sleepers, Ballast, Subgrade and Formation, Track Fittings and Fastenings, Creep of Rail						
Module 2	Geometric Design of Railway	Assignment	Numerical Problems	10 Sessions		
Topics: Geometric design of railway track, gradients, grade compensation, speed of trains on curves, super elevation, cant deficiency, negative super elevation, vertical curves.						
Module 3	Components of Rail Transport	Quiz	Memory Recall	11 Sessions		
Topics: Points and Crossings, Switches, Design of Turnouts, Track Junctions and Layouts, Track Maintenance, Track Drainage, Train Resistance and Tractive Power, Tractive Effort and Hauling Power of Locomotive, Railway Stations and Yards						
Module 4	Introduction to Tunnel Engineering	Assignment	Research Assignment	12 Sessions		
Topics: Tunnels: Necessity/advantage of a tunnel, Classification of Tunnels, Size and shape of a tunnel, Alignment of a Tunnel, Portals and Shafts, Methods of Tunneling in Hard Rock and Soft ground, Mucking, Lighting and Ventilation in tunnel, Dust control, Drainage of tunnels, Safety in tunnel construction.						
Targeted Application & Tools that can be used:						

Railway infrastructure development, metro rail projects, and tunnel construction. Roles in public sector units like Indian Railways, metro rail corporations, and infrastructure consultancies involved in geometric design of railway tracks, planning of stations and yards, and safe tunneling practices. Knowledge from this course is also applicable in large-scale civil projects requiring underground construction, such as highways, pipelines, and utility tunnels. Professionally Used Software: Open Rail Designer

Project Work/ Assignment:

1. Research based assignment on subsidiaries of Indian Railways
2. Numerical problems on highway geometric design
3. Memory recall quiz
4. Research based assignment on methods of tunelling

Text Books:

1. Satish Chandra and MM Agarwal, "Railway Engineering", Oxford University Press.
2. R Srinivasan, "Harbour, Dock and Tunnel Engineering", Charotar Publishing House Pvt. Ltd.

References:

1. SC Saxena and SP Arora, "A Textbook of Railway Engineering", Dhanpat Rai Publications
2. Ahuja and Birdi, "Roads, Railways, Bridges and Tunnels Enggineering", Rajsons Publications
3. K P Subramanian, "Highway Railway Airport and Harbour Engineering" Scitech Publications

Web Resourses:

NPTEL course – Transportation Engineering II - Prof. Rajat Rastogi
https://nptel.ac.in/courses/105107123

NPTEL course – Rock Mechanics and Tunneling - Prof. Debarghya Chakraborty
https://nptel.ac.in/courses/105105212

Topics relevant to "Employability": Railway Track Components and Stresses, Geometric Design of Railway Tracks, Points, Crossings, and Turnouts, Track Maintenance and Drainage, Train Resistance, Tractive Effort & Hauling Power developing Employability Skills through Participative Learning techniques. This is attained through the assessments provided.

Catalogue prepared by	Ms. Anju Mathew
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<table>
<tr><td>Course Code: CIV3415</td><td colspan="3">Course Title: Airport Engineering and Harbour
Type of Course: Professional Elective Theory</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="8">1.1</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Anti-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Course Description</td><td colspan="8">This course offers comprehensive insights into the planning, design, and functional aspects of airport and harbour infrastructure. Students will learn to design key components of airports such as runways, taxiways, aprons, and terminal areas, considering modern aircraft characteristics and air traffic requirements. The harbour engineering component covers planning and layout of ports, harbours, and docks, emphasizing real-world maritime operations such as dredging, loading/unloading, and breakwater design.</td></tr>
<tr><td>Course Objective</td><td colspan="8">The objective of the course is to familiarize the learners with the concepts of Airport Engineering and Harbour and attain Employability Skills through Participative Learning techniques.</td></tr>
<tr><td>Course Out Comes</td><td colspan="8">On successful completion of the course the students shall be able to:
CO.1 Explain the various airport characteristics and components.
CO.2 Demonstrate the design of various airport elements.
CO.3 Describe the layout and components of Harbours and Ports.</td></tr>
<tr><td>Course Content:</td><td colspan="8"></td></tr>
<tr><td>Module 1</td><td colspan="2">Airport Planning</td><td>Assignment</td><td colspan="2">Research Based Assignment</td><td colspan="2">12 Sessions</td></tr>
<tr><td colspan="9">Topics:
Airport Terminology, classification, Aircraft Characteristics, Airport survey, Site selection, Airport Size and obstructions.</td></tr>
<tr><td>Module 2</td><td colspan="2">Airport Design</td><td>Assignment</td><td colspan="2">Problem Based Assignment</td><td colspan="2">18 Sessions</td></tr>
<tr><td colspan="9">Topics:
Runway Orientation, Basic Runway Length, Geometric Design of Runway, Layout of Taxiway, Geometric Standards, Exit Taxiway, Terminal Building, Apron, Typical Airport Layout, Visual Aids, Grading and Drainage, Air Traffic Control.</td></tr>
<tr><td>Module 3</td><td colspan="2">Introduction to Harbour Engineering</td><td>Case Study</td><td colspan="2">Indian Harbours</td><td colspan="2">15 Sessions</td></tr>
<tr><td colspan="9">Topics:
Classification of Harbour, Accessibility and size of Harbours, Classification of Ports, Port Facilities, Breakwater – function and types, Planning and Layout of Ports, Docking, Repairing, Approach, Loading Unloading, Storing, Dredging and Guiding Facilities</td></tr>
<tr><td colspan="9">Targeted Application & Tools that can be used: The course is highly relevant to careers in airport and seaport infrastructure development, civil and transportation planning, and urban mobility systems. Graduates can work in airport and port authorities, infrastructure consultancy firms, construction companies, and government agencies involved in transportation and logistics. Skills in runway and port design are essential for roles in planning, execution, and maintenance of large-scale transport hubs.</td></tr>
<tr><td colspan="9">Project Work/ Assignment:</td></tr>
<tr><td colspan="9">1. Research based assignment on Aviation Scenario in India
2. Numerical problems on Airport Component Design</td></tr>
</table>

3. Case Study on the various Harbours and Ports in India	
Text Book 1. Rangwala, "Airport Engineering", Charotar 2. R. Srinivasan, "Harbour, Dock and Tunnel Engineering", Charotar	
References 1. Khanna S.K., and Arora M.G. "Airport Planning and Design", Nem chand and Bros. 2. Saxena and Subhash C, "Airport Engineering: Planning and Design" CBS Publishers 3. Oza and Oza, "Dock and Harbour Engineering", Charotar Publishing House Web Resourses: 1. NPTEL course – Transportation Engineering - II https://archive.nptel.ac.in/courses/105/107/105107123/ 2. NPTEL course – Port and Harbour Structures https://archive.nptel.ac.in/courses/114/106/114106025/	
Topics relevant to "EMPLOYABILITY SKILLS": Runway Orientation, Basic Runway Length, Geometric Design of Runway, Layout of Taxiway, Geometric Standards for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Ms. Anju Mathew
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
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Course Code: CIV3416	Course Title: Urban Transport Planning Type of Course: Professional Elective Theory	L-T-P-C	3	0	0	3
Version No.	1.1					
Course Pre-requisites	CIV2501 Transportation Engineering					
Anti-requisites	NIL					
Course Description	This Course deals with the planning of transportation systems in modern cities. This course consists of urban transport planning, modeling techniques in planning, data collection and inventories, trip generation and distribution, modal split and traffic assignment, urban mass transportation process, basic elements of transport networks, and land use planning models. It also covers essentials of transportation economics and current topics of relevance such as sustainable urban transportation, integrated public transport planning, intermediate public transport, nature of traffic problems in cities, application of technology in transportation and urban freight distribution.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Urban Transport Planning and attain Employability Skills through Participative Learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: CO.1 Describe the importance of transport planning and transportation surveys. CO.2 Explain trip generation and trip distribution in the transportation planning process. CO.3 Apply trip distribution process. CO.4 Apply basics of transportation economics for sustainable transportation.					
Course Content:						
Module 1	Introduction to Urban Transport	Assignment	Data Collection	10 Sessions		
Topics: Introduction –General , transportation in cities , future development Urban Activity System, classification of roads, types of urban or road system, urban goods movement-classification of urban goods movements ,methodology of approach to analysis of goods movement ,modelling demand for goods transport ,urban transportation system planning conceptual aspects						
Module 2	Introduction to Urban Transport Planning	Assignment	Data Collection	10 Sessions		
Topics: Transport Planning: Definition, Relevance, Scope, Systems approach to transport planning, Stages in transport planning; Urban and Intelligent Transportation, Urban Mass Transit Systems Transportation Survey: Zoning; Types of survey- Home interview Surveys, Commercial Vehicle Surveys, Taxi Surveys, etc. ; Inventory of Transport Facilities, Inventory of Land Use and Economic Activities						
Module 3	Trip Generation and Distribution	Assignment	Software Application	11 Sessions		
Topics: Trip Generation: Trips, Trip purpose, Factors Governing Trip Generation and Attraction Rates, Multiple Linear Regression Analysis, Trip Rate Analysis, Cross Classification						

Trip Distribution: Origin-Destination Matrix, Methods of Trip Distribution: Growth Factor method and Synthetic methods, Problems				
Module 4	Mode Choice, Traffic Assignment and economics	Assignment	Software Application	14 Sessions
Topics: Modal Split: Factors affecting modal split, Modal Split analysis, Logit Model, Problems, Definition and scope of transportation economics, transportation demand and supply, Concept of elasticity, marginal cost, opportunity cost, congestion pricing Concept of sustainable transportation, main approaches towards sustainable transport/freight, Solutions Traffic Assignment: Description of transport network, Purpose, Principles, Assignment Techniques, Problems				
Targeted Application & Tools that can be used Application areas: The course caters to employability of graduates as transport planners and consultants in future. The rapid growth of existing cities and development of new cities has created huge demand for transportation and its effective planning. In addition to passenger transport, the area of freight transport is promising where graduates can be employed to provide innovative solutions. It also helps nurture skills of students to apply concepts of transport planning learnt during the course in real time projects through software applications. The course also caters to environment and sustainability by helping plan and design efficient traffic management systems which can reduce congestion on roads, encourage public transport, reduce emissions and create a positive impact on the environment. Professionally used software: CUBE/TransCAD/open doors				
Text Books 1. Kadiyali L R, "*Traffic* Engineering *and Transport Planning*", Khanna Publishers, 2017. 2. Papacostas, "*Fundamentals of Transportation Planning*", Tata McGraw Hill, 2002. 3. Subash C Saxena, "*A Course in Traffic Planning and Designing"*, Dhanapat Rai and Sons, Delhi, 1989.				
References 2. Jothi Kristey and Lal, "*Introduction to Transportation Engineering"*, PHI, New Delhi, 2002. 3. Wilson AG, "*Urban and Regional Models in Geography and Planning*", John Wiley and Sons, London, 1974. 4. Hutchinson B.G, "*Introduction to Urban System Planning*", Tata McGraw Hill. E Resources: https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=103100&site=ehost-live&ebv=EB&ppid=pp_16				
Topics relevant to "EMPLOYABILITY SKILLS": Transport Planning, Urban and Intelligent Transportation, Urban Mass Transit Systems, transportation demand and supply, sustainable transportation/freight for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.				
Catalogue prepared by	Dr. Madhavi T /Ms. Sangeetha H M			
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025			
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Course Code: CIV3417	Course Title: Traffic Engineering Type of Course: Professional Elective theory	L-T-P-C	3	0	0	3
Version No.	1.1					
Course Pre-requisites	1] CIV2501 Transportation Engineering Basic insights into traffic stream characteristics					
Anti-requisites	NIL					
Course Description	The course deals with various elements of road traffic such as the road user and the vehicles. In addition, detailed discussions on various traffic studies such as volume and speed studies, accident studies will be held. Emphasis would be given on the methods of traffic data collection, fundamentals of traffic flow and highway capacity. Traffic regulation and control related topics would include design of rotaries and traffic signal design. Latest concepts of intelligent transport systems, road safety, street furniture and lighting would form an integral part of the course.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Traffic Engineering and attain Employability Skills through Participative Learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: 1] Describe the importance of traffic engineering and its components. 2] Summarize traffic stream characteristics. 3] Examine various traffic studies and their onsite applications. 4] Determine rotary and traffic signal design parameters.					
Course Content:						
Module 1	Introduction to Traffic Engineering	Quiz	Memory recall questions		8 sessions	
Topics: Introduction, Objectives and scope of traffic engineering, Mobility and Accessibility, Traffic Engineering Elements and Components of road Traffic, Road Users- the vehicle, driver and road, Traffic characteristics Problems						
Module 2	Traffic Stream	Assignment	Problem solving		7 sessions	
Topics: Traffic Stream parameter and their relationships- Traffic Density and Relationships among Macroscopic Parameters, Single Regime Traffic Stream Models, Multi-Regime Models and Characteristics of Interrupted Flow headway, density, flow, Models in traffic engineering Shockwave and queuing						
Module 3	Traffic Studies	Case Study	Data Collection		15 sessions	
Topics: Sampling in traffic studies, objectives, methods of traffic study – equipment, data collection, analysis and interpretation of Spot speeds, Speed and delay, Volume, Origin – destination, Parking and Accident studies						
Module 4	Traffic Operations	Seminar	Activity based learning		15 sessions	
Topics: Traffic Regulations, Traffic Control Devices, Signage, Intersections, Conflict Points, Rotary Design Traffic signals: Types of Signals- Fixed time and Vehicle Actuated Signals Traffic Signal Design: Determination of Optimum Cycle Length, Green time, Red time, Webster's method: Problems; Intelligent Transportation Systems Road Safety: Road crashes, Road Safety Audit, Accident Prevention, Traffic Calming						

Street Furniture, Lighting

Targeted Application & Tools that can be used

Application areas: The course caters to employability of graduates as traffic engineers in future. The rapid growth of cities with their traffic challenges provide ample opportunities for employment in future.

It also helps nurture skills of students by providing real time situations to apply concepts of traffic engineering in future such as in creating a green corridor: a signal-less organ transport corridor in a city.

The course also caters to environment and sustainability by helping plan and design efficient traffic interchanges and signals which can reduce congestion on roads and contribute to lesser carbon emissions.

Professionally used software: VISSIM, MATLAB/Python

Project work/Assignment:

Quiz: Surprise quiz will be conducted in regular class based on introduction to Traffic Engineering

Assignment: Practice problems based on traffic Stream parameter and their relationships

Case study: Students will submit a case study report on accident studies in metro cities

Seminar: There will be a group presentation, where students will present concepts related to traffic Operations

Text Books

4. Kadiyali L R, "*Traffic* Engineering *and Transport Planning*", Khanna Publishers, 4th edition 2016
5. Khanna, S.K and Justo, C.E.G., "*Highway Engineering*", Nem Chand and Bros. Roorkee (U.P), 10th edition 2018.
6. Mc. Shane, William R., Roess, Roger P. and Prassas Elena S., "*Traffic Engineering*", Pearson, 2019.

References

5. Jothi Kristey and Lal, "*Introduction to Transportation Engineering"*, PHI, New Delhi, 2002.
6. AASHTO, *"A Policy on Geometric Design of Highway and Streets"*, 2004.
7. R. J. Salter and N. B. Hounsel, *"Highway Traffic Analysis and Design"*, Macmillan Press Ltd, 1996.
8. Chandra, Satish, S. Gangopadhyay, S. Velmurugan, and Kayitha Ravinder. "Indian highway capacity manual (Indo-HCM)." (2017).
9. Gartner, Nathan H., Carrol Jl Messer, and Ajay Rathi. "Traffic flow theory-A state-of-the-art report: revised monograph on traffic flow theory." (2002).

Weblink:

W1:https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=NAP_1_29062023_3749

W2: https://archive.nptel.ac.in/courses/105/101/105101008/

Topics relevant to "EMPLOYABILITY SKILLS": Models in traffic engineering, Model traffic stream characteristics in MATLAB/Python using real time traffic data, methods of traffic study – equipment, data collection, analysis and interpretation, Perform simulation of rotary and traffic signals in VISSIM for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mr. Aayush Kumar/ Santhosh M B
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025

Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3418	Course Title: Highway Geometric Design Type of Course: Professional Elective theory	L-T-P-C	3	0	0	3
Version No.	1.1					
Course Pre-requisites	1] CIV2101 Surveying 2] CIV2501 Transportation Engineering Basics of surveying required for highway alignment and project preparation. Knowledge about sight distance, horizontal, and vertical alignment					
Anti-requisites	NIL					
Course Description	This course deals with the study of geometric design provisions for various transportation facilities as per IRC and other guidelines. Discussion of controls governing geometric design, route layout and selection. Elements of design include sight distances, horizontal alignment, transition curves, super elevation and side friction. Vertical alignment consists of grades, crest and sag curves. Highway cross-sectional elements and design of rural roads and urban streets. The course also deals with at grade inter-sections - sight distance considerations and principles of design, channelization.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Highway Geometric Design and attain Employability Skills through Problem Solving methodologies					
Course Outcomes	On successful completion of this course the students shall be able to: 1) Describe components of Geometric design in the context of transportation planning & design 2) Choose the criteria for design of various elements of highway. 3) Apply the principles of horizontal and vertical alignment design to develop typical cross-sections of highways.					
Course Content:						
Module 1	Introduction to Highway design	Quiz	Memory recall question	10 Sessions		
Topics: Introduction to highway geometric design: Definition and scope of geometric design, Introduction to various elements of Highway geometric design. Factors affecting Geometric design of Highways. Human and vehicle factors: Concepts and application of human factors in design and typical vehicle factors used in geometric design.						
Module 2	Factors affecting geometric design	Case Study	Data Collection	15 Sessions		
Topics: Sight Distances: Overview, types of sight distances, Factors affecting sight distances on highway, stopping sight distance, overtaking sight distance, overtaking zones, sight distance at intersection. Scaling and recording sight distance from a plan						
Module 3	Horizontal and Vertical Alignment	Assignment	Problem solving	20 Sessions		
Topics: Horizontal Alignment: Overview, Design speed, horizontal curve, Centrifugal ratio or impact factor, Analysis of Super-elevation, Design of Super-elevation, Attainment of Super-elevation, Radius of horizontal curve, Extra Widening, Mechanical widening, Transition curves, Setback distance, Curve resistance. Vertical Alignment: Overview, Gradient, types of gradient,						

grade compensation, Summit curve, types of summit curve, length of summit curve, Valley curve, design consideration, length of valley curve, safety criteria.

Targeted Application & Tools that can be used:

Application Areas: This course would help graduates pursue career as a full time Highway Design Engineer being able to apply basic principles for the design of roads within the context of a design problem. They would also develop skills of preparing detailed plans for such infrastructure elements. Also, can assess the environmental impacts consideration pertaining to the location and design of roads.

Professionally Used Software: MS Excel, auto cadd

Project work/Assignment:

Quiz: Surprise quiz will be conducted in regular class based on elements of highway geometric design

Case study: Students will submit a case study report on highway geometric design methodology and code adopted in various developed countries

Assignment: Practice problems based on horizontal and vertical highway alignment

Textbooks:

1. S.K Khanna, C. E. G. Justo, A Veeraragavan., „Highway Engineering“, 10th Edition: 2018
2. L. R. kadiyali & Dr. N.B. Lal, "Principles and Practices of Highway Engineering" Khanna Publishers. 6th edition 2016

Reference books:

1. Xundon Jia, Wen Cheng, Ming Guan, "Highway Geometric design", Kendall Hunt Publishing Company, 2012.

W1:https://presiuniv.knimbus.com/user#/searchresult?searchId=Knimbus%20Open%20ebooks&curPage=0&layout=grid&sortFieldId=doc_title_str&topresult=false&search_within=highway%20geometric%20design

W2: https://archive.nptel.ac.in/courses/105/101/105101087/

Topics related to development of "Employability Skills": Scaling and recording sight distance from a Plan for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mr. Santhosh M B
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
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Course Code: CIV3419	Course Title: Pavement Design Type of Course: Professional Elective theory	L-T-P-C	3	0	0	3
Version No.	1.1					
Course Pre-requisites	1] CIV2501 Transportation Engineering 2] CIV2100 Building Materials and Concrete Technology Basic insights into types of pavements and material characterization.					
Anti-requisites	NIL					
Course Description	This Course gives detailed knowledge about designing different types of pavements based on various load and climatic conditions. It consists of analysis and design of pavements, types and components, comparison between Highway and Airport pavements. Further, sub grade properties, stresses and deflections, wheel load stresses, procedures, advantages and applications of different Pavement Design Methods will be discussed.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Pavement Design and attain Employability Skills through Problem Solving methodologies.					
Course Out Comes	On successful completion of the course the students shall be able to: 1] Describe the structural and functional aspects of various types of pavements. 2] Estimate the critical design traffic for pavement design. 3] Apply concepts of flexible pavement design in practical scenario. 4] Determine stresses in concrete pavements for various load combinations.					
Course Content:						
Module 1	Introduction to Pavement Design	Quiz	Memory recall questions	08 sessions		
Topics: Requirement of pavements, Types of pavement structures, Functions of various pavement components, Introduction to factors affecting pavement design, Failure criteria in Rigid and Flexible pavement, Pavement distresses, Comparison between rigid and flexible pavement. Pavement Material Characterization– Soil, Aggregates and Bitumen.						
Module 2	Design considerations for Flexible Pavement	Assignment	Problem solving	07 sessions		
Topics: Wheel load considerations – Maximum Wheel load, Axle Configurations, Concept of tyre pressure and contact pressure, Estimation of Design Traffic. Desired material characteristics, Climatic Considerations. Introduction to analysis of stresses in Flexible pavement by layer theory concept. Maintenance of Bituminous surfaces of highways as per IRC 82.						
Module 3	Design methods of Flexible Pavements	Assignment	Problem solving	15 Sessions		
Topics: Discussion on various methods of Flexible Pavement Design – CBR/IRC Method, Group Index Method, etc. Discussion on IRC 37 guidelines for Flexible Pavement Design, Marshall Mix Design. Methods for the design of flexible airport pavement.						
Module 4	Design Considerations and Design Methods of Rigid Pavements	Case study	Data Collection	15 sessions		
Topics: Basic Concepts of analysis of stresses in Rigid pavement, Modified Westergaard's equations, Analysis of wheel load stresses, Warping stress due to temperature differential, Frictional Stress, Critical Stress combinations, Joints in cement concrete pavement and their functions.						

General Design approach, Design of dowel bars and Tie bars, Introduction to IRC 58 Guidelines
Maintenance of Rigid Pavements as per IRC SP 83.

Targeted Application & Tools that can be used

Application areas: The course is useful for graduates while seeking employment in the field of design of highway pavements or airport runways. Design engineers with higher skill set are always in demand by the industry.
Professionally used software: IIT-PAVE/MATLAB/Python/ MX- LOAD

Project work/Assignment:

Quiz: Surprise quiz will be conducted in regular class based on flexible and rigid pavements
Assignment: Practice problems based on design of flexible and rigid pavements
Case study: Students will submit a case study report on pavement construction methodologies and code adopted in various developed countries

Text Books

1. L. R. kadiyali & Dr. N.B. Lal, "Principles and Practices of Highway Engineering" Khanna Publishers. 6th edition 2016
2. *Khanna, S.K and Justo, C.E.G.,* "Highway Engineering"*, Nem Chand and Bros. Roorkee (U.P), 10th edition 201*
3. Yoder and Witezak, "*Principles of pavement design"*, John Wiley and Sons, 2011.

References

1. Yang, "*Design of functional pavements*", McGraw –Hill, 1972.
2. Huang, Y.H. "*Pavement Analysis and Design*", Pearson Education, 2008.

Weblink:

W1:https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=NAP_1_29062023_1509

W2: https://nptel.ac.in/courses/105104098

Topics relevant to "Employment :

Pavement Material Characterization, Maintenance of Bituminous surfaces of highways as per IRC 82, Maintenance of Rigid Pavements as per IRC SP 83, White topping overlay in roads for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mr. Aayush Kumar / Santhosh M B
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
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Course Code: CIV3420	Course Title: Highway Construction and Maintenance Type of Course: Professional Elective Theory	L-T-P-C	3	0	0	3
Version No.	1.1					
Course Pre-requisites	[1] Highway Engineering [2] Concrete and Highway materials testing laboratory Basics of pavement materials and their characterization.					
Anti-requisites	NIL					
Course Description	This course presents practices and techniques used in the construction of Hot-Mix Asphalt (HMA) and Portland Cement Concrete (PCC) pavements. The course is designed to provide engineering students exposure to many elements of the construction activities in order to aid in the analysis of solving construction-related problems. The course also discusses various issues affecting pavement performance and corresponding maintenance procedures being adopted for the same.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Highway Construction and Maintenance and attain Employability Skills through Participative Learning techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: 1] Discuss the working aspects of HMA and PCC pavement construction. 2] Identify the construction steps and technique used for HMA and PCC pavement construction 3] Explain various pavement distresses on-site observation. 4] Interpret the maintenance procedures for different pavement types.					
Course Content:						
Module 1	HMA Pavements	Assignment	Programming Task	10 Sessions		
Topics: Hot Mix Asphalt (HMA): Difference between construction of HMA and PCC pavements. Introduction, plant operations, Surface preparation, HMA mix delivery, placement & compaction, HMA construction problems and troubleshooting.						
Module 2	PCC Pavements	Case Study	Data Collection	12 Sessions		
Topics: Portland Cement Concrete (PCC): Introduction, Plant operations, Paving techniques, Curing and Sawing and Traffic management on PCC pavements						
Module 3	Bituminous pavement maintenance	Assignment	Data Collection	12 Sessions		
Topics: Highway Maintenance, repair & Overhaul: Introduction, Highway maintenance components, common types of road failures, their causes and remedies. Maintenance of Bituminous pavements (patch work and surfacing)						
Module 4	RCC maintenance	Assignment	Data Collection	11 Sessions		
Topics: Rigid Pavement Maintenance, repair & Overhaul: Maintenance of concrete roads, filling cracks, repairing joints, maintenance of shoulder (berm). Mechanized maintenance of roads, Maintenance management system (MMS)						
Targeted Application & Tools that can be used: Application Area is in the field of Highway projects under Public sector (NHAI, AAI) or private sector as Supervising Engineers to ensure that roads are constructed in accordance with the technical specifications, optimizing use of available materials thus minimizing project cost. They						

can also be employed in Quality control (QC) sector having knowledge of various tests and desirable properties of the construction materials. Professionally Used Software: Python, MATLAB
Text Books 1. Khanna, S.K and Justo, C.E.G., "*Highway Engineering*", Nem Chand and Bros. Roorkee (U.P), 1998. 2. Dar-Hao Chen and Cindy Estakhri, *"Material, Design, Construction, Maintenance, and Testing of Pavement"*, Geotechnical Special Publications, American Society of Civil Engineers, 2009. 3. Freddy L. Roberts and Kandhal, P.S., *"Hot Mix Asphalt Materials, Mixture Design and Construction*", University of Texas Austin, Texas, NAPA Education Foundation Lanham, Maryland, 1991.
References 1. A T Papagiannakis and E A Masad, *"Pavement Design and Materials"*, John Wiley & Sons, 2008. 2. Web link: https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=iih&AN=156634368&site=ehost-live
Topics relevant to "EMPLOYABILITY SKILLS": HMA and PCC plant operations for development Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mr. Navneet Singh/Mr Santhosh M B
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3421	Course Title: Advanced Soil Mechanics Type of Course: Professional Elective & Theory	L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CIV2512 Geotechnical Engineering					
Anti-requisites	NIL					
Course Description	This Course is intended to cover the most advanced aspects such as shear strength, stress path, consolidation problems and properties of soil as an engineering material and its effect in laying foundation systems.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Advanced Soil Mechanics and attain Employability Skills through Problem Solving methodologies.					
Course Outcomes	On successful completion of this course the students shall be able to: CO.1 Describe the behavior of soil under effective stress conditions. CO.2 Demonstrate the various factors governing the consolidation behavior of soils. CO.3 Determine the shear strength parameters for the design of geotechnical structures.					
Course Content:						
Module 1	Effective Stress	Assignment	Memory Recall based Quiz	15 Sessions		
Topics: The principle of effective stress, Total stress, Porewater pressure and their variations, Effective stresses in partially saturated soils, effective stress in soil mass under hydrostatic conditions, effective stress in soil mass with capillary fringe, effective stress in soil mass with surcharge at ground level.						
Module 2	Compressibility and consolidation	Assignment	Numerical solving task	20 Sessions		
Topics: Compressibility and Consolidation: One-, two- and three-dimensional compression, Oedometer test, parameters – coefficient of volume change, constrained modulus, compression index, swell for loading and unloading, maximum past consolidation stress, Over-consolidation ratio, Primary and secondary compression, consolidation - One-, two- and three-dimensional problems, Consolidation of partially saturated soils, Creep/Secondary Consolidation. Radial consolidation, pre-compression of clay deposits with and without sand drains, secondary consolidation - factors affecting, related problems.						
Module 3	Shear Strength of Soil	Assignment	Numerical solving task	10 Sessions		
Topics: Mohr-Coulomb theory; measurement of shear strength, drainage conditions, stress paths, pore pressure parameters, Hvorslev's strength theory.						
Targeted Application & Tools that can be used: This course emphasizes the importance of soil parameters used in construction of foundations, roads, railways and open excavations. Professionally Used Software: PLAXIS 2D						
Project Work/ Assignment: Assignment: Memory Recall based Quiz is assigned to from Module 1						

Numerical solving task is assigned from Module 2 and 3.	
Text Book: 1. B.M. Das, Advanced Soil Mechanics, CRS Press, 4th edition, 2013 2. Terzaghi and Peck, Soil Mechanics in Engineering Practice, John Wiley & Sons, 3rd edition, 1996	
References 1. Bowles, J.E. – Foundation Analysis and Design, 5th Edition, BBS Publisher, 2009. 2. Mitchell J.K, Fundamentals of soil Behaviour, John Wiley & Sons, 3rd edition, 2013	
Topics relevant to "EMPLOYABILITY SKILLS": Collection of data on soil strength for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Dr. Madhavi T
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3422	Course Title: Stability of Slopes Type of Course: Professional Elective & Theory	L-T-P-C	3	0	0	3
Version No.	1.1					
Course Pre-requisites	CIV2514 Foundation Engineering					
Anti-requisites	NIL					
Course Description	The course aims at providing geotechnical engineers with a comprehensive view on soil slope stability. It addresses landslide types and mass movement classification; slope failure mechanisms and methods for slope stability analysis are discussed; remedial measures and risk analysis are presented.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Stability of Slope and attain Employability Skills through Problem Solving methodologies.					
Course Outcomes	On successful completion of this course the students shall be able to: CO.1 Determine the slope stability under various loads. CO.2 Choose mechanics of limit equilibrium procedures. CO.3 Prepare the design reinforced slope.					
Course Content:						
Module 1	Slope Stability Conditions for Analysis	Assignment	Memory Recall based Quiz	20 Sessions		
Topics: Slope Stability Conditions for Analysis: Introduction, end-of-construction stability, long-term stability, rapid (sudden) drawdown, earthquake, partial consolidation and staged construction, other loading conditions- Rapid Flood Loading, Surcharge Loading. Stability analysis: Stability analysis by the Swedish slip circle method, Stability analysis by friction circle method, Taylor's stability number and stability curves, Wedge method, Stability analysis during steady seepage, during sudden drawdown and during & immediately after construction. Special design problems and details: Design considerations during earthquake, Partial Submergence and Intermediate Water Level and analysis cases for earth and rockfill dams.						
Module 2	Mechanics of Limit Equilibrium Procedures	Assignment	Numerical solving task	15 Sessions		
Topics: Mechanics of Limit Equilibrium Procedures: Equilibrium conditions, single free-body procedures- infinite slope procedure, logarithmic spiral procedure.						
Module 3	Reinforced Slopes and Embankments	Assignment	Numerical solving task	15 Sessions		
Topics: Reinforced Slopes and Embankments: Introduction, limit equilibrium analyses with reinforcing forces, factors of safety for reinforcing forces and soil strengths - method a equations, method b equations, types of reinforcement, reinforcement forces - creep, installation damage, and deterioration in properties over time, pullout resistance, allowable reinforcement forces and factors of safety, orientation of reinforcement forces, reinforced slopes on firm foundations and embankments on weak foundations.						

Targeted Application & Tools that can be used: This course would most benefit persons who are involved in the design and analysis of slope stability for various civil engineering projects such as roadways, railway and earthen dams. Professionally Used Software: Plaxis 2D and 3D
Project Work/ Assignment:
Assignment: Memory Recall based Quiz is assigned to from Module 1 Numerical solving task is assigned from Module 2 and 3.
Text Book: 1. Soil Strength and Slope Stability, 2nd Edition, J. Michael Duncan Stephen G. Wright Thomas L. Brandon.
References: 1. Soil Mechanics and Foundation Engineering by V N S Murthy, CBS Publishers and Distributors, New Delhi, First edition 2007. 2. Shulka and Yin, Fundamentals of Geosynthetic Engineering Taylor and Francis group, London 2010. Website: https://www.youtube.com/watch?v=e8WUMP6Rt94 Notes/PPT: https://nptel.ac.in/content/storage2/courses/105101001/downloads/L20.pdf
Topics relevant to "EMPLOYABILITY SKILLS": Assisting with the design of slopes; Design of embankments for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Dr. Madhavi T
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
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<table>
<tr><td>Course Code:
CIV3423</td><td colspan="3">Course Title: Ground Improvement Techniques
Type of Course: Professional Elective & Theory</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="8">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="8">CIV2514 Foundation Engineering</td></tr>
<tr><td>Anti-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Course Description</td><td colspan="8">The Course deals with the concepts of improvement of construction sites that are not suitable for supporting physical infrastructure such as buildings, bridges, highways, tunnels and dams. When such conditions arises then soil needs to be treated using ground improvement techniques. Ground improvement methods improve the engineering properties of the soil mass which is treated to meet project performance requirements.</td></tr>
<tr><td>Course Objective</td><td colspan="8">The objective of the course is to familiarize the learners with the concepts of Ground Improvement Techniques and is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies.</td></tr>
<tr><td>Course Outcomes</td><td colspan="8">On successful completion of this course the students shall be able to:
CO.1 Examine the problems associated with the existing ground condition and problematic soils.
CO.2 Demonstrate various techniques of ground modifications and suggest the methods of ground improvement techniques.
CO.3 Determine the application potential, basic principles and mechanism of geo-synthetics.</td></tr>
<tr><td>Course Content:</td><td colspan="8"></td></tr>
<tr><td>Module 1</td><td colspan="2">Introduction to Ground Improvement Technique</td><td>Assignment</td><td colspan="3">Memory Recall based Quiz</td><td>1 Sessions</td></tr>
<tr><td colspan="9">Topics:
Introduction to Ground Improvement Techniques, Definition, Objectives of ground improvement, need for ground improvement techniques, Classification of ground improvement techniques, Emerging trends in ground improvement techniques, soil distribution in India, Alteration of ground after formation, Reclaimed soils. Types of problematic soils and their problems.</td></tr>
<tr><td>Module 2</td><td colspan="2">Mechanical, Hydraulic and chemical Ground Modifications</td><td>Assignment</td><td colspan="3">Numerical solving task</td><td>20 Sessions</td></tr>
<tr><td colspan="9">Topics:
Compaction- Definition, Effect of compaction on various properties of soil, Smooth wheel rollers, Sheep foot rollers, and Pneumatic tired rollers.
Deep compaction- Blasting, Vibratory probe, vibratory compactors and vibroflotation, compaction quality control, Engineering behaviour of compacted fine grained soil. Hydraulic modification- Introduction, seepage, Filter requirement, Hydraulic modification- Purpose of dewatering, open sump methods, well point system, Electro-kinetic stabilization, Preloading and types of vertical drains, Chemical modification with the addition of admixtures-Lime, fly-ash and bitumen. Physical modification- Purpose of grouting and aspects of grouting.</td></tr>
<tr><td>Module 3</td><td colspan="2">Inclusion methods of Ground Improvement</td><td>Assignment</td><td colspan="3">Numerical solving task</td><td>15 Sessions</td></tr>
</table>

Topics: Soil reinforcement-Geo-synthetics, Geo-synthetics types, Functions and applications of geo-synthetics. Stone columns, Ground anchors-Types of ground anchors and its applications, soil nailing-Purpose of soil nailing, Applications of soil nailing, Micro-piles-Advantages of micro-piles, Rock bolts-Principles of rock bolts and their functions.
Targeted Application & Tools that can be used: The most technically challenging and time critical infrastructure projects and transportation sectors in the portfolio of roads, rail, water and building development projects. Professionally Used Software: Plaxis 2D and 3D
Project Work/ Assignment:
ssignment: Memory Recall based Quiz is assigned to from Module 1 Numerical solving task is assigned from Module 2 and 3.
Text Book: 1. Manfired R. Hausmann, "Engineering Principles of Ground Modification", McGraw-Hill Pub, Co. 2. P. Purushothama Raju, "Ground improvement Techniques", USPT3. S. Ramamrutham, R. Narayan, "Theory of Structures", Dhanpat Rai Publishing Company.
References 1. Koerner, R. M., "Designing with geosynthetics", Prentice Hall Inc. 2. K. Krisch & F. Krisch (2010) – Ground Control and Improvement, John Wiley & Sons 1994 Website: https://nptel.ac.in/courses/105/108/105108075/ e-book- https://books.google.co.in/books?id=cDGIhh7ttMcC&printsec=copyright#v=onepage&q&f=false Notes/PPT: https://nptel.ac.in/courses/105/105/105105210/
Topics relevant to "EMPLOYABILITY SKILLS": Advising on procedures required and the suitability of construction materials; Analysis of sites for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

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<table>
<tr><td>Course Code: CIV3424</td><td colspan="3">Course Title: Reinforced Earth Structures
Type of Course: Professional elective Theory</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="8">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="8">CIV2514 Foundation Engineering</td></tr>
<tr><td>Anti-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Course Description</td><td colspan="8">This course caters to Mechanically stabilized earth walls (MSEWs) are cost effective and aesthetically pleasing. The basic concept behind MSEWs is to combine soil, reinforcing materials made of steel or polymers, and appropriate facing to produce a composite system with engineering properties that are ideal for roadway applications, construction of steep embankments.</td></tr>
<tr><td>Course Objective</td><td colspan="8">This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies.</td></tr>
<tr><td>Course Outcomes</td><td colspan="8">On successful completion of this course the students shall be able to:
CO.1 Determine the application potential, basic principles and mechanism of geo-synthetics.
CO.2 Examine the appropriate material properties and parameters used in design.
CO.3 Prepare the design of reinforced earth retaining walls.</td></tr>
<tr><td>Course Content:</td><td colspan="8"></td></tr>
<tr><td>Module 1</td><td colspan="2">Introduction to reinforced soil structures</td><td>Assignment</td><td colspan="3">Memory Recall based Quiz</td><td>10 Sessions</td></tr>
<tr><td colspan="9">Topics:
Introduction to reinforced soil structures: Historical background, comparison with reinforced cement concrete structures, Principles, concepts and mechanisms of reinforced earth.</td></tr>
<tr><td>Module 2</td><td colspan="2">Types of Geosynthetic materials and their testing</td><td>Assignment</td><td colspan="3">Memory Recall based Quiz</td><td>15 Sessions</td></tr>
<tr><td colspan="9">Topics:
Types of geosynthetic materials used and their properties, laboratory testing, constructional details, metallic strips, metallic grids, geotextiles, geogrids, geomembranes and geocomposites, their functions and design principles.</td></tr>
<tr><td>Module 3</td><td colspan="2">Application of Geosynthetics and design</td><td>Assignment</td><td colspan="3">Case study</td><td>20 Sessions</td></tr>
<tr><td colspan="9">Topics:
Application of Geosynthetics – Pavements, Clay Liners, Soil erosion Introduction, Design methods, Function and Mechanism, Geotextile properties and test methods. – Physical, Mechanical and Hydraulic properties, Construction methods and techniques using Geotextiles, Design applications of reinforced soil structures: Bearing capacity Improvement, Reinforced Earth Walls.</td></tr>
<tr><td colspan="9">Targeted Application & Tools that can be used:
This course would most benefit persons who are involved in the design and construction of earth retention structures for various civil engineering projects.
Professionally Used Software: Plaxis 2D and 3D</td></tr>
<tr><td colspan="9">Project Work/ Assignment:</td></tr>
<tr><td colspan="9">Memory Recall based Quiz is assigned to from Module 1

Numerical solving task is assigned from Module 2.</td></tr>
</table>

Case study: The students will be given a case study on Module 3 and students submit report.	
Text Book: 1. Koerner, R.H. Designing with geosynthetics, Prentice Hall Inc, 5TH Edition, 2005.	
References 1. Jones, C.J.F.P. Reinforcement and soil structures, Thomas Telford, 1996. 2. Jewel, R.A. Soil reinforcement with geotextiles (Special publication), CIRIA, 1996. 3. Ingold, J.S. and Miller, K.S., Geotextiles hand book, Thomas Telford Ltd, 1988 4. Shulka and Yin, Fundamentals of Geosynthetic Engineering Taylor and Francis group, London 2010 Website: https://nptel.ac.in/courses/105/108/105108075/ Notes/ PPT: https://nptel.ac.in/courses/105/106/105106052/	
Topics relevant to "Employability Skill": Assisting with the design of reinforced walls; Bearing capacity improvement in railways and roadways for developing EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Dr. Madhavi T
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
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Course Code: CIV3425	Course Title: Advanced Foundation Design Type of Course: Professional Elective	L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CIV2514 Foundation Engineering CIV2508 Design of RCC Structural Elements					
Anti-requisites	NIL					
Course Description	The course will review the related geotechnical knowledge and apply theory to foundations. The design examples are illustrated and will show application of theory into practice. All key concepts related to foundation will be explained and emphasis will be placed on the practical application of the information provided.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Advanced Foundation Design and attain Employability Skills through Problem Solving methodologies.					
Course Outcomes	On successful completion of this course the students shall be able to: CO.1 Select appropriate foundations type based on available soil conditions. CO.2 Determine the load carrying capacity of each type of foundation. CO.3 Analysis and design of reinforced concrete shallow foundations, pile foundations, well foundations, and machine foundations.					
Course Content:						
Module 1	Shallow Foundations	Assignment	Collection of data	12 Sessions		
Topics: Soil investigation – Basic requirements of foundation – Types and selection of foundations. Bearing capacity of soil, Bearing Capacity of Foundations with Uplift or Tension Forces, Bearing Capacity Based on Building Codes (Presumptive Pressure), Safety Factors in Foundation Design, - plate load test – Design of reinforced concrete isolated, strip, combined and strap footings.						
Module 2	Pile Foundations	Assignment	Software/ Plaxis 2D	10 Sessions		
Topics: Introduction – Types of pile foundations – load carrying capacity - pile load test – structural design of straight piles – different shapes of piles cap – structural design of pile cap.						
Module 3	Caisson Foundations	Assignment	Numerical Problems	12 Sessions		
Topics: Types of Caisson foundation – Standard Caisson – Pneumatic Caisson – construction of standard caissons –Final positions of caissons, Functions.						
Module 4	Machine Foundations	Assignment	Numerical Problems	11 Sessions		
Topics: Introduction – Types of machine foundation – Basic principles of design of machine foundation – Dynamic properties of soil – vibration analysis of machine foundation’						
Targeted Application & Tools that can be used: This course is emphasizes the analysis and design of foundations based on different soils. Professionally Used Software: SAFE						
Project Work/ Assignment:						

Text Book:

1. V.N.S.Murthy, Advanced Foundation Engineering, CBS publishers & distributors, first edition (2017)
2. Tomlinson, M. J. and Booman, R. Foundation Design and Construction, Prentice Hall Publishing, 2001.

References

1. Bowles, J.E. – Foundation Analysis and Design, 5th Edition, BBS Publisher, 2009.
2. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indian edition, 2012

E-Resources:

https://web.s.ebscohost.com/ehost/resultsadvanced?vid=6&sid=680fe419-e0f6-4c8d-b6ac-7777ec3d0447%40redis&bquery=geotechnical+engineering&bdata=JmRiPWUwMDB4d3cmZGI9bmxlYmsmdHlwZT0xJnNlYXJjaE1vZGU9U3RhbmRhcmQmc2l0ZT1laG9zdC1saXZl

Topics relevant to "EMPLOYABILITY SKILLS": Advising on design and the suitability of foundation along with its construction materials for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Dr. Madhavi T
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Course Code: CIV3426	Course Title: Earth and Earth Retaining Structures Type of Course: Professional elective Theory		L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CIV2514 Foundation Engineering					
Anti-requisites	NIL					
Course Description	The course will review the related geotechnical knowledge and apply theory to retaining walls. The design examples are illustrated and will show application of theory into practice. All key concepts will be explained, and emphasis will be placed on the practical application of the information provided.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Earth and Earth Retaining Structures and attain Employability Skills through Problem Solving methodologies.					
Course Outcomes	On successful completion of this course the students shall be able to: CO.1 Compute the lateral earth pressure acting on retaining structures. CO.2 Prepare the design for rigid retaining walls. CO.3 Prepare the design of coffer dams.					
Course Content:						
Module 1	Earth Pressure Theories	Assignment	Numerical solving task	15 Sessions		
Topics: Earth Pressure Theories: Introduction, active and passive earth pressures, earth pressure at rest, Rankine's theory for determination of active and passive earth pressure, coefficient of earth pressure at rest, earth pressure distribution, total earth pressure and its point of application, determination of tension cracks and critical height for unsupported excavation, effect of water table on earth pressure, Coulomb's theory of active and passive earth pressure, Culmann's and Rebhann's graphical methods for determination of active and passive earth pressures.						
Module 2	Rigid retaining structures	Assignment	Numerical solving task	16 Sessions		
Topics: Rigid Retaining Structures: Types of retaining walls, Stability (sliding, overturning, bearing capacity) of gravity and cantilever walls, design principles of retaining walls, Effect of backfill material and drainages, Empirical methods and Stability analysis.						
Module 3	Flexible retaining structures and Coffer dams	Assignment	Case study	14 Sessions		
Topics: Flexible Retaining Structures: Sheet pile walls, Construction methods- Cantilever and Anchored sheet pile wall. Coffer dams & Cellular coffer dams: Introduction – types of coffer dams - Design of cellular coffer dams on rock and Soil.						
Targeted Application & Tools that can be used: This course emphasizes the design of earth retaining structures used in construction of roads, railways and open excavations. Professionally Used Software: Plaxis 2D and 3D						

Project Work/ Assignment:	
Memory Recall based Quiz is assigned from Module 1 and 2. Case study: The students will be given a case study on Module 3 and students submit report.	
Text Book: 1. Clayton, C.R.I., Woods, R.I., Bond, A.J., Milititsky, J. – Earth Pressure and Earth-retaining structures, CRC Press, Taylor and Francis group, 2013. 2. Budhu, M. – Foundations and Earth retaining structures, John Wiley & Sons, Inc., 2008.	
References 1. Bowles, J.E. – Foundation Analysis and Design, 5th Edition, BBS Publisher, 2009. 2. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indian edition, 2012 Website: https://nptel.ac.in/content/storage2/courses/105101083/download/lec26.pdf E-book: https://pdfcookie.com/documents/foundations-and-earth-retaining-structures-muni-budhu-9lgry89n8y2o Notes/PPT: https://nptel.ac.in/courses/105/101/105101083/	
Topics relevant to "EMPLOYABILITY SKILLS": _ Assisting with the design of retaining structures; Design of Braced cuts for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Dr. Madhavi T
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<table>
<tr><td>Course Code:
CIV3427</td><td colspan="4">Course Title: Designing of soil structures with Geosynthetics

Type of Course: Professional Elective Theory</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="9">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="9">CIV2512 Geotechnical Engineering and CIV2514 Foundation Engineering</td></tr>
<tr><td>Anti-requisites</td><td colspan="9">Nil</td></tr>
<tr><td>Course Description</td><td colspan="9">This course caters to geosynthetics as construction materials in civil engineering projects. It will introduce the concept of geosynthetics, their manufacturing process, behavior and applications in different civil engineering designs. Geosynthetics have emerged as an exciting material in wide array of applications such as transportation, Geotechnical, environmental, hydraulics and all activities which include soils and rocks.</td></tr>
<tr><td>Course Objective</td><td colspan="9">The objective of the course is to familiarize the learners with the concepts of Designing of soil structures with Geosynthetics and attain Employability Skills through Problem Solving methodologies.</td></tr>
<tr><td>Course Out Comes</td><td colspan="9">On successful completion of this course the students shall be able to:
• Illustrate the principles and mechanisms of reinforced soil.
• Demonstrate applications of reinforced soil.
• Prepare the design of different type of structures using geosynthetics</td></tr>
<tr><td>Course Content:</td><td colspan="9"></td></tr>
<tr><td>Module 1</td><td colspan="3">Introduction and need for geosynthetics</td><td>Assignment</td><td colspan="3">Memory Recall based Quiz</td><td colspan="2">12 Sessions</td></tr>
<tr><td colspan="10">Topics:
Historical background - Introduction to geosynthetics reinforced soil structures, comparison of geosynthetics reinforcement with reinforced cement concrete structures, Principles, concepts and mechanisms of geosynthetic reinforced soil.</td></tr>
<tr><td>Module 2</td><td colspan="3">Types of Polymers as Geosynthetics and Manufacturing Techniques</td><td>Assignment</td><td colspan="3">Memory Recall based Quiz</td><td colspan="2">15 Sessions</td></tr>
<tr><td colspan="10">Topics:
Materials used and their properties such as physical properties, mechanical and chemical properties, laboratory testing and constructional details, geotextiles, geogrids, geomembranes and geocomposites, their functions and design principles.</td></tr>
<tr><td>Module 3</td><td colspan="3">Strength Analysis of Reinforced Soils</td><td>Assignment</td><td colspan="3">Numerical solving task</td><td colspan="2">18 Sessions</td></tr>
<tr><td colspan="10">Topics:
Design applications of reinforced soil structures such as separation, reinforcement. Filtration, drainage, containment and combination: Bearing capacity Improvement, Reinforced Earth Walls, Slopes, Soil Nailing, design of structures using geosynthetics.</td></tr>
<tr><td colspan="10">Targeted Application & Tools that can be used:
The module contents emphasize the application of the principles of geosynthetics reinforced soil, Reinforced earth has so many applications in construction work. Some of the</td></tr>
</table>

applications include its use in stabilization of soil, construction of retaining walls, bridge abutments for highways, industrial and mining structures. Professionally used Software: Plaxis 2D and 3D.
Project Work/Assignment:
Assignment: Memory Recall based Quizzes will be assigned from Module 1 and 2. Numerical solving task will be assigned from Module 3.
Textbooks T1. Koerner, R.H. Designing geosythetics, Prentice Hall Inc, 5TH Edition, 2005.
References R1. Jones, C.J.F.P. Reinforcement and soil structures, Thomas Telford, 1996. Website: https://nptel.ac.in/courses/105106052 Notes/PPT: https://archive.nptel.ac.in/content/syllabus_pdf/105106052.pdf E Resources Presidency University: https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1805050&site=ehost-live&ebv=EB&ppid=pp_3_1
Topics relevant to "EMPLOYABILITY SKILLS": Measuring and modeling: Soil Hydraulic Characteristics, Measurement of Shear Strength and determination of phase properties of unsaturated soil for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

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Course Code: CIV3428	Course Title: Environmental Pollution and Control Type of Course: Professional Elective & Theory Only Course		L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CHE7601 Environmental Studies					
Anti-requisites	NIL					
Course Description	The purpose of this course is to enable the students to improve the understanding of various pollution control strategies and the application skills of remediation techniques for different environmental components i.e. air, water and soil. Professional environmental engineers have a significant role and benefits to guard the quality of our environmental resources in many ways including: environmental cleanup, water quality treatment, smart waste disposal and preventing industrial air and noise pollution. They chose and design water and sewage treatment plants that clean water for human use. This is a theory based course which will give an idea of different sources, effects and control of pollution, Environmental Hygiene etc.					
Course objective	The objective of the course is to familiarize the learners with the concepts of Environmental Pollution and Control and attain Employability Skills through Participative Learning techniques.					
Course Outcomes	On successful completion of the course the students shall be able to: CO1. Recognize the various sources of water pollution and control methods. CO2. Explain the behaviour of air pollutants in atmosphere and its control strategies. CO3. Summarize the impact and control measures of industrial noise Pollution.					
Course Content:						
Module 1	Water Pollution and Control	Assignment	Data Collection/ Interpretation	14 Sessions		
Topics: Definition, Sources and effects of Water Pollution. Water borne diseases. Drinking water quality Characteristics and standard limits. Water Quality index. Langelier and Ryznar indices. Biodegradation: aerobic and anaerobic decomposition processes. Oxygen sag curve. Control Techniques: Methods of Waste water treatment. Water Quality index. Water (Prevention and Control of Pollution) Act, 1974 and Rules.						
Module 2	Air Pollution and Control	Assignment	Data Collection/ Interpretation	12 Sessions		
Topics: Definition, Sources, classes and effects of air pollution. Air borne diseases. Air quality characteristics and standard limits. Formation and effects of photochemical smog and PAN particles. Types of inversion, Temperature lapse rate & stability, wind velocity & turbulence, plume behavior, Plume Rise, Gaussian dispersion model. Control Techniques: Particulate matter and gaseous pollutants- settling chambers, cyclone separators, scrubbers, filters & ESP. Air quality index. Air (Prevention & Control of Pollution) Act, 1981 and Rules.						
Module 3	Noise and Soil Pollution and control	Case study	Data Interpretation / Analysis	10 Sessions		
Topics: Concept of Sound. Decibel levels of common noises. Hazards of noise pollution. Effects of noise-physiological and psychological effects, Measurement of noise levels. Engineering description of noise and sound, sound pressure level, frequency, and propagation. Sound Level and Noise standards. Principles of Noise reduction. Noise reduction possibilities. Noise protecting equipments. Control of industrial noise pollution in industries.						

Targeted Application & Tools that can be used:
This course helps the students to understand the basic principles of measurement and monitoring techniques of environmental parameters.

Project Work/ Assignment:

5. Assignment: Students will submit in written Memory recall and Numerical solving task on module 1 and 2.
6. Seminar: Students will give presentation on relevant topics in group.

Text Books:

T1. M N Rao and H V N Rao, *Air pollution, Tata McGraw-Hill publishing company limited, New Delhi*. 1990.
T2. C.S. Rao, *Environmental Pollution Control Engineering, New Age International*. 2007.
T3. De A.K., *Environmental Chemistry", New Age Publisher International Pvt Ltd*. 2016.

References:

R1. Brady N.C., *The Nature and Properties of Soil, Prentice-Hall India*. 1996.
R2. Eckenfelder W, *Industrial Pollution Control, McGraw Hill Int. Ed*. 1999.

Web sources:
W1:https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DOAB_1_06082022_21589

Topics relevant to development of "Employability": Environment laws, water quality index, air quality index. Regulatory bodies: SPCB, CPCB for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout

Catalogue prepared by	Dr. Venkatesha Raju K and Mr. Bhavankumar M
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3430	Course Title: Climate Change and Sustainable Development Type of Course: Professional Elective/ Theory Only Course		L-T-P-C	3	0	0	3
Version No.	1.1					
Course Pre-requisites	CHE7601 Environmental Studies					
Anti-requisites	NIL					
Course Description	The purpose of this course is to enable the students to provide a general concept within the dimensions of climate change and challenges to Sustainable Development.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Climate change and Sustainable development and attain Employability Skills through Participative Learning techniques.					
Course Outcomes	On successful completion of the course the students shall be able to: CO.1 Outline the key concepts on Sustainable development and Climatic change. CO.2 Generalize the climatic mitigations and risk involved in climate change for sustainable development. CO.3 Distinguish the relationship between climate change and sustainable development. CO.4 Identify tools for analysis and Development for Sustainable development. CO.5 Infer on Climatic adaptations for attaining risk Resilience					
Course Content:	Introduction to Climatic change, Social Issues with Climate change, Climatic mitigations, Climate change and sustainable development, Tools for analysis and Development for Sustainable development and climatic adaptation.					
Module 1	Introduction to Climatic change	Quiz	Quiz	9 Sessions		
Topics: Climate Change, Global Warming, Acid Rain, Ozone Layer Depletion, Nuclear Accidents & Nuclear Holocaust. The Environment Protection Act. Issues involved in Enforcement of Environmental Legislation. Public Awareness.						
Module 2	Social- Economic Dimensions of Climate change	Quiz	Quiz	9 Sessions		
Topics: From Unsustainable to Sustainable Development. Urban Problems Related to Energy. Water Conservation, Rainwater Harvesting and Watershed Management. Resettlement & Rehabilitation: Social, Economic and Environmental Concerns. Community based adaptation and Social Resilience.						
Module 3	Climatic mitigations and Low Carbon Pathways	Assignment	Understanding and Analysing the concepts	9 Sessions		
Topics: Green House Gas Emission, Energy supply and consumption, Renewable Energy transition. Introduction to carbon neutrality and Net Zero concept, Lifestyle and Technological solution for emission reduction						
Module 4	Climate change and sustainable development	Assignment	Understanding and Analysing the concepts	9 Sessions		
Topics: Relationship between climate change and sustainable development, Economic, social and environmental risks arising from climate change, Vulnerability, adaptation and adaptive						

capacity, Mitigation and mitigative capacity, tunnelling to restructure growth more sustainably and Relevant principles for policy formulation.				
Module 5	Tools for analysis and Development for Sustainable development and climatic adaptation	Presentation	Discussion on Real world Case	9 Sessions
Topics: Relationship between climate change and sustainable development, Economic, social and environmental risks arising from climate change, Vulnerability, resilience, adaptation and adaptive capacity, Mitigation and mitigative capacity. National Action Plan, Water Security, Food Security, Health Risk Resilience, Urban Risk Resilience and Disaster Risk Resilience.				
Targeted Application & Tools that can be used: This course helps the students to understand the basic concepts of climate change & its mitigation, with special reference to India's commitment towards climate change and policy. Professionally Used Software: MS office				
Project Work/Assignment: 1. Quiz: Quiz will be conducted to evaluate the student's understanding of Module 1 and Module 2. 2. Assignment: Students will be evaluated for their ability to understand and analyse the concepts of Module 3 and 4 3. Presentation: Students will present real world cases in group presentation and discuss the solution based on the knowledge imparted from the course.				
Text Book T1 R.K. Pachauri, "*Climate Change and Sustainable Development"*, OXFORD University Press, 2015.				
References R1 Mohan Munasinghe, "Climate Change and Sustainable Development". R2 M.L. Narasaiah, "Biodiversity and sustainable Development", Discovery publishing House, New Delhi. Online Source E book link: https://www.researchgate.net/profile/Mohan-Munasinghe/publication/228790602_Climate_Change_and_Sustainable_Development_Linkages_Points_of_Departure_From_The_IPCC_TAR/links/0deec521b8af3d0e0d000000/Climate-Change-and-Sustainable-Development-Linkages-Points-of-Departure-From-The-IPCC-TAR.pdf				
Topics relevant to "EMPLOYABILITY SKILLS": Urban Risk Resilience and Disaster Risk Resilience, adaptation and adaptive capacity, Mitigation and mitigative capacity, Industry visits for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.				
Catalogue prepared by	Ms. Shwetha A / Dr. Venkatesh Raju			
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025			
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025			

<table>
<tr><td>Course Code: CIV3431</td><td colspan="4">Course Title: Urban Waste Management
Type of Course: Professional Elective/ Theory Only Course</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="9">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="9">CIV3444 Environmental pollution and Control</td></tr>
<tr><td>Anti-requisites</td><td colspan="9">NIL</td></tr>
<tr><td>Course Description</td><td colspan="9">This course demonstrates to get on broader understandings on various aspects of solid waste management in terms of collection, transfer, transport and management of urban solid waste.</td></tr>
<tr><td>Course Objective</td><td colspan="9">The objective of the course is to familiarize the learners with the concepts of Urban Waste Management and attain Employability Skills through Participative Learning techniques.</td></tr>
<tr><td>Course Out Comes</td><td colspan="9">On successful completion of the course the students shall be able to:
CO.1 Recognise the sources and composition of solid waste with collection and transport system.
CO.2 Compare the solid waste disposal techniques in terms of energy recovery and volume reduction
CO.3 Summarize the best management practices to be adopted by waste generators and stakeholders.</td></tr>
<tr><td>Course Content:</td><td colspan="9"></td></tr>
<tr><td>Module 1</td><td colspan="3">Introduction to urban solid Wastes.</td><td>Assignment</td><td colspan="2">Data Collection/ Interpretation</td><td colspan="2">16 Sessions</td></tr>
<tr><td colspan="10">Topics:
Terminologies, Sources and Types of solid wastes, Physical and Chemical composition of municipal solid waste. Generation rate-numerical Problems. Determination of composition of MSW Waste collection systems, analysis of collection system. Need for transfer operation, transport means and methods, transfer station types and design requirements. Solid waste management 2000 rules with 2016 amendments.</td></tr>
<tr><td>Module 2</td><td colspan="3">Processing, Energy recovery Disposal of Urban Solid wastes</td><td>Assignment</td><td colspan="2">Data Collection/ Interpretation</td><td colspan="2">16 Sessions</td></tr>
<tr><td colspan="10">Topics:
Purpose of processing; Mechanical volume and size reduction. Treatment; Biomedical waste, E-waste, Construction and Demolition waste. Energy recovery; aerobic and anaerobic composting and incinerators. Disposal: land farming, deep well injections. Landfills: Design and operation-site selection, Geo-environmental investigations, engineered sites, liners and covers, leachate control and treatment, gas recovery and control-utilization of recovered gas and landfill monitoring and reclamation.</td></tr>
<tr><td colspan="10"></td></tr>
<tr><td>Module 3</td><td colspan="3">Management of Urban Waste Services</td><td>Assignment</td><td colspan="2">Data Collection/ Interpretation</td><td colspan="2">13 Sessions</td></tr>
<tr><td colspan="10">Topics:
Concepts of waste Management; reduction, recycling and reuse, 3R’s and 5R’s. Present scenario of SWM in Urban Local Bodies: Current practices and deficiencies; Case studies of some of the successfully operating Waste to Energy plants; Role of informal sectors in SWM. Waste generators and other stakeholders (Ministries, Pollution control boards, Local authorities, Manufacturers, Industries, etc.); Criteria for setting up of solid waste management facilities; Time frame for implementation and monitoring etc.</td></tr>
<tr><td colspan="10">Targeted Application & Tools that can be used:
This course helps the students to understand the basic principles of life cycle assessment of urban solid waste management.</td></tr>
</table>

Professionally Used Software:
Project Work/ Assignment: 7. Assignment: Students will submit in written Memory recall and Numerical solving task on module 1 and 2. 8. Seminar: Students will give presentation on relevant topics in group.
Text Books: T1. Tchobanoglous, G., Theisen, H., & Vigil, S. A. (2014). Integrated Solid Waste Management: Engineering Principles and Management Issues. New Delhi: McGraw-Hill Education (India) Private Limited. T2. Peavy, H. S., Rowe, D. R., & Tchobanoglous, G. (2010). Environmental Engineering. New York: McGraw-Hill. T3. Khan, I. H., & Ahsan, N. (2012). Textbook of solid waste management. New Delhi: Satish Kumar Jain for CBS Publisher and Distributors.
References: R1. CPHEEO (2000). Manual on Municipal Solid Waste Management, Central Public Health and Environmental Engineering Organisation, Ministry of Urban Development, Govt. of India, New Delhi. R2. Notification on "Municipal Solid Waste Management Rules, 2016 and its amendments, MoEF & CC, Govt. of India". Web sources: W1. https://www.intechopen.com/chapters/67974
Topics relevant to development of "Employability skill": Waste collection systems, analysis of collection system, visit to solid waste dumping sites for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Dr. Venkatesha Raju K
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
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Course Code: CIV3432	Course Title: Urban Flood Analysis and Control Type of Course: Professional Elective Theory Only Course	L-T-P-C	3	0	0	3
Version No.	1.2					
Course Pre-requisites	CIV2505 Hydrology and Irrigation Systems CIV3100 Disaster mitigation and management Basic concepts of hydrology, Disaster Management, Climate change.					
Anti-requisites	Nil					
Course Description	The purpose of the course is to give an understanding of the concepts of hydrology under the implications of climate change. The course also provides insights about urban flood and its analysis. It also emphasizes the concepts of Hydrology in conjunction with climate change and it implication on flood occurrences and mitigation. The nature of the course is theory based, and it discusses the concept of climate change in hydrology and its control and management.					
Course Objective	This course is designed to develop Employability skills by using problem solving methodologies.					
Course Outcomes	On successful completion of the course the students shall be able to: 1. Explain the influence of urban density on floods 2. Describe the key uncertainties of climate and expected consequences of climate change 3. Explain the impacts of land use change on runoff. 4. Interpret the concept of Resilience, Vulnerability, Robustness & Sustainability of flood response 5. Prepare plan for Sustainable drainage systems					
Course Content						
Module 1	Introduction	Quiz	Case study	10 Sessions		
Introduction: The influence of climate, causes of flooding, types of flooding, fluvial/pluvial flooding, principles of land use planning Climate Change: Key uncertainties and Robust Findings: A review of the past, signs of change, Expected consequences						
Module 2	Hydrology of cities	Assignment	SWMM	15 Sessions		
Urban hydrological cycle, Land use & runoff, Urban flood risk assessment, Tangible & intangible damages, Loss of life estimation in flood risk assessment, flood risk mapping Urban drainage systems: A historical perspective, Major & Minor flows, SUDS/LIDS, Practices in water sensitive urban design						
Module 3	Responding to Flood Risk	Assignment 2	Case study	20 Sessions		
Responses, Resilience, Vulnerability, Robustness & Sustainability, SPR Model, Confronting flood management with land use planning, Building types, infrastructure & public open spaces Enhancing coping & recover capacity: Flood forecasting warning and response, Emergency Planning, Management & Evacuation						

Targeted Application & Tools that can be used: To design and optimize urban drainage system for mitigating Flood, SWMM (Storm water Drainage Model)

Project work/Assignment:

Quiz: Based on urban flooding and climate cahnge
Assignment 1: Case study and discussion on Drainage systems of smart cities
Assignment 2: Flood mitigation and forecasting model.

Text Book

T1. Chris Zevenbergen, Adraian Cashman, Erik Pasche and Richard Ashely. —Urban Flood Management‖, CRC Press-2010 Edition

T2. Richard Ashley, Stephen Garvin, Erik Pasche, Andreas Vassilopoulos, Chris Zevenbergen. - Advances in Urban Flood Management‖ CRC Press-2007 Edition.

References

R1. Wheater, H. S., Mcintyre, N., Jackson, B. M., Marshall, M. R., Ballard, C., Bulygina, N. S., Reynolds, B. and Frogbrook, Z. —Multiscale Impacts of Land Management on Flooding‖, Wiley-Blackwell, Oxford, UK, (2010).

R2. Arun Kumar. —Handbook of Flood Management: Flood Risk Simulation, Warning, Assessment and Mitigation‖, SBS Publisher, India, Vol. 1 2009

R3.https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=iih&AN=152368126&site=ehost-live

Web resources: https://www.edx.org/course/flood-risk-management

Topics related to "Employability Skills": Flood Management in Urban areas: case study, LID practices to Urban drainage systems for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Aashi Agarwal/Santhosh M B
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3433	Course Title: Integrated watershed management Type of Course: Professional Elective Theory	L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	Basic concepts of hydrology and hydrogeology, Water resource management.					
Anti-requisites	Nil					
Course Description	The course is interdisciplinary in nature, the technical concepts of hydrology, hydrogeology are intertwined with integrated approach in resource management concepts for efficient management of water sources for a sustainable development.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Integrated watershed management and attain Employability Skills through Participative Learning techniques.					
Course Outcomes	On successful completion of the course the students shall be able to: CO.1 Understand and apply integrated approach techniques for water resource management. CO.2 Comprehend and apply concepts of conjunctive use for efficient water resource management. CO.3 Understand the concept and need for rainwater harvesting systems					
Course Content:						
Module 1	Integrated watershed resource management	Case study	Data Collection/ Data Analysis	10 Sessions		
Introduction to integrated approach: Issues and challenges, Natural systems, Human systems, Interaction of natural and human systems, IWRM Principles, concepts and planning, Implementation, Development and management, community participation and local capacity building, IWMA models and case study of IWRM adaptions in urban cities.						
Module 2	Conjunctive use of water	Assignment 1, Case study	Data Interpretation / Analysis	12 Sessions		
Introduction, Surface and groundwater, Conjunctive use; Necessity, Indian scenario on consumption status of groundwater and surface water resources, Advantages, limitations, management, schemes, Mechanisms, Modelling of water resources management systems, Case study.						
Module 3	Rainwater harvesting systems and Roof catchment system	Assignment 2, Case study.	Interpretation	08 Sessions		
Introduction, Hydrological aspects, Hydrogeological aspects, Groundwater recharge, Integrated systems, Case study. Rainwater harvesting system, Roof water catchment system, Urban water scarcity, RWH; Costs, safety and water quality, maintenance, case study						
Targeted Application & Tools that can be used: IOT Applications in smart water management.						
Project Work/ Assignment:						
Text Book 1. K. Subramanya, Engineering Hydrology, Tata McGraw Hill Publishers, New Delhi. 2. H.M. Raghunath, Ground Water, Wiley Eastern Publication, New Delhi.						

3. Daniel P. Loucks and Eelco van Beek, Water Resources Systems. Planning and Management, UNESCO Publication

References

1. Lal, Ruttan.Integrated Watershed Management in the Global Ecosystem. CRC Press, New York.
2. Heathcote, I. W. Integrated Watershed Management: Principles and Practice. 1988. John Wiley and Sons, Inc., New York

E book link R1: https://web.s.ebscohost.com/ehost/detail/detail?vid=15&sid=cbc51846-7bf7-482b-8aac-fbd99ab97ee4%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#

E book link R2: https://web.s.ebscohost.com/ehost/detail/detail?vid=16&sid=cbc51846-7bf7-482b-8aac-fbd99ab97ee4%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#

E book link R3: https://web.s.ebscohost.com/ehost/detail/detail?vid=0&sid=543f92bf-0b83-4c38-920f-46755d05e915%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#

Topics relevant to "EMPLOYABILITY SKILLS": Rainwater Harvesting System Designing for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout

Catalogue prepared by	Dr. Venkatesh Raju
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3434	Course Title: Environmental Hydraulics Type of Course: Professional Elective Course/ Theory only	L-T-P-C	3	0	0	3
Version No.	1.1					
Course Pre-requisites	CIV2503 Fluid Mechanics					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Environmental Hydraulics and attain Employability Skills through Participative Learning techniques.					
Anti-requisites	NIL					
Course Description	The course provides basic knowledge of hydraulics for application in quantitative water management (e.g. design of rivers, flood protection measures and hydraulic structures). By concentrating on a detailed explanation of the laws of conservation of mass, momentum and energy, turbulent mixing and dispersion in rivers and estuaries, the course aims at providing the student a clear understanding of steady water flow through conduits, rivers and canals.					
Course Outcomes	On successful completion of this course the students shall be able to: 1. Identify the hydraulic behaviors of open channels and their causes 2. Define the turbulent mixing and dispersion in rivers and estuaries 3. Analyze a Turbulent dispersion and mixing in Vertical and transverse direction 4. Explain the process of turbulent dispersion in natural systems					
Course Content:						
Module 1	Introduction to open channel flow	Assignment	Program to calculate area and discharge of different channel sections	10 classes		
Introduction: Fluid properties, Fluid statics, Open channel flows, Fundamentals of open channel flows, Fundamental principles, Open channel hydraulics of short, frictionless transitions, the hydraulic jump, Open channel flow in long channels, Channel transitions including bed and width changes.						
Module 2	Turbulent Mixing and Dispersion in Rivers and Estuaries	Case study	Case study on mixing and dispersion in rivers	10 classes		
Introduction to mixing and dispersion in natural waterways, Laminar and turbulent flows, turbulent shear flows jets and wakes, Boundary layer flows, fully developed open channel flows, mixing in turbulent shear flows Diffusion: basic theory, Basic equations and Applications, Mathematical aids, Advective diffusion: Basic equations, Basic applications, Two- and three-dimensional applications						
Module 3	Turbulent dispersion and mixing: Vertical and transverse mixing	Assignment	Calculation of boundary share stress and the shear velocity	12 sessions		
Introduction, Flow resistance in open channel flows, Vertical and transverse (lateral) mixing in turbulent river flows, Turbulent mixing applications, Friction factor calculations, Turbulent mixing in hydraulic jumps and bores.						
Module 4	Turbulent dispersion and mixing: Longitudinal dispersion, Turbulent dispersion in natural systems	Assignment	Numerical problems on longitudinal dispersion	13 sessions		
Introduction, One-dimensional turbulent dispersion, Longitudinal dispersion in natural streams, Approximate models for longitudinal dispersion, Design applications, Longitudinal						

dispersion in natural rivers with dead zones, Dispersion and transport of reactive contaminants, Transport with reaction

Targeted Application & Tools that can be used:

Apply Open channel flow and dispersion principles to design and analyze river systems for flood management, pollution control and environmental impact assessment

Project Work/Assignment:

1. Assignment: Numerical probles in each module will be given to evaluate the students understanding on the concept.
2. Case Study: Real time study and application of the knowledge

Textbooks

1. Hubert Chanson, "Environmental Hydraulics of Open Channel Flows", Elsevier Butterworth-Heinemann publications, 2004.

References

1. Zheng, C. and Bennett, G. D., Applied contaminant Transport Modeling, A John wiley & sons, inc, publication, Newyork, 2002.
2. Martin, L.J. and McCucheon, S.C, Hydrodynamics of transport for water quality modeling, Lewis Publishers, Boca Raton, 1999.

Web Source

3. https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=189593&site=ehost-live&ebv=EB&ppid=pp_Cover

Topics relevant to "EMPLOYABILITY SKILLS": Longitudinal dispersion in natural stream for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mr Santhosh M B
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3435	Course Title: Industrial Wastewater Treatment Type of Course: Professional Elective Theory Only	L-T-P-C	3	0	0	3
Version No.	1.1					
Course Pre-requisites	CIV2516 Wastewater Treatment and Disposal Systems					
Anti-requisites	NIL					
Course Description	Industrial wastewater treatment covers the mechanisms and processes used to treat waters that have been contaminated in some way by anthropogenic industrial or commercial activities prior to its release into the environment or its re-use. The focus of this course is on management of industrial wastewater including topics such as cleaner production, industrial water management, toxicity, physical chemical processes, anaerobic industrial wastewater treatment, and sludge management and treatment.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Industrial Wastewater Treatment and attain Employability Skills through Participative Learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: 1] Discuss the self-purification streams. 2] Describe the different treatment methods for various types of industrial wastewater. 3] Explain Process flow sheet showing origin / sources of waste water for selected industry.					
Course Content:						
Module 1	Stream Quality	Quiz	Quiz	15 Classes		
Topics: Introduction: Domestic and Industrial Wastewater, Effect on Streams and on Municipal Sewage Treatment Plants, Stream Sampling, effluent and stream Standards, Self-Purification of natural streams, Zones of Pollution, Stream Quality Dissolved oxygen Sag Curve in Stream.						
Module 2	Treatment Methods	Presentation	Various treatment Methods	15 Classes		
Topics: Volume Reduction, Strength Reduction, Neutralization, Equalization and Proportioning. Removal of Inorganic suspended solids, organic Solids, suspended solids and colloids, Treatment and Disposal of Sludge Solids, Advanced Treatments.						
Module 3	Treatment- Industrial Wastewater	Assignment	Flowcharts for origin and treatment Processes	15 Classes		
Topics: Process flow sheet showing origin / sources of wastewater- Tanning industry, Distillery and Sugar Industry, Paper and Pulp Industry, Textile Industry and Steel industry, Pharmaceutical and petrochemical Industry.						
Targeted Application & Tools that can be used Application Area is Sewage Treatment Plants, Effluent treatment plants. Professionally Used Software: GPS-X(hydromantis), QGIS, BioWin. Project Work/Assignment: 1. Quiz: Quiz will be conducted for students to evaluate the understanding of basic concepts						

2. Presentation: Students will present the various treatment methods adopted for various pollutant. 3. Assignment: Students will draw flowcharts for various industrial processes.	
Text Book T1. Rao and Datta, "Industrial Waste Treatment", Oxford and IBH Publishing Co.Pvt.Ltd., NewDelhi, 1987. T2. Dr. A. D. Patwardhan, "Industrial WasteWater Treatment", Prentice Hall of India.	
References R1. Metcalf & Eddy, "Wastewater engineering: treatment and reuse" McGraw Hill Publications. R2. Nelson Nemerow, "Industrial Waste Treatment", Addison –Wesley., 2007 Web source: nptel.ac.in/courses/105105350	
Topics relevant to development of "Employability": Treatment methods of Industrial Wastewater for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Mr. Bhavan Kumar, Dr. Mohammad Shahid G
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3436	Course Title: Open Channel Flow Type of Course: Professional Elective Theory		L-T-P-C	3	0	0	3
Version No.	1.2					
Course Pre-requisites	1] CIV2503 Fluid Mechanics 2] CIV2505 Hydrology and Irrigation Systems Basic insights related to fluid dynamics, hydraulics, canal and irrigation system					
Anti-requisites	NIL					
Course Description	The purpose of this course demonstrates the concept of free surface flows. It shall apply the fundamental laws of mechanics (conservation of mass, momentum, and energy) to a wide variety of flows, categorized by their spatial and temporal variability. It will help students to develop an understanding of free surface flow, and they will be able to analyse the flow conditions and flow profiles at control sections. This is a theory-based course which will give basic understanding of flow through open channels.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Open Channel Flow and attain Employability Skills through Problem Solving methodologies.					
Course Out Comes	On successful completion of the course the students shall be able to: 1] Describe the specific energy curve and its applications in channel transitions. 2] Examine the flow profiles under gradually varied flow. 3] Interpret the various energy dissipaters.					
Course Content:						
Module 1	Introduction to Free surface flow	Quiz	Memory recall questions	10 Sessions		
Topics: Basic concepts of free surface flows, velocity and pressure distribution, Mass, energy and momentum principle for prismatic and non-prismatic channels, Review of Uniform flow: Standard equations, hydraulically efficient channel sections, Energy-depth relations: Concept of specific energy, specific force, critical flow, critical depth, hydraulic exponents, and channel transitions. HEC-RAS for computing energy-depth relations.						
Module 2	Gradually Varied Flow	Assignment	Problem solving	15 Sessions		
Topics: Equation of gradually varied flow and its limitations, flow classification and surface profiles, Control sections, Computation methods and analysis: Integration of varied flow equation by analytical method. Using HEC-RAS for determining the water surface profiles at various reaches.						
Module 3	Rapidly Varied flow	Case Study	Data Collection/ Data Analysis	20 Sessions		
Topics: Rapidly Varied Flow: Concepts, hydraulic jump in rectangular channels, classification of jumps, characteristics of jump – length location height, application of hydraulic jump stilling basins, shape type-2 and type-4. Hydraulic jump in rectangular channels, Sloping channels, Jump in non-rectangular channels, application of hydraulic jump as energy dissipater. Design of energy dissipaters.						

Targeted Application & Tools that can be used:

Application Area is Critical flow, Channel design, Energy dissipation

Professionally Used Software: HEC-RAS, HEC-HMS.

Project work/Assignment:

Quiz: Surprise quiz will be conducted in regular class based on introduction to open channel flow

Assignment: Practice problems based on gradually and rapidly varied flow

Case study: Students will submit a case study report on hydraulic jumps and energy dissipaters

Text Books

T1 Chow,V.T." Open Channel hydraulics" McGraw Hill Publication. 3rd edition 2003

T2 Subramanya, K., Flow through Open Channels, TMH, New Delhi 3rd edition 2008

References

R1. Rajesh Srivastava, Flow through Open Channels , Oxford University Press

R2. Streeter, V.L.& White E.B., "Fluid Mechanics" McGraw Hill Publication

W1: https://presiuniv.knimbus.com/user#/searchresult?searchId=Knimbus%20Open%20ebooks&curPage=0&layout=grid&sortFieldId=doc_title_str&topresult=false&search_within=open%20channel%20flow

W2: https://nptel.ac.in/courses/105107059

Topics related to "Employability Skill": Design of energy dissipaters for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Aashi Agarwal/Mr. Santhosh B
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3437	Course Title: Water Resource Management Type of Course: Professional Elective	L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	Hydrology and Irrigation Systems					
Anti-requisites	NIL					
Course Description	The purpose of this course is to introduce water resources planning and management. It involves the processes in hydrologic cycle that includes measurement, computation, estimation and determination in each area. The benefit of the course is learning concepts like integrated water resources management and develop best low impact developmental practices to improve watershed as an entity. The nature of the course is theory based and deals with water resources problems, its control and utilization.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Water Resources Management and attain **Employability Skills** through **Participative Learning techniques**.					
Course Outcomes	On successful completion of this course the students shall be able to: 7) Outline the issues related to planning and management of water resources. 8) Summarize the implementation of IWRM in different regions. 9) Explain various water harvesting techniques					
Course Content:						
Module 1	Water resources Planning	Assignment	Memory recall task	15 Sessions		
Topics: Water Resources Planning and Management: Necessity, System components, planning scales, Approaches, planning and management aspects, Analysis, Models for impact prediction and evaluation, Adaptive Integrated Policies, Post Planning and management Issues						
Module 2	Integrated Water Resources Management	Assignment	Memory recall task	15 Sessions		
Topics: Integrated Water Resources Management: Definition of IWRM, Principles, Implementation of IWRM, Legislative and Organizational Framework, Types and Forms of Private Sector Involvement.						
Module 3	Water Management	Seminar	Participative learning	15 Sessions		
Topics: Water Harvesting and Conservation: Water Harvesting Techniques – Micro-catchments - Design of Small Water Harvesting Structures – Farm Ponds – Percolation Tanks – Yield from a Catchment, Rainwater Harvesting-various techniques related to Rural and Urban area.						
Targeted Application & Tools that can be used: Application Area is Integrated watershed management, Watershed modelling Professionally Used Software: GIS						
Project Work/Assignment: 9. Assignment: Students will submit in written Memory recall task on module 1 and 2. 10. Seminar: Students will give presentation on relevant topics in group.						
Text Books 1. S K. Subramanya, Engineering Hydrology, Tata McGraw Hill Publishers, New Delhi, April 2024. 2. Mollinga, P. et al, Integrated Water Resources Management, Water in South Asia Volume I, Sage Publications, 2006.						
References						

R1. Dhruva Narayana, G. Sastry, V. S. Patnaik, Watershed Management, CSWCTRI, Dehradun, ICAR Publications, 1997 Web link: https://archive.nptel.ac.in/courses/105/108/105108081/	
Topics relevant to "Employability Skills": IWRM and Water quality modelling for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Mr. Bhavan Kumar
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3438	Course Title: Advanced Fluid Mechanics Type of Course: Professional Elective Theory	L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	Concepts of Engineering Mechanics, Computational modelling, Vector calculus and Differential Equations.					
Anti-requisites	Nil					
Course Description	This is an advanced course in Fluid Mechanics. The subject Fluid Mechanics has a wide scope and is of prime importance in several fields of engineering and science. Present course emphasizes the fundamental underlying fluid mechanical principle. This course is a well-balanced coverage of physical concepts, mathematical operations along with examples and exercise problems of practical importance. The course will provide a strong fundamental understanding of the basic principles of Fluid Mechanics and will be able to apply the basic principles to analyze fluid mechanical systems					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Advanced Fluid Mechanics and attain Employability Skills through Problem Solving methodologies.					
Course Outcomes	On successful completion of the course the students shall be able to: 1) Recognize the concepts of fluid motion to practical problems. 2) Apply concepts by dimensional and model analysis. 3) Interpret the concept of compressible and viscous flow and CFD Applications. 4) Illustrate the flow in laminar and turbulent state and Concepts of boundary layer theory.					
Course Content:						
Module 1	**Fluid mechanics and open channel flow**	Quiz	Memory recall questions	10 Sessions		
Topics: Review on Fluid Properties, Concept of fluid kinematics; Methods of describing fluid motion, Fluid Dynamics; Momentum equation, force exerted by a flowing fluid on a Pipe-Bend, Moment of Momentum equation, Introduction to Navier Stokes equation. Open Channel flow**:** Introduction, Continuity equation. Uniform flow Chezy's and Manning's equations for uniform flow in open channel, velocity distribution, most efficient channel section. Energy and Momentum Principles Critical depth, concepts of specific energy and specific force, Channel Transitions (Hump and Width reduction) **Notches and Weirs:** Classification, discharge over rectangular, triangular, trapezoidal notches, Cippoletti notch, broad crested weirs						
Module 2	**Dimensional analysis and Model Analysis**	Assignment	Problem solving	10 Sessions		
Topics: **Dimensional analysis:** Need for dimensional analysis, Dimensions and units, Dimensional Homogeneity and dimensionless ratios, methods of dimensional analysis, Rayleigh's method, Buckingham Pi theorem, Similitude and Model studies. Numerical problems. **Model Analysis:** Similitude and types, Types of forces acting in moving fluid, Dimensionless numbers, Models laws or similarity laws.						
Module 3	**Compressible Flow and Viscous flow**	Assignment	Problem solving	15 Sessions		

Topics: **Compressible Flows:** Introduction, thermodynamic relations of perfect gases, internal energy and enthalpy, speed of sound, pressure field due to a moving source, basic Equations for one-dimensional flow, stagnation and sonic Properties, normal and oblique shocks. **Viscous flow:** Reynold's Number, Entrance flow and Developed flow, Laminar flow between parallel plates, Poiseuille equation – velocity profile, Couette flow, Fully developed laminar flow in circular pipes, Hagen - Poiseuille equation, related numerical. **Introduction to CFD:** Necessity, limitations, philosophy behind CFD, and applications.				
Module 4	Mechanics of Laminar and Turbulent flow, Boundary layer theory	seminar	Activity based learning	10 Sessions
Topics: Introduction; Laminar and turbulent flows; viscous flow at different Reynolds number - wake frequency; laminar plane Poiseuille flow; stokes flow; flow through a concentric annulus structure and origin of turbulent flow. Introduction; Boundary layer equations; displacement and momentum thickness, shape factor; flow over a flat plate similarity transformation, integral equation for momentum and energy; skin friction coefficient and Nusselt number; separation of boundary layer; critical Reynolds number; control of boundary layer separation.				
Targeted Application & Tools that can be used: [Computational fluid Dynamics is a science that uses data structures to solve issues of fluid flow, Applications: cavitation prevention, aerospace engineering, HVAC engineering				
Project work/Assignment: **Quiz:** Surprise quiz will be conducted in regular class based on concepts of fluid mechanics and open channel floe **Assignment:** Practice problems based on dimensional analysis, compression and viscous flow **Seminar:** Students will give seminar presentation on topics related to Mechanics of Laminar and Turbulent flow, Boundary layer theory				
Text Book 1. P N Modi and S M Seth, "Hydraulics and Fluid Mechanics, including Hydraulic Machines", 20th edition, 2015, Standard Book House, New Delhi 2. R.K. Bansal, "A Text book of Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi				
References S K SOM and G Biswas, "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw Hill, New Delhi W1:https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DOAB_1_06082022_8868 W2: https://archive.nptel.ac.in/courses/112/105/112105218/				
Topics relevant to "EMPLOYABILITY SKILLS": Computational Fluid Dynamics, Dimensional Analysis for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.				
Catalogue prepared by	Mr Santhosh M B			
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025			
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025			

Course Code: CIV3439	Course Title: Statistics in Hydrology Type of Course: Professional Elective Theory Only Course	L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	Basic Mathematics and Basics of Hydrology					
Anti-requisites	-Nil-					
Course Description	This purpose of the course is to provide an overview on understanding the use of statistics in hydrologic systems. The course will benefit the students as it will develop insights about analysis of hydrologic extremes. It also benefits the student to understand the concepts of Hydrology in context of uncertainty and to develop forecasting models. The nature of the course is theory based and it discusses the concept of statistics in hydrology.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Statistics in Hydrology and attain Employability Skills through Problem Solving methodologies					
Course Outcomes	On successful completion of the course the students shall be able to: 1) Analyse hydrological data 2) Calculate frequency analysis of hydrologic extremes 3) Apply hypothesis testing using chi square and KS tests.					
Course Content:						
Module 1	Introduction to Statistical Hydrology	Quiz	Quiz	15 Sessions		
Topics: Deterministic and Stochastic Hydrology, review of concepts of probability, probability axioms, Random variables and their properties, probability distribution and probability density function, Discrete and continuous probability distributions used in hydrology, moments and expectations of distributions.						
Module 2	Analysis of hydrologic extremes	Assignment	Numerical Problems	15 Sessions		
Topics: Frequency analysis of extreme events, extreme value distributions, analysis of floods, droughts and other natural hazards, regional flood frequency analysis. Correlation analysis and correlation coefficient, Simple linear regression, Multivariate regression analysis, Correlation coefficient and its significance in regional analysis, analysis of variance, applications – rainfall-runoff analysis.						
Module 3	Hypothesis testing and Time series analysis	Assignment	Numerical Problems	15 Sessions		
Topics: Hypothesis testing, goodness test of fit tests, Chi Square test and KS test, Hydrologic Time Series Analysis, Hydrologic time series, components of hydrologic time series, analysis of hydrologic time series.						
Targeted Application & Tools that can be used: This Course helps student to apply the fundamentals of statistical techniques in hydrologic systems and help to understand the forecasting models.						
Project/Assignment: 1. Quiz: MCQs to check the students understanding of concepts 2. Assignments: Numerical problems to evaluate application of statistics in hydrological data analysis						
Textbook T1. Hann, C.T., "Statistical Methods in Hydrology", First EastWest Press Edition, New Delhi, 1995.						
References R1. Clarke, R.T., "Statistical Models in Hydrology", John Wiley, Chinchester,1994.						

Web Source: https://web.s.ebscohost.com/ehost/detail/detail?vid=0&sid=8459efd5-754d-49e5-98ed-d395ec913af4%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d# https://web.s.ebscohost.com/ehost/detail/detail?vid=0&sid=8f1dd173-e7d7-4bdd-ab36-7df6b823570b%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#	
Topics relevant to "EMPLOYABILITY SKILLS": Correlation analysis, Frequency analysis of extreme events, extreme value distributions, analysis of floods, droughts and other natural hazards, for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Ms. Aashi Agarwal
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3440	Course Title: Environmental management Systems and Audits Type of Course: Professional Elective Theory Only Course		L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CHE7601 Environmental Studies					
Anti-requisites	-Nil-					
Course Description	This course will introduce the students to the basics of environmental management systems and their role in reducing overall environmental impacts within industry and business operations. The concepts of this course provide an overview of the purpose of an EMS model and ISO 14001 systems and how companies adopt/implement them. This course also focus on auditing process in terms of using the audit as a management tool for environmental performance.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Environmental management Systems and Audits and attain Employability Skills through Participative Learning techniques					
Course Out Comes	On successful completion of the course the students shall be able to: 1] Explain environmental management system (EMS) concepts, guidelines and requirements of the ISO 14001 standard. 2] Describe the stages of EMS implementation, best practice techniques and principles to achieve continual improvement in an organization 3] Identify and utilize various tools and techniques such life cycle assessment, environmental audits, evaluation of environmental performance for environmental decision-making					
Course Content:						
Module 1	Introduction to Environmental Management system	Assignment	Case Study	15 Sessions		
Topics: Overview of the state of the global environment, the earth's natural systems, sustainability and sustainable development–Case study. Evaluation tools of environmental management system (EMS), organizational barriers, management responsibility, elements and extent of application, EMS structure						
Module 2	ISO 14000 and ISO140001	Assignment	Conceptual understanding	15 Sessions		
Topics: ISO 14000-Background, the ISO 14000 series, business and standards, voluntary standards and ISO 14000 and world practice, international chamber of commerce principles, ISO in developing world; ISO 14001 & elements of EMS-environmental policy, planning, implementation and operation checking & correction action and management review–Case study						
Module 3	Audit and Life Cycle Assessment	Quiz	Quiz	15 Sessions		
Topics: Scope and objectives, standards for auditing, registration, implementing the audit, procedures, benefits, environmental auditing as a management tool-Case study. Components of LCA, measuring environmental impact life-cycle stages, strategic framework for LCA and LCA-a tool for sustainability-Case study.						
Targeted Application & Tools that can be used: This Course helps student to assess effects of anthropogenic activities on environmental components and learn to combat environmental issues through apposite measures and management strategies.						
Project work/Assignment:						

1. Assignment: Assignment will be given to evaluate the conceptual understanding of the subject with case study 2. Quiz: MCQs to evaluate the students' understanding.	
Text Book T1. Tinsley Stephen. 2009. Environmental Management Systems, Taylor and Francis, United Kingdom.	
References R1. Ajith Sankar, 2015. Environmental Management, Oxford University, Web Source: https://web.s.ebscohost.com/ehost/detail/detail?vid=3&sid=7d4d85f1-eabc-4503-ad63-06d8335dcf19%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#	
Topics relevant to "EMPLOYABILITY SKILLS": Environmental auditing as a management tool. Components of LCA, measuring environmental impact life-cycle stages, for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Dr. Venkatesha Raju K.
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3441	Course Title: Introduction to Infrastructure System and Planning Type of Course: Professional Elective Theory	L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CIV1200 Foundations of Integrated Engineering					
Anti-requisites	NIL					
Course Description	The purpose of this course is to enable the students to appreciate the need for Infrastructure, which is instrumental in promoting economic growth of any country. The course is conceptual in nature where the students learn what is Infrastructure, types and challenges and the planning. This helps the students to develop the critical thinking pertaining to the infrastructure development and corresponding usage to the mankind.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Introduction to Infrastructure System and Planning and attain Employability Skills through Participative Learning techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: 1) Explain core concepts of problem-solving, ethics, environment, and safety in engineering projects. 2) Describe sustainability principles and the engineer's role in sustainable development. 3) Apply sustainability assessment tools to evaluate the environmental impact. 4) Explain the basic concepts of automation, IoT, robotics, AI, machine learning, and 3D printing in the context of engineering applications. 5) Describe the functions of digital modeling, simulation, and project management tools used in integrated engineering projects					
Course Content:						
Module 1	Introduction to Infrastructure	Assignment	Theory based			18 Sessions
Topics: Definitions of infrastructure; Types of Infrastructure systems, Phases in Infrastructure Planning, Transportation Infrastructure (Roads, Bridges, Airports, Ports, Waterways), Transportation Research using GIS, Urban and Rural Infrastructure, Water and Sanitation Infrastructure (Water Supply Systems, Sewage treatment systems), Public –private partnerships (PPP) in Water and sanitation, Energy Infrastructure (Dams, power plants, power distribution and transmission facilities, pipelines)						
Module 2	Infrastructure Planning	Presentation	Case Study using Primavera/MS projects/MS excel			12 Sessions
Topics: Typical infrastructure planning steps; Planning and appraisal of major infrastructure projects; Screening of project ideas; Life cycle analysis; multi-criteria analysis for comparison of infrastructure alternatives Procurement strategies; Scheduling and management of planning activities.						
Module 3	Concepts of Infrastructure Planning	Assignment		Theory based		15 Sessions
Topics: Financial Evaluation - Time value of money, Investment criteria, Project cash flows – elements and basic principles of estimation, Financial estimates and projections, Cost of capital, Rate of return; Project risk analysis; Political and social perspectives of infrastructure planning; Case studies						

Targeted Application & Tools that can be used:
Application: Water and Sanitation Infrastructure (Water Supply Systems, Sewage treatment systems), Energy infrastructure (Dams, power plants, power distribution and transmission facilities, pipelines)
Professionally Used Software: MSP/ Primavera.

Project work/Assignment:
Assignment: Theory based question on the topics covered in Module 1 and 3 as assignments 1 and 2.
Presentation: Presentation on case studies of projects planning using any commercially acclaimed software.

Textbooks:
T1. A. S. Goodman and M. Hastak, *Infrastructure planning handbook: Planning, engineering, and economics, McGraw-Hill, New York, 2006.*
T2. J. Parkin and D. Sharma, *Infrastructure planning, Thomas Telford, London, 1999.*

References:
R1. A. S. Goodman and M. Hastak, *Infrastructure planning handbook: Planning, engineering, and economics, McGraw-Hill, New York, 2006.*
R2. J. D. Finnerty, *Project financing - Asset-based financial engineering, John Wiley & Sons, New York, 1996*
R3. A. S. Goodman and M. Hastak, *Infrastructure planning handbook: Planning, engineering, and economics, McGraw-Hill, New York, 2006.*

Web Resources:
1. https://www.india.gov.in/ (National portal for Infrastructure in India)
2. NPTEL Swayam MOOC course relevant to Module 3 can be accessed through Infrastructure Economics - https://onlinecourses.nptel.ac.in/noc22_hs64/preview
3. Coursera certification course link https://www.coursera.org/learn/managing-urban-infrastructures-1

e-Books:

Energy Infrastructure and Exploration Areas: Characteristics, Relationships, and Local Acceptance

https://web.p.ebscohost.com/ehost/detail/detail?vid=15&sid=df00d162-177f-4522-8e85-4d07adbaee49%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=1606082&db=nlebk

Geographic Information Systems in Transportation Research
https://web.p.ebscohost.com/ehost/detail/detail?vid=25&sid=df00d162-177f-4522-8e85-4d07adbaee49%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=91152&db=nlebk

Infrastructure Investments: Politics, Barriers and Economic Consequences
https://web.s.ebscohost.com/ehost/detail/detail?vid=29&sid=75dced1d-8682-4283-be1c-20875abe641c%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=1488020&db=nlebk

Topics relevant to development of "EMPLOYABILITY SKILL": Planning and appraisal of major infrastructure projects, Scheduling and management of planning activities for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mr. Ajay H A/Mrs. Divya Nair
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025

Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3442	Course Title: Urban Planning and Design Type of Course: Professional Elective Theory		L-T-P-C	3	0	0	3
Version No.	1.2					
Course Pre-requisites						
Anti-requisites	NIL					
Course Description	Urban Planning and Design focuses on the correlation between the built environment and social, economic and institutional forces. The course delivers a profound and broad knowledge on the multiple factors in sustainable urban development. The Project works associated with the course enhances strong practical skills. The course is conceptual in nature that offers the planning and design practices to the environmental conditions and societal needs of the future.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Urban Planning and Design and attain Employability Skills through Problem Solving methodologies.					
Course Outcomes	On successful completion of this course the students shall be able to: CO.1 State the important topics on Urban Planning and fundamentals. CO.2 Discuss how to develop Plans and with Developmental Regulations. CO.3 Apply the concepts of urban planning and Governance in various cases.					
Course Content:						
Module 1	Definitions of Planning	Case Studies	Computer Aided Design (CAD) in Planning	13 Sessions		
Topics: Various definitions of town and country planning; Goals and objectives of planning; Components of planning; Benefits of planning, Defining what counts as planning knowledge: various sources of planning knowledge, Reasoning and its various forms in planning; Space, place and location, Orthodoxies of planning including the Lamps of Planning, Components of sustainable urban and regional development. Theories of Urbanization: Concentric Zone theory, Sector theory, Multiple Nuclei Theory, Land use and Land Value Theory of William Alonso.						
Module 2	Development Plans and Development Regulations	Case Study	Computer Aided Design (CAD) in Planning	14 Sessions		
Topics: Definition of development plan; Types of development plans: master plan, city development plan, structure plan, district plan, action area plan, subject plan, town planning scheme, regional plan, sub-regional plan; Planning Advisory Group report and the UDPFI Guidelines; Sector plans and spatial plans; Defining development and development control regulations, types of development control; Implications of violations of development control regulations; Conforming and Nonconforming land uses; Compatible and non-compatible land uses, LULU and NIMBY						
Module 3	Governance of Planning	Assignments	Computer Aided Design (CAD) in Planning	11 Sessions		
Topics: Local government in India; District Planning Committees and Metropolitan Planning Committees; Introduction to Internationalization and globalization of planning: meanings and forms of globalization; Characteristics of a global city; City as a physical entity, social entity and political entity confirming land uses, Principles for planning for a global city; Case studies						
Targeted Application & Tools that can be used: Target Application: Construction, Planning and Design of Villas, Planning of Layouts Professionally Used Software: Computer Aided Design (CAD) in Planning.						

Text Books:

T1. A. S. Goodman and M. Hastak, *Infrastructure planning handbook: Planning, engineering, and economics, McGraw-Hill, New York, 2006.*

T2. Rao. M. P, *Urban Planning: Theory and Practice, CBS Publication (1), 2009.*

References:

R1. J. D. Finnerty, *Project financing - Asset-based financial engineering, John Wiley & Sons, New York, 1996*

R2. State Urban Regulations: Urban Development-12th Five year Plan (2012-17) https://niti.gov.in/planningcommission.gov.in/docs/plans/planrel/fiveyr/12th/pdf/12fyp_vol1.pdf

Web Resources:

1. https://www.india.gov.in/ (National portal for Infrastructure in India)
2. NPTEL Swayam MOOC course relevant to Module 1, 3 can be accessed through https://nptel.ac.in/courses/124107158
3. Coursera course link: https://www.coursera.org/courses?query=urban%20planning

E-BOOKS:

1. Smart Urban and Rural Planning Techniques

https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1355890&site=ehost-live

2. Urban Design: Three Types of Continuity, Case Studies
https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=860111&site=ehost-live

Topics relevant to "EMPLOYABILITY SKILLS": Governance of Planning for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mrs. Divya Nair
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

<table>
<tr><td>Course Code: CIV3443</td><td colspan="3">Course Title: Construction Equipment and Machinery
Type of Course: Professional Elective Theory</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="8">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="8">CIV2100- Building Materials and Concrete Technology</td></tr>
<tr><td>Anti-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Course Description</td><td colspan="8">This course deals with different construction equipment and processes in practice. It also highlights on different machinery/ equipment and their role in the construction industry. This course is conceptual in nature and requires the knowledge of different building materials for selecting the right equipment for a specific task. The course demonstrates how best to use each piece of equipment.</td></tr>
<tr><td>Course Objective</td><td colspan="8">The objective of the course is to familiarize the learners with the concepts of Construction Equipment and Machinery and attain Employability Skills through Participative Learning techniques.</td></tr>
<tr><td>Course Outcomes</td><td colspan="8">On successful completion of the course the students shall be able to:
CO.1 Classify different Construction equipment.
CO.2 Recognize the modern techniques used in construction.
CO.3 Choose suitable formworks that supports the structures during construction.
CO.4 Locate a suitable construction equipment for the completion of a construction task</td></tr>
<tr><td>Course Content:</td><td colspan="8"></td></tr>
<tr><td>Module 1</td><td colspan="2">Basics of Construction Equipment</td><td>Quiz</td><td colspan="2">Memory recall based quiz</td><td colspan="2">15 Sessions</td></tr>
<tr><td colspan="9">Topics:
Conventional construction methods Vs Mechanized methods, Factors affecting the selection of equipment, purchase and service life of equipment, Maintenance of an equipment. Causes of damage and deterioration of Machinery/Equipment, Preventive measures against damage of an equipment. Use of Construction equipment in Dangerous Working Environment: Complications, Safety and Hygiene.</td></tr>
<tr><td>Module 2</td><td colspan="2">Construction Equipment & Machinery</td><td>Article review</td><td colspan="2">Article review on the characteristics of different construction equipment</td><td colspan="2">20 Sessions</td></tr>
<tr><td colspan="9">Topics:
Excavating equipment- Power Shovels, Back Hoe, Drag line, Clamshell – Excavating and Earth Moving Equipment – Scrapers, Bull Dozers, Tractors, Hauling Equipment – Dump trucks, Dumpers Loaders, truck.
Earthwork equipment, Hoisting and Lifting equipment, Material handling Equipment, Concrete mixing equipment, Transporting and Placing , Cranes, Dewatering Equipment

Drones – Use of Drones in Construction Projects, Benefits, Challenges, Human handling Vs Drones</td></tr>
<tr><td>Module 3</td><td colspan="2">Principles of construction</td><td>Case Study</td><td colspan="2">Presentations</td><td colspan="2">15 Sessions</td></tr>
<tr><td colspan="9">Topics:
Formworks, Centering and Shuttering of sheet piles, moving the forms, Joints in concrete, Plastering and Pointing, Shoring and Scaffolding, underpinning, submerged structures</td></tr>
</table>

Module 4	Structure Prefabrication	Case study	Presentations	10 Sessions

Topics:
Prefabricated panels and structures, Transporting and Erection of structures, Fire resistance in construction, Damp proofing, Termite proofing, Sound insulations, Ventilation

Targeted Application & Tools that can be used:
Equipment and Formworks application in: Dams, Bridges, Construction projects etc.
Tools used: - Construction equipment management software like Geniebelt

Project Work/ Assignment:

1. Quiz: - Multiple choice questions on basic features of construction equipment
2. Article review:- Article review on the characteristics of different construction equipment
3. Case study: - students should give Presentations on principles of construction used in industry
4. Case study: - Presentations on different prefabrication techniques used in construction industry

Text Book

T1. Sharma S.C, Construction Equipment and Management, Khanna Publishers, New Delhi, 2013.
T2. Peurifoy R.L, Schexnayder J.C and Shapira. A, Construction Planning, Equipment and Methods, Tata McGraw Hill, New Delhi, 2010.

References

R1. Sharma &Kaul, Building Construction, S. Chand & Company Pvt, New Delhi, 1998
R2. Varghese P.C, Building Constructions, Prentice Hall
R3. Arora S. P and Bindra S. P, A Text Book of Building Construction ,Dhanpat Rai Publication, New Delhi, 2013.
R4. Mahesh Varma, Construction Equipment and its Planning and Applications, Metropolitan Book Co.(P) Ltd., New Delhi. India.

Weblinks:
https://onlinecourses.nptel.ac.in/noc21_ce21/preview
https://www.coursera.org/lecture/systems-engineering/module-7-part-1-tzOCY

Topics relevant to "EMPLOYABILITY SKILLS": Maintenance of an equipment, Formworks, Centering and Shuttering of sheet piles, moving the forms, Plastering and Pointing, Shoring and Scaffolding, underpinning, submerged structures, Transporting and Erection of structures, Damp proofing, Termite proofing, Concrete mixing , Transporting and Placing for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mrs. Divya Nair
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV2039	Course Title: Construction Quality and Safety Type of Course: Professional Elective and Theory Only	L-T-P-C	3	0	0	3
Version No.	1.1					
Course Pre-requisites	CIV2100 - Building Materials and Concrete Technology					
Anti-requisites	NIL					
Course Description	The purpose of this course is to deal with the significance of Quality, Risk and Safety in Construction and to develop the basic abilities of risk management. The course is more of conceptual in nature and needs fair knowledge of causes for construction accidents, risk identification. This course mainly focusses on management aspects of construction project such as organization, quality management and safety management. The course develops the construction site safety skills by attaining quality. The course also enhances the programming abilities through assignments.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Construction Quality & Safety and attain Employability Skills through Participative Learning techniques					
Course Outcomes	On successful completion of the course the students shall be able to: CO.1 Discuss total quality management and safety for construction projects. CO.2 State aspects of Safety, safety rules. CO.3 Identify risks involved in construction projects.					
Course Content:						
Module 2	Construction Quality Management	Case Study	Data Collection	16 Sessions		
Topics: Construction Quality, Inspection and Testing, Quality control, Quality Assurance, Total Quality Management, Benchmarking, Quality philosophy. Standards, manual, Quality philosophy. Quality Certification for companies and laboratories, ISO Certification.						
Module 3	Safety Management	Case Study	Data Collection	15 Sessions		
Topics: Safety in Construction: Causes, classification, cost of an accident, safety program for construction, protective equipment, accident report. Types of injuries, Factors affecting safety. Personal & Structural safety. Recording injuries Safety Performance on Construction Sites, Safety Auditing and Its Use in Proactive Prevention of Accidents.						
Module 4	Construction Risk Management	Term paper	Data Collection	14 Sessions		
Topics: Certainty, Risk and Uncertainty Reasons for the risks, Types of Risks, Risk Management Identification and Nature of Construction Risks, Minimizing risks and mitigating losses, Risk mitigation						
Text Books 1. "Construction Project Management", Kumar Neeraj Jha, Pearson. Second Edition. 2. "Construction Planning and Management Paperback", 2018, by P.S. Gahlot, B. M. Dhir						
References 1. "Safety Management in construction and Industry", David Gold Smith, Mc Graw Hill 2. "Construction Safety Management", K N Vaid, NICMAR, Bombay 3. "Management for Total Quality", N. Logothetis, Prentice Hall 2.						

4. "Project Management Body of Knowledge" (PMBOK® GUIDE, Guide, A.), Project Management Institute, 2001.
5. Managing Risk in Construction Projects, 3rd Edition by Nigel J smith.

Web Resources

1. https://onlinecourses.nptel.ac.in/noc21_ce16/preview
2. https://onlinecourses.nptel.ac.in/noc22_mg55/preview
3. https://nptel.ac.in/courses/110/105/110105094/

E-Resources

1. https://web.p.ebscohost.com/ehost/ebookviewer/ebook/ZTAwMHh3d19fMjQ2NDA2OF9fQU41?sid=3281a842-6740-4e2b-a3d5-36b396d796c3@redis&vid=4&format=EB&rid=4
2. https://web.p.ebscohost.com/ehost/ebookviewer/ebook/ZTAwMHh3d19fMzIyMDcyX19BTg2?sid=3281a842-6740-4e2b-a3d5-36b396d796c3@redis&vid=5&format=EB&rid=1

Topics relevant to development of "Employability Skills": Project Management- Project Management Function, Role of Project Manager, Organizing for Construction, Principles of organization Safety & risk management for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout

Catalogue prepared by	Mrs. Sowmyashree T/ Mr. Ahamed Sharif
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

<table>
<tr><td>Course Code:
CIV3445</td><td colspan="4">Course Title: Project Management in Infrastructure Development
Type of Course: Professional elective/ Theory</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="9">1.1</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="9">Basic knowledge of different civil engineering structures and Basic Engineering mathematics.</td></tr>
<tr><td>Anti-requisites</td><td colspan="9">NIL</td></tr>
<tr><td>Course Description</td><td colspan="9">The purpose of this course is to introduce the real world risks and challenges in managing infrastructure. The course briefly describes the infrastructure planning process as well as the state of infrastructure across sectors in India. It helps students in understanding various risks that plague infrastructure projects and the solutions or fixes that can help us execute infrastructure projects better. The course is replete with real-world case studies to ensure that what is being discussed is practically applicable. The course is both conceptual and analytical in nature.</td></tr>
<tr><td>Course Objective</td><td colspan="9">The objective of the course is to familiarize the learners with the concepts of Project Management in Infrastructure Development and attain Employability Skills through Problem Solving methodologies.</td></tr>
<tr><td>Course Outcomes</td><td colspan="9">On successful completion of the course the students shall be able to:
1] Explain Infrastructure management at all levels.
2] Prepare Plan for infrastructure systems that provide resilience against natural and man-made hazards.
3] Prepare life cycle analysis of Infrastructure projects.</td></tr>
<tr><td>Course Content:</td><td colspan="9"></td></tr>
<tr><td>Module 1</td><td colspan="3">Introduction to Infrastructure</td><td>Quiz</td><td colspan="3">Memory Recall based quiz</td><td colspan="2">15 Hours</td></tr>
<tr><td colspan="10">Topics:
Introduction to Infrastructure Projects: Transportation infrastructure, power, water and telecom sectors, Rural and Urban Infrastructure Sectors, Players and Phases in an Infrastructure Project. Introduction to Project, Phases of a Project, Activities involved in a project, Stake holders of a Project, Structure of a project Organization, Traits of a Project Manager</td></tr>
<tr><td>Module 2</td><td colspan="3">Project Management in Infrastructure</td><td>Assignment</td><td colspan="3">Numerical solving task</td><td colspan="2">20 Hours</td></tr>
<tr><td colspan="10">Topics:
Concepts of Work breakdown structure, planning terminologies, Bar Charts, Network diagram and logic, Duration estimation of an activity, Network analysis, Float of an activity and its types, Planning technique - Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), Planning and scheduling of infrastructure projects, Resource management in infrastructure, Construction and maintenance of infrastructure, Public private partnerships Risk management in infrastructure projects, Infrastructure economics and finance.</td></tr>
<tr><td>Module 3</td><td colspan="3">Life cycle Analysis</td><td>Case study</td><td colspan="3">Presentations</td><td colspan="2">10 Hours</td></tr>
<tr><td colspan="10">Topics:
Project Governance, Data base Management, Design for infrastructure service life, Life cycle cost and benefit analysis, Maintenance of infrastructure – case studies, Privatization in infrastructure sector.</td></tr>
<tr><td colspan="10">Targeted Application & Tools that can be used:</td></tr>
</table>

Infrastructure projects like Highways, Aviation, Power and Energy, Railways, Water infrastructure etc.
Professionally Used Software: MSP/ Primavera

Project Work/ Assignment:

1. Quiz:- Multiple choice questions on Phases of a project, stakeholders and structure of an organization
2. Assignment: - Problems on CPM and PERT Network analysis
3. Case Study:- Students should give presentations on case studies relevant to Maintenance of infrastructure and Data base management

Textbooks:

1. Grigg, Neil, Infrastructure engineering and management, Wiley (1988)
2. Hudson, Haas, Uddin , Infrastructure management : integrating design , construction, maintenance , rehabilitation and renovation , McGraw Hill ,(1997)

References:

1. A. S. Goodman and M. Hastak, Infrastructure planning handbook: Planning, engineering, and economics, McGraw-Hill, New York, 2006.
2. Sharma S.C. "Construction Equipment and Management", Khanna Publishers, Delhi, 1988.

E-Resources

1. Scheduling techniques in Projects: https://swayam.gov.in/nd1_noc19_ce24/preview
2. Project Planning and Control: https://swayam.gov.in/nd1_noc19_ce30/preview
3. Project Management: https://swayam.gov.in/nd1_noc19_mg30/preview

Topics relevant to "EMPLOYABILITY SKILLS": Infrastructure management, risk management, project planning for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mrs. Divya Nair
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3446	Course Title: Construction Practices and Challenges in Infrastructure Projects Type of Course: Professional Elective and Theory	L-T-P-C	3	0	0	3
Version No.	1.3					
Course Pre-requisites	CIV3459-Introduction to Infrastructure System and Planning					
Anti-requisites	NIL					
Course Description	This course deals with different construction practices and the challenges involved in Infrastructure projects. This course highlights the sequence of activities in construction such as Site Clearance, Marking at site, Earthwork Masonry, Flooring, Building Foundation etc. This course is conceptual in nature and exhibits legal and contractual issues in infrastructure projects. Different strategies are also acknowledged in the course so as to mitigate risks in projects.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Construction Practices and Challenges in Infrastructure Projects and attain Employability Skills through Participative Learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: CO.1 Describe the sequence of activities in the construction practices with different infrastructure projects. CO.2 Explain the different types and stages of an infrastructure project. CO.3 Review the legal and contractual issues along with the challenges and risks involved in Infrastructure projects. CO.4 Prepare the strategies to mitigate risk in an infrastructure project.					
Course Content:						
Module 1	Construction Practices	Assignment	Article review on construction practices	15 Sessions		
Topics: Sequence of activities and construction co-ordination – Site Clearance, Marking at site, Earthwork Masonry – stone masonry, Bond in masonry, concrete hollow block masonry ; Flooring – damp proof courses, construction joints, movement and expansion joints ; Building foundations – basements, temporary shed; Centering and shuttering – slip forms, scaffoldings , de-shuttering forms – Fabrication and erection of steel trusses, frames , braced domes.						
Module 2	Introduction to Infrastructure Projects	Quiz	Memory recall based quiz	10 Sessions		
Topics: Types of Infrastructure projects. Role of Infrastructure-The Urban infrastructure in India, The Rural infrastructure in India, Special Economic Zones, Organizations and layers in the field of infrastructure, Stages of an Infrastructure Project Lifecycle, Data management of an Infrastructure Lifecycle.						
Module 3	Challenges to Infrastructure Projects	Case Study	Presentations on challenges in Infrastructure projects	15 Sessions		
Topics: Mapping and Facing the landscape of risks in Infrastructure projects, Economic and demand risks: Case study for Political Risks, Socio-Environmental Risks, Cultural Risks in International Infrastructure Projects, Legal and Contractual Issues in Infrastructure, Challenges in Construction and Maintenance of Infrastructure.						

Module 4	Strategies for Successful Infrastructure Project Implementation	Quiz	Memory Recall questions	20 Sessions

Topics:
Risk Management framework for Infrastructure projects, Shaping the Planning phase of Infrastructure projects to mitigate risks, Designing Sustainable Contracts, Introduction to Fair Process and Negotiation, Negotiating on Multiple stakeholders on Infrastructure projects. Innovative design and Maintenance of Infrastructure facilities- Capacity building and improving the Governments' role in Infrastructure implementation, Integrated framework for successful infrastructure planning and management-Future Directions

Targeted Application & Tools that can be used:
Infrastructure projects like Highways, Aviation, Power and Energy, Railways, Water infrastructure etc.
Professionally Used Software: MSP/ Primavera

Project Work/ Assignment:

1. Assignment: - Article review on various construction practices involved in Infrastructure projects.
2. Quiz 1: - Mutiple choice questions from introduction to Infrastructure projects
3. Case study : - Presentations on challenges in Infrastructure projects
4. Quiz 2: - Multiple choice questions from strategies for successful implementation of infrastructure projects.

Text Book
T1. Grigg, Neil, Infrastructure engineering and management, Wiley (1988)
T2. Hudson, Haas, Uddin , Infrastructure management : integrating design , construction, maintenance , rehabilitation and renovation , McGraw Hill ,(1997)
T3. Thompson, Glenn.A,(2011). Fundamentals of Infrastructure Engineering: Civil Engineering Systems Planning and Design

References
R1. Antil J. M. (1988), Civil Engineering Construction, McGraw Hill Book Co.
R2. Sharma S.C.(2024), Construction Equipment and Management, 6th edition, Khanna Publishers, Delhi
R3. Frank Harris, Modern Construction Equipment and methods, John Wiley and Sons, 1989.
R4. Peurifoy R L(2023), Construction Planning, Equipment and Methods, 10th Ed, Mc Graw Hill

Weblinks:
https://onlinecourses.nptel.ac.in/noc19_ce29/preview
https://fr.coursera.org/lecture/construction-project-management/challenges-and-opportunities-in-the-construction-industry-HTkSH

Topics relevant to "EMPLOYABILITY SKILLS": Construction co-ordination – Site Clearance, Marking at site Building foundations – basements, temporary shed; Centering and shuttering – slip forms, scaffoldings, de-shuttering forms – Fabrication and erection of steel trusses, frames, braced domes for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mrs. Divya Nair
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3039	Course Title: Applications of Remote Sensing and GIS in Infrastructure Development Type of Course: Professional Elective Theory	L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CIV2101 – Surveying CIV2102 – Surveying Lab					
Anti-requisites	NIL					
Course Description	This course introduces the fundamentals of Remote Sensing and GIS, focusing on their applications in urban infrastructure development. Remote sensing provides spatial data on Earth's resources, while GIS integrates spatial and attribute data for analysis. Key themes include terrain, geology, hydrology, and land use. Applications in civil engineering include housing, sanitation, power, and water supply planning. It supports urban growth analysis and effluent disposal strategies. The course covers essential Remote Sensing and GIS concepts and terminology. It highlights the integration of satellite data with socio-economic and natural resource data. Students will learn to apply these tools for solving construction and infrastructure challenges.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Applications of Remote Sensing and GIS in Infrastructure Development and attain Employability Skills through Participative Learning techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: CO.1 Recognize the concept of remote sensing and GIS. CO.2 Review the importance of Remote Sensing and GIS in infrastructure development. CO.3 Apply spatial and attribute data integration using Remote Sensing and GIS for infrastructure development. CO.4 Produce a digital map, images, and to communicate information in a meaningful way to others.					
Course Content:						
Module 1	New techniques in Remote Sensing and GIS for Infrastructural development	Assignment	Theory based questions	12 Sessions		
Topics: Fundamental concept of Remote Sensing and GIS – Developments of Sensors, platforms, Resolutions, EMR interaction with earth surface materials. Introduction to digital data, Elements of Image interpretation and processing techniques. Characteristics of Landsat, WorldView, Cartosat, Sentinel, GeoEye, ERS, RADARSAT Satellites Orbital features, Data products. GIS – Basic concept, Essentials, Data types, Topology concept.						
Module 2	Digital image Processing and interpretation techniques	Assignment	Theory based questions	12 Sessions		
Topics: Basic concept of digital image processing - Principles, Image Rectification, Image enhancement and Mosaicking. Satellite Image classification - Supervised, Unsupervised, Ground truth data and training set manipulation, Classification and accuracy assessment. Interpretation of Multispectral Imagery and High resolution data for simulation or modelling. Remote Sensing applications in groundwater studies.						

Module 3	Overview to UAV remote sensing and its applications	Case study	Presentations	09 Sessions
Topics: Introduction to UAV remote sensing - techniques and prospects used in data collection. Applications in Civil Engineering and infrastructure development projects.				
Module 4	Geographical Information System and Data analyses.	Case study	Presentations	12 Sessions
Basic principles of GIS, Important components, Raster and vector data model and methods of data analysis. Non-spatial data and its types. Map projection, Topology creation, Digital cartography and Map making. GIS analyses for various applications. Techniques used to generate TIN and DEM model. Google earth – Introduction, Installations, tools used, and its various applications in Infrastructure developments. Vector overlay on Google maps. Geo-literacy as a fundamental life skill development for students				
Targeted Application & Tools that can be used: Application areas is analyses of data of a ward in Bangalore. The data can be used by BBMP for planning and development activities. Professionally used software: Satellite Image Processing software - ERDAS and GIS software such as ArcMap / QGIS, MS Excel word.				
Project Work/ Assignment:				
1) Assignment 1: - New techniques in Remote Sensing and GIS for Infrastructural development 2) Assignment 2: - Digital image Processing and interpretation techniques. 3) Case Study:- Overview to UAV remote sensing and its applications 4) Case Study:- Geographical Information System and Data analyses.				
Text Books 1) Thomas M. Lillesand, Ralph W. Kiefer, Remote Sensing and GIS, John Wiley, 2008. 2) Kang-Tsung Chang, Introduction to Geographic Information System, McGraw-Hill, 2015.				
References 1) M. Anji Reddy, Remote Sensing and Geographic Information System, BS Publications, 4th Edition. 2) Jean-Paul Donnay, Mike J. Barnsley, et al., Remote Sensing and Urban Analysis: GISDATA-9, CRC Press, London, December 2000. 3) Basudeb Bhatta, Remote Sensing and GIS, Oxford Publications, 2nd Edition, 2011. 4) C.P. Lo, Albert K.W. Yeung, Concept and Techniques of Geographic Information Systems, Pearson, 2nd Edition, 2016. Web resources https://www.iirs.gov.in/ https://bhuvan.nrsc.gov.in/ http://www.earthsat.com/ https://www.gislounge.com/ https://www.esri.com/en-us/what-is-gis/overview https://www.usgs.gov/products/data-and-tools/gis-data https://www.qgis.org/ https://www.qgistutorials.com/ https://onlinecourses.nptel.ac.in/noc22_ce84/preview https://onlinecourses.nptel.ac.in/noc24_ce48/preview				
Topics relevant to "EMPLOYABILITY SKILLS": Data collection & analyses for an assignment. The software's used will be ArcMap, QGIS, Image Processing, and MS EXCEL for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.				

Catalogue prepared by	Dr. Shwetha A
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3448	Course Title: Environmental Impact Assessment for Infrastructure projects Type of Course: Professional Elective	L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	Environmental Pollution and Control					
Anti-requisites	Nil					
Course Description	The main objective of this Course to assess the impact of any engineering projects on the environment. This Course introduces the methodology of environmental impact assessment (EIA) as a vital tool for sound environmental management and decision-making. The Course provides an overview of the concepts, methods, issues and various forms and stages of the EIA process. This course also provides environmental guidelines for Airport, highway and construction projects					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Environmental Impact Assessment for Infrastructure projects and attain Employability Skills through Participative Learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: CO.1 Explain the EIA notification and Environmental clearance process in India CO.2 Predict the impacts on Environment caused by any developmental projects CO.3 Summarize the public participation and EIA for relevant projects. CO.4 Describe the method of impact analysis and environmental audit.					
Course Content:						
Module 1	Scope and EIA process in India	Assignment	Memory recall task	12 Sessions		
Topics: Introduction, Purpose of EIA, Evolution & History of EIA, EIA- Guiding principles, Benefits of EIA ,EIA Notification 2006 and Amendments in EIA notification, Categorization of projects, Stages in Prior Environmental Clearance Process, Validity of EC						
Module 2	Prediction and Assessment of Impacts on the Environment	Assignment	Memory recall task	10 Sessions		
Topics: Prediction and Assessment of Impacts on the Environment: Air, Water, Noise, Biological, Cultural and Socioeconomic Environment						
Module 3	Public participation and EIA for various projects	Seminar	Case study	12 Sessions		
Topics: Introduction, Participation in the EIA process, objectives of public participation, Techniques of public participation, Advantages and disadvantages EIA for Airport, highway and Construction projects.						
Module 4	Impact analysis and Environmental auditing	Seminar	Case study	11 Sessions		
Topics: Impact Analysis methods- Adhoc, Checklist, Overlay, Matrices and Network. Environmental auditing: water audit, waste audit, material audit, energy audit, Green audit-Case studies						
Targeted Application & Tools that can be used: This Course helps student to assess impact of engineering projects on environment and to prepare EIA report on any projects Professionally Used Software: GIS						

Project Work/Assignment: 11. Assignment: Students will submit in written Memory recall on module 1 and 2. 12. Seminar: Students will give presentation on relevant topics in group.	
Text Book T1. Larry W Canter, "Environment impact Assessment", McGraw Hill Publication, 2015	
References R1. Jain R.K –Van, "Environment impact Analysis", Nostrand Reinhold Co, 2016 Web Source: https://archive.nptel.ac.in/courses/124/107/124107160/	
Topics relevant to "EMPLOYABILITY SKILLS": EIA report for Construction projects for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Mr Bhavan Kumar
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3056	Course Title: Geospatial Analysis in Urban Planning Type of Course: Professional Elective and Theory Only	L-T-P-C	2	0	2	3
Version No.	1.0					
Course Pre-requisites	CIV2101 – Surveying CIV2102 – Surveying Lab					
Anti-requisites	NIL					
Course Description	This course will introduce the fundamentals of remote sensing techniques provide geospatial information which is appropriate, accurate, timely, accessible and available in a suitable format. New developments in Earth observation satellite like LIDAR, hyper-spectral sensors and Drone based remote sensing are increasing the prosperity of information. The course also covers the emerging technology like Digital Image processing method and its applications in urban planning. It is technical field concerned with how land is developed. To urban planners, the protection of the environment and the welfare of people are of the primary importance. Urban planning involves strategically designing infrastructure and transportation mechanisms. But it also takes into account how urban growth affects the environment including water quality, air quality, and habitat preservation. Remote sensing images, platforms and sensors, image interpretation and processing techniques and GIS tools are used in their work to more effectively create smart growth plans. The associated tutorial ensures better understanding of the topics covered in theory in theory portions.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Geospatial Analysis in Urban Planning and attain Employability Skills through Participative Learning techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: CO.1 Provide planning professionals with a full understanding of GIS & RS concepts, principles and how they can be applied for Urban and spatial planning. CO.2 Utilize GIS tools and remote sensing & Drone techniques used to study urban growth trends, patterns and problems within the planning area. CO.3 Prepare geospatial data and integrate it with a GIS to create maps and images, to communicate spatial data and non-spatial information.					
Course Content:						
Module 1	Introduction to Remote Sensing	Assignment	Theory based questions	10 Sessions		
Topics: Introduction to Remote sensing data types (satellite platforms, satellite images etc.) and GIS • Satellite/drone image resolution - spatial, temporal, spectral and radiometric resolution of an image and feature extraction etc. • Role of high-resolution satellite and drone images in spatial planning. • GIS Introductions, methods and tools used in different applications.						

Module 2	Digital image Processing and interpretation techniques.	Assignment	Theory based questions	10 Sessions
Topics: Introduction to digital image: Image classification - Supervised, Unsupervised and its various applications, Ground truth data and training set manipulation, Classification accuracy assessment. Interpretation of Multispectral Imagery and High-resolution data.				
Module 3	Urban population growth and transport trends analysis	Case study	Presentations	10 Sessions
Topics: Role of GIS and remote sensing in the creation of urban population growth models. • Population growth study • Smart or intelligent urban transport system • Role of Geospatial technology in smart urban transport system.				
List of theory tasks: Experiment No 1: Downloading and installation of QGIS from open-source website. Experiment No 2: Downloading of sample satellite data Experiment No 3: Uue of various tools of QGIS and their usage. Experiment 4: Creation of vector data base from satellite data and other maps. Experiment 5: Secondary data collection from government sources related to urban planning. Experiment 6: Land use / land cover map preparation and generation of landuse statistics. Experiment 7: Digital map creation.				
Targeted Application & Tools that can be used: An application area is data collection of one taluk / district. The analyzed data can be used by Government department and Private companies to understand the urban growth trend and future planning purposes. Professionally used software: ARCMap / QGIS, MS Office.				
Project Work/ Assignment:				
6) Assignment 1: - Introduction to Remote Sensing. 7) Assignment 2: - Digital image Processing and interpretation techniques. 8) Case Study:- Urban population growth and transport trends analysis.				
Text Books T1. Hassan A. Karimi, GIS Data Analytics in Urban Planning, CRC Press, 2023. T2. Kang-Tsung Chang, Introduction to Geographic Information Systems, McGraw-Hill Education, 9th Edition, 2023. T3. Alex D. Singleton, Seth Spielman, David Folch, Urban Analytics, SAGE Publications Ltd., 2020.				
References R1 Stan Geertman, John Stillwell, Planning Support Systems and Smart Cities, Springer, 2020. R2. Henk J. Scholten, John Stillwell, Geographical Information Systems for Urban and Regional Planning, Springer, 2019. R3. Brian Tomaszewski, Geographic Information Systems (GIS) for Disaster Management, CRC Press, 2nd Edition, 2020. Weblinks: http://Geo Spatial Analysis in Urban Planning - Course (nptel.ac.in) http://Geospatial Analytics for Reassessing Urban Structures | by Freddy Fashridjal | Towards Data Science.				

https://onlinecourses.nptel.ac.in/noc23_ce26/preview E-resources: https://search.ebscohost.com/login.aspx?direct=true&db=e000xww&AN=933799&site=ehost-live https://search.ebscohost.com/login.aspx?direct=true&db=e000xww&AN=2153716&site=ehost-live http://Geo Spatial Analysis in Urban Planning - Course (nptel.ac.in)	
Topics related to development of "EMPLOYABILITY": The students can work in the Government Departments, Private sector as specialists to supports in urban planning and designing. The software used will be Open GIS and MS Excel for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Dr. Shwetha A
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3450	Course Title: Built Environment Design Type of Course: Professional Elective Theory Only Course		L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	Nil					
Anti-requisites	Nil					
Course Description	The objective of this course is to introduce Cultural Discourse in Built Environment Theory, Research, Practice and Education. To build the foundation and re-orient the students to use systems thinking and through interdisciplinary methods for bringing under one umbrella together the scientific, ecological, technological, and political dimensions of the subject of culturally responsive Built Environments.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Built Environment Design and attain Employability Skills through Participative Learning techniques.					
Course Outcomes	On successful completion of the course the students shall be able to: CO.1 Discuss the basic concepts of built environment. CO.2 Explain the present need of built environment in conjunction of with technology and development. CO.3 Compare the historical changes and evolution of built environment (Indian Scenario)					
Course Content:						
Module 1	Introduction	Quiz	Quiz	15 Sessions		
Built Environment: Definition, Principles and Concepts: Place and Space; Introduction to Vernacular Architecture: What is a Dwelling? Dimensions of culturally responsive built environment; 3D Laser Scanner in Built Environment; Winter Urbanism. Vernacular resources, materials and technology.						
Module 2	Built up environment, Cultural disaster and risk	Assignment	Discussion on various heritage buildings	15 Sessions		
Power in built form, Spatial Analysis, Religious Architecture; a continuum of meaning, Understanding construction workers' Housing, Sustainable Habitat for Urban poor Culture Disasters and Risk, Conservation: Principles and practices;						
Module 3	Planning for culture, Social change in India	Presentation	Case study	15 Sessions		
Cultural economies; Safeguarding intangible heritage, culturally responsive built environment: Architectural education; Summarizing culturally responsive built environment, Social Cohesion, Social change in India (Sanskritization & Westernization) and change towards modernization.						
Targeted Application & Tools that can be used: Application in sustainable buildings and Green Buildings						
Project Work/Assignment: 1. **Quiz:** Quiz will be conducted to evaluate the student's understanding of foundational concepts related to built environment 2. **Assignment:** Students will be submitting an assignment related to various heritage buildings 3. **Presentation:** Students will present real world cases in group presentation						

Text Book 1. Bourdier, J. and Al Sayyad, N. (eds.) (1989). Dwellings, Settlement and Tradition. Lanham, Maryland: University Press of America 2. King, A. (ed.) (1997) Culture, Globalization and the World-System: Contemporary Conditions for the Representation of Identity. Minneapolis: University of Minnesota	
References 1. Lang, J, Desai, M. (ed.) (1997) Architecture and Independence: the search for identity – India 1880 to 1980, Oxford: Oxford University Press. 2. Oliver, P. (2003). Dwellings: The Vernacular House WorldWide. London: Phaidon Press. 3. Oliver (2006) Built to meet needs: Cultural issues in vernacular Architecture, Oxford: Architectural press. Web Resource https://onlinecourses.nptel.ac.in/noc19_ar13/preview https://nptel.ac.in/courses/105107156	
Topics relevant to "EMPLOYABILITY SKILLS": Spatial Analysis, Cultural Disaster risk, Culturally responsive built environment for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Mr. Adil Nadeem Hussain/Mr. Ajay H A
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV2041	Course Title: Fundamentals of Smart City Type of Course: Professional Elective & Theory only	L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course is designed to introduce the students to the concept of Smart Cities. The course enables the students to gain insights into the modern-day smart city components and characteristics. This course will make an overall introduction to global smart city development in order to inform the leaders in smart cities and communities. The course will enable the students to make a step forward in developing an open, collaborative, citizen-centric, and digitally-enabled operating model for their city that realizes their vision of smart city toward sustainable, resilient, and prosperous future.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Fundamentals of Smart City and attain Employability Skills through Participative Learning techniques					
Course Outcomes	On successful completion of this course the students shall be able to: CO.1 Describe the technologies and the smart solutions for the development of smart cities. CO.2 Prepare a sustainable urban system plan to build smart, inclusive, sustainable cities. CO.3 Demonstrate the knowledge of implementing and operation of smart cities.					
Course Content:						
Module 1	Introduction to Smart cities	Assignment	Data collection	12 Sessions		
Topics: Smart City: Definition, Idea, Concepts and Necessity; Core components, Technologies, Conceptualizing cities as complex socio-technical systems, digitalization, Implications on digitalization on cities, Smart solutions, Dimensions of Smart city development - smart infrastructure and building, smart transportations, smart energy, smart water management system, smart waste management, smart healthcare, and smart environment. Smart city models.						
Module 2	Smart City planning	Term paper/Assignment	Data Collection	10 Sessions		
Topics: Sustainable urban system plan, Planning approaches, Strategic urban development plan, Smart city documentation, Reference framework, Smart city proposal, Urban resilience; Urban consultations; Case studies						
Module 3	Financing and Implementation	Term paper	Data Collection and Analysis	8 Sessions		
Topics: Government funding, Public private partnership, Convergence schemes; Implementation by SPV, Implementation by decentralization, Mission monitoring – Case studies						
Targeted Application & Tools that can be used: Knowledge of the Fundamentals of Smart cities will cater to the Skill of young graduates in the field of urban planning through consultation process.						

Text Books:

1. *Smart City Emergence 2019 Elsevier Inc.* *https://www.sciencedirect.com/book/9780128161692/smart-city-emergence*

References:

1. Saraju P Mohanty, Uma Choppali, Elias Kougianos, " *Everything you wanted to know about Smart Cities",* IEEE Consumer Electronics Magazine, July 2016
2. Barton A, Manning R. Smart Cities: Technologies, Challenges and Future Prospects. Nova; 2017.

PU e-Library Resources

1. https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=1993146&site=ehost-live

Topics relevant to development of "Employability": Smart technologies and solutions, Smart city planning process and Urban consultation for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mr. Ajay H A
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3452	Course Title: Urban Mobility Type of Course: Professional Elective Theory	L-T-P-C	3	0	0	3
Version No.	1.2					
Course Pre-requisites	[1] CIV2501 Transportation Engineering [2] CIV2025 Urban Transport Planning Basic concepts of Transport modelling					
Anti-requisites	NIL					
Course Description	This course deals with the fundamental concepts of Urban mobility. It gives insights into the evolution of urban mobility, urban transits and planning. Modern challenges hindering the implementation of Urban mobility plans are also discussed. Process of Sustainable Urban mobility plan led by Europe is taken as a case study, the cumbersome process of implementation of Urban Mobility planning is explained step by step.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Urban Mobility and attain Employability Skills through Problem Solving methodologies.					
Course Out Comes	On successful completion of the course the students shall be able to: 1] Describe the basic concepts of Urban Mobility. 2] Explain the challenges faced in implementing Sustainable Urban Mobility Plan. 3] Prepare Sustainable Mobility plans. 4] Interpret he implementation of Sustainable Urban Mobility plans					
Course Content:						
Module 1	Introduction to Urban Mobility	Quiz	Memory recall questions	8 Sessions		
Topics: Urban Mobility & its Evolution: Different forms of urban mobility, Collective transportation (public transit), Individual transportation, freight transportation. Evolution of urban transits. Sustainable transportation, Stakeholder consensus on transport improvements, Aligning local activities and societal goals						
Module 2	Challenges in Urban Mobility planning	Assignment	Data Collection	7 Sessions		
Topics: Challenges in mobility planning: Accuracy and completeness of transport data, Model development Scenario formulation and comparison, Reconciliation between vision and strategy, Policy instruments in Smart mobility						
Module 3	Sustainable Urban Mobility Plan	Seminar	Data Collection	15 Sessions		
Topics: Sustainable Urban Mobility Plans (SUMP), Main characteristics of a SUMP, Sustainable urban mobility planning process, Transport planning practise in Europe and India, common challenges of urban mobility planning in Europe and India, Smart mobility as catalyst for policy change towards low carbon						
Module 4	Implementation of Urban Mobility planning	Case study	Data Collection	15 Sessions		
Topics: Urban mobility planning: Practical recommendations, Complete data collection, evaluation and representation, integrating land use, Evaluating alternative scenarios, Time horizons and monitoring, Stakeholder participation in UMP preparation, Case Studies.						
Targeted Application & Tools that can be used: Having studied this course will enable students to work as a transport planner for consultancies and can also work as a government consultant.						
Project work/Assignment:						

Quiz: Surprise quiz will be conducted in regular class based on introduction to urban mobility
Assignment: Practice problems based on challenges in urban mobility planning
Seminar: Students will be given seminar topics based on Sustainable Urban Mobility Plan
Case study: Students will submit a case study report on implementation of Urban Mobility planning in various developed countries

Text Book

1. Mashrur A. Chowdhury and Adell Sadek,"*Fundamentals of Intelligent Transportation Systems Planning*", , Artech House, Inc., 2003.
2. Sussman, Joseph, NY, "*Perspectives on Intelligent Transportation Systems (ITS)*": Springer, 2010.

References

1. Federal Ministry for economic corporation and development "Urban Mobility Plans National Approaches and Local Practice" GIZ publishers,
2. "National ITS Architecture Documentation", US Department of Transportation, 2007 (CD-ROM).

Web link: https://nptel.ac.in/courses/105/106/105106058/

PU e-Library Resources

W1:https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DOAB_1_06082022_1074

Topics relevant to "EMPLOYABILITY SKILLS": Planning for sustainable transport solutions, Sustainable urban mobility planning process for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mr. Ajay H A/Mr Santhosh M B
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3453	Course Title: Urban sanitation and Hygiene Type of Course: Professional Elective Theory Only Course	L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CIV3428 Environmental Pollution and Control					
Anti-requisites	NIL					
Course Description	This course demonstrates to understand the necessity of hygiene and sanitation in urban localities, with urbanization trends and increasing population, there is an exponential need for managing sanitation waste generated by knowing fundamentals of personal hygiene.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Urban sanitation and Hygiene and attain Employability Skills through Problem Solving methodologies.					
Course Out Comes	On successful completion of the course the students shall be able to: CO.1 Explain various concepts of urban sanitation planning. CO.2 Review the knowledge of sanitation practices for buildings. CO.3 Summarize the importance of personal hygiene.					
Course Content:						
Module 1	Introduction to Urban Sanitation	Quiz		14 Sessions		
Topics: Sanitation – Overview and Issue, Need for participatory planning, Environmental policy, Environmental Impact Assessment 2006 and National Urban Sanitation Plan, Integrated municipal solid waste management, Decentralized waste management – Wastewater, Solid waste, Plastic waste, Faecal sludge. Case study of Alappuzha.						
Module 2	Sanitation in buildings and sanitary fittings	Assignment	Report	16 Sessions		
Importance and Requirement of Building Drainage, General Layout of Sanitary Fittings and House Drainage Arrangements for Single and Multi- Storied Buildings as Per B.I.S Code of Practice. Dual pipe system. Sanitary Fittings- Water Closets, Flushing Cisterns, Urinals, Inspection Chambers, Traps, Anti-siphonage. Inspection, Testing and Maintenance of sanitary fittings.						
Module 3	Occupational Hygiene	Assignment	Report	12 Sessions		
Topics: Hygiene – Basics, Concepts, Entry of microbes and Hygiene; Impact of sanitation on Health, Hygiene Interventions. Food hygiene – Importance of food hygiene training, factors affecting food safety, Food handler's personal hygiene, Hand hygiene, Oral hygiene, Skin hygiene; Global sanitation development for hygiene.						
Targeted Application & Tools that can be used: To eradicate lack of occupational hygiene, open defecation, and to improve lifestyle changes, and apply engineering techniques for proper sanitation processes.						
Project Work/ Assignment: 13. Assignment: Students will submit in written Memory recall and Numerical solving task on module 1 and 2. 14. Seminar: Students will give presentation on relevant topics in group.						

Text Book

1. Johns N (1991) Managing Food Hygiene, Palgrave Macmillan.
2. Sprenger RA (2000) The Food Hygiene Handbook, High Field Publication
3. Park K (2015) Park Textbook of preventive & social medicine 24th Ed., Banarsidas Bhanot Publ. Bedi YP (1977) A handbook of social and preventive medicine, Anand Publ.
4. Roday S (2011) Food Hygiene and Sanitation with case studies, 2nd Ed., TATA McGraw Hill Education Pvt. Ltd. New Delhi.

References

1. "Global Water Supply and Sanitation Assessment 2000 Report" from CD directory "Global monitoring: water supply and sanitation".
2. Crabtree, K.D. et al. 1997. "Waterborne adenovirus: a risk assessment". Water Science and Technology 35(11-12): 1-6.
3. Havelaar, AH and JM Melse. 2003. Quantifying public health risk in the WHO Guidelines for Drinking Water Quality: A burden of disease approach.
4. Haas, C and JNS Eisenberg. 2001. Risk Assessment. In Water quality - Guidelines, standards and health: Assessment of risk and risk management for water-related infectious disease, Lorna Fewtrell and Jamie Bartram, Eds. Published on behalf of the WHO by IWA Publishing, London.

Web Links

W1. https://nap.nationalacademies.org/read/13347/chapter/1

Topics relevant to "EMPLOYABILITY SKILLS": Sanitation in buildings and sanitary fittings, Industry visits for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Dr. Venkatesha Raju K and Mr. Ajay A
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3454	Course Title: Smart Materials and Structures Type of Course: Professional Elective Theory Only Course		L-T-P-C	3	0	0	3
Version No.	1.1					
Course Pre-requisites	1] CIV2100 Building Materials and Concrete Technology 2] CIV2500 Strength of Materials					
Anti-requisites	NIL					
Course Description	The objective of this course is to have students learn the basic aspects of smart structural systems including smart materials, sensor technology, signal processing methods, modelling of smart structures and structural control concepts and expose them diverse and rapidly expanding applications of smart materials and technologies. The course is both conceptual and analytical in nature and needs fair knowledge of Strength of Materials. The course develops the critical thinking and analytical skills. The course also enhances the programming abilities through assignments.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Smart Materials and Structures and attain Employability Skills through Participative Learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: 1] Understand the ideas about instrumented structures and response. 2] Perceive the strain measuring techniques using electrical strain gauge. 3] Demonstrate the working principles of sensors and actuators. 4] Know about signal processing and their control systems.					
Course Content:						
Module 1	Introduction	Quiz	Memory Recall based Quizzes	8 Sessions		
Topics: Introduction to Smart Materials and Structures; Micromechanics and Macromechanics of composites; Instrumented structures functions and response – Sensing systems – Self diagnosis – Actuation systems and effectors.						
Module 2	Measuring Techniques	Term Paper		8 Sessions		
Topics: Strain Measuring Techniques using Electrical strain gauges, Types – Resistance – Capacitance – Wheatstone bridges – Pressure transducers – Load cells – Temperature Compensation – Strain Rosettes.						
Module 3	Sensors and Actuators	Assignment		14 Sessions		
Topics: Smart Sensors – Introduction; Communications for Smart sensors; Control techniques, Wireless sensing; Standards for Smart sensing. Actuator and actuator materials – Piezoelectric and Electrostrictive Material – Modelling a Magnetostrictive material; Magneto structure Material – Shape Memory Alloys –Electromagnetic actuation – Role of actuators and Actuator Materials; Concept of Self-Healing.						
Module 4	Signal Processing and Control Systems	Term Paper		8 Sessions		
Topics: Data Acquisition and Processing – Signal Processing and Control for Smart Structures – Sensors as Geometrical Processors – Signal Processing – Control System – Linear and Non-Linear.						

Targeted Application & Tools that can be used:

Application Area is Infrastructure developing companies, Structural Consultancy Servicing Firms, Central and state Research and development Structural Engineering laboratories.
Professionally Used Software: Excel, MATLAB and ANSYS Software.

Text Book

T1. L. S. Srinath, "Experimental Stress Analysis", Tata McGraw-Hill, 1998.
T2. Brain Culshaw, "Smart Structure and Materials", Artech House – Borton. London, 1996.

References

R1. Srinivasan, A. V. and Michael McFarland, D., "Smart Structures: Analysis and Design", Cambridge University Press, 2009.

R2. Michelle Addington and Daniel L. Schodek, "Smart Materials and Technologies: For the Architecture and Design Professions", Routledge 2004.

R3. J. W. Dally and W. F. Riley, "Experimental Stress Analysis", Tata McGraw-Hill, 1998.

Web Resources

1. https://nptel.ac.in/courses/112/104/112104251/
2. https://nptel.ac.in/courses/112/104/112104173/

PU e-Library Resources

1. https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=1020599&site=ehost-live
2. https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=iih&AN=157432220&site=ehost-live
3. https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=248891&site=ehost-live

Topics relevant to "EMPLOYABILITY SKILLS": Strain Measuring Techniques using Electrical strain gauges, Data Acquisition and Processing – Signal Processing and Control for Smart Structures for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mr. Ramachandra Gollar
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

<table>
<tr><td>Course Code:
CIV3455</td><td colspan="3">Course Title: Urban Air Pollution and Control
Type of Course: Professional Elective</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="8">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="8">Environmental studies</td></tr>
<tr><td>Anti-requisites</td><td colspan="8">Nil</td></tr>
<tr><td>Course Description</td><td colspan="8">The purpose of this course is to illustrate the need for urban air pollution and control and to develop the basic abilities of understanding of sources and effects of air pollution, air pollutants and their effects, air pollution episodes, meteorology, plume behaviour, wind rose diagrams, sampling techniques, air pollution control equipment for particulate matter & gaseous pollutants.</td></tr>
<tr><td>Course Objective</td><td colspan="8">This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies.</td></tr>
<tr><td>Course Out Comes</td><td colspan="8">On successful completion of the course the students shall be able to:
1] Classify air pollution, pollutants, sources and effects
2] Summarize Plume dispersion, sampling and analysis techniques for air quality assessment
3] Explain the various techniques of air pollution control</td></tr>
<tr><td>Course Content:</td><td colspan="8"></td></tr>
<tr><td>Module 1</td><td colspan="2">Introduction</td><td colspan="2">Assignment</td><td colspan="2">Memory recall task</td><td colspan="2">15 Sessions</td></tr>
<tr><td colspan="9">Topics:
Air Pollution – Definitions, Scope and Significance, Air Pollutants – Classifications – Natural and Artificial – Primary and Secondary, Characteristics of air pollutants and Emission sources.
Effects of Air pollutants on man, material, vegetation and animals; Global effects of air pollution – Green House effect, Heat Islands, Acid Rains, Ozone Holes, air pollution episodes.</td></tr>
<tr><td>Module 2</td><td colspan="2">Meteorology</td><td colspan="2">Assignment</td><td colspan="2">Memory recall and Numerical solving task</td><td colspan="2">15 sessions</td></tr>
<tr><td colspan="9">Topics:
Meteorology and plume Dispersion: properties of atmosphere, Wind forces, Moisture and relative Humidity, Influence of Meteorological phenomena on Air Quality, wind rose diagrams. Lapse Rates, Winds and moisture plume behaviour and plume Rise Models, Sampling methods and analysis techniques for air quality assessment.</td></tr>
<tr><td>Module 3</td><td colspan="2">Control of air pollution-Particulates and Gaseous</td><td colspan="2">Seminar</td><td colspan="2">Participative learning</td><td colspan="2">15 sessions</td></tr>
<tr><td colspan="9">Topics:
Control of particulates – Control at Sources, Process Changes, Equipment modifications, Control Equipment’s – Settling Chambers, Inertial separators, Centrifugal separators, Fabric filters, Dry and Wet scrubbers, Electrostatic precipitators
Control of gaseous Pollutants-Absorption and adsorption techniques.</td></tr>
<tr><td colspan="9">Targeted Application & Tools that can be used:
Application area of urban air pollution and control in controlling air pollution in industries, Central and state air pollution control board etc.
Professionally used software: ArcGIS.</td></tr>
<tr><td colspan="9">Project Work/Assignment:
1. Assignment: Students will submit in written Memory recall and Numerical solving task on module 1 and 2.
2. Seminar: Students will give presentation on relevant topics in group.</td></tr>
<tr><td colspan="9">Text Book
1) M N Rao, “Air pollution and control”, McGraw Hill Publication-2017</td></tr>
</table>

References 1) C S Rao, "Environment pollution and control Engineering", New age international publishers-2018. Web Source: *https://archive.nptel.ac.in/courses/105/107/105107213/*	
Topics relevant to Employability Skill: Sampling methods and analysis techniques for air quality assessment Control of gaseous Pollutants-Absorption and adsorption techniques. for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Mr. Bhavan Kumar
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3456	Course Title: Intelligent Transportation Systems Type of Course: Professional Elective Theory	L-T-P- C	3	0	0	3
Version No.	1.1					
Course Pre-requisites	1] CIV2501 Transportation Engineering 2] Traffic Engineering 3] Urban Transport Planning Basic insights into transport planning and traffic characteristics.					
Anti-requisites	NIL					
Course Description	This course deals with the fundamental concepts of Intelligent Transportation Systems (ITS) and its utility in designing transportation infrastructure and vehicles. In addition, the course covers concepts of sustainable mobility, travel demand management, electronic toll collection and road-pricing. Apart from technology discussions, this course will include topics related to policy, economics, safety and security, as well as transport planning for smart cities using ITS. The course aims at applying engineering theories, principals and standards in the performance, control and management of transportation systems using ITS.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Intelligent Transportation Systems and attain Employability Skills through Participative Learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: 1] Describe the importance of intelligent transportation systems. 2] Illustrate major applications of intelligent transportation systems. 3] Show how ITS can be used in fleet oriented services. 4] Interpret the role of technology in ITS and security issues involved.					
Course Content:						
Module 1	Introduction to Intelligent Transportation Systems (ITS)	Case study	Data Collection	5 classes		
Topics: Basic Concepts: Importance of Intelligent Transportation Systems (ITS). Definition, Roles and Responsibilities, Evolution Architecture Components and Standards, ITS across the globe. Applications of Intelligent Transportation Systems in smart cities						
Module 2	Mature Applications of ITS	Assignment	Data Collection	9 classes		
Topics: Automatic Traveler Information Systems, Automatic Transportation Management Systems: Traffic Detection, Signals, Incident detection and management, Ramp Metering, Tolling, Congestion pricing, Electronic Road Pricing and Automatic Vehicle Classification						
Module 3	Fleet Oriented ITS Services	Assignment	Data Collection	8 classes		
Topics: Advanced Public Transportation Systems (APTS), BRT, Commercial Vehicle Operations (CVO), Intermodal Freight , including International Operations and Supply Chains						
Module 4	ITS and Technology, Safety and Security	Assignment	Simulation	8 classes		
Topics: Automated highway systems(AHS), Sensors, ITS Standards, Regionally scaled deployment in smart cities Critical ITS issues: ITS and security, safety, human factors, privacy, sustainability and future						
Targeted Application & Tools that can be used Application areas: The course caters to employability of graduates in the niche fields of traffic systems engineering using modern tools such as Internet of Things and Artificial Intelligence. In addition, the course directly feeds the smart cities concept of the Government of India where engineers are required for developing smart transportation systems. It also helps nurture skills of students to apply concepts learnt manually in the transportation field using latest technology.						

The course caters to environment and sustainability by helping design efficient traffic management systems which can reduce congestion on roads, encourage public transport, reduce emissions and create a positive impact on the environment. Professionally used software: DIRECTView-AMS, Intelligent Network Flow Optimization Analysis, Modeling, and Simulation (AMS)
Text Books 3. Mashrur A. Chowdhury and Adel Sadek, Artech House, "*Fundamentals of Intelligent Transportation Systems Planning*", Inc., 2003. 2. Sussman and Joseph, "*Perspectives on Intelligent Transportation Systems (ITS)"*, NY: Springer, 2010.
References 1. Kan Paul Chen, John Miles, *"ITS Hand Book 2000: Recommendations for World Road Association (PIARC)"*, Artech House Books, 2000. 2. US Department of Transportation*, "National ITS Architecture Documentation"*, 2007 (CD-ROM). 3. Web link: https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2401173&site=ehost-live
Topics relevant to "EMPLOYABILITY SKILLS": Mature Applications of ITS, Fleet Oriented ITS Services, ITS and Technology, Safety and Security for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mr. Aayush Kumar/Mr Santhosh M B
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3800	Course Title: Construction Economics and Finance Type of Course: Professional Elective and Theory		L-T-P-C	3	0	0	3
Version No.	1.2						
Course Pre-requisites	NIL						
Anti-requisites	NIL						
Course Description	The purpose of this course is to provide an in-depth knowledge of the economic and financial principles used in the construction industry. It explores the relation between the application of the techniques and expertise of economics to make investment decisions in the construction industry. The course is both conceptual and analytical in nature and needs fair knowledge of Mathematics. The course develops the critical thinking for decision making and analytical skills to choose construction resources for the construction project. By participating in the course students will be able to examine the economic concepts to take decisions on project feasibilty and comparison of alternatives to select an efficient project.						
Course Objective	The objective of the course is to familiarize the learners with the concepts of Construction Economics and Finance and attain Employability Skills through Problem Solving methodologies.						
Course Out Comes	On successful completion of the course the students shall be able to: 1) Compare the alternatives for decision making 2) Analyze the economy of equipment based on its life cycle cost. 3) Review plans for dispute resolution in construction contracts.						
Course Content:							
Module 1	Construction Economics	Assignment	Numerical solving task	20 Sessions			
Topics: Engineering economics: Basic principles – Time value of money, Quantifying alternatives for decision making, Cash flow diagrams, Equivalence- Single payment in the future, Present payment compared to uniform series payments, Future payment compared to uniform series payments, Comparison of alternatives: Present, future and annual worth method of comparing alternatives, Rate of return							
Module 2	Equipment economics	Quiz	Memory based quiz	15 Sessions			
Topics: Equipment costs, Ownership and operating costs, Buy/Rent/Lease options, Replacement analysis. Depreciation, Inflation and Taxes. Benefit-cost analysis.							
Module 3	Estimate & Contract Changes	Case Study	Presentation	10 Sessions			
Topics: Types of Estimates, Approximate estimates – Unit estimate, Factor estimate, parametric estimate and Life cycle cost. Breach of the Contract, Contract Changes and Construction Contract Claims and Dispute Resolution.							
Targeted Application & Tools that can be used: Cost – Benefit Analysis for Infrastructure Projects, Resource Allocation and Budget Forecasting, Life Cycle costing, Financial Modelling tools such as Excel with Macros and MATLAB.							
Project Work/ Assignment: 1. Assignment- Problems on Arithmetic Gradient, Geometric Gradient, Present & Annual worth and Rate of Return.							

2. Quiz- Multiple choice questions from Replacement analysis, depreciation, Inflation and taxes.
3. Case studies- Students will give presentations on the allotted topics from Contracts and will submit reports

Text Books

T1. Blank, L. T. and Tarquin,A. J,"Engineering Economy", Ninth Edition, WCB/McGraw-Hill, 2024.

2. Collier, Kieth, "Construction Contracts", 3rd Edition , Prentice Hall, 2000.

References

R1. K N Jha "Construction Project Management- Theory and Practice", Second edition, Pearson Education India, 2015.

2. S. Ranaga Rao "Contract Management and Dispute Resolutions" Engineering staff College of India (ESCI) January 2008.

Web Resources:

https://onlinecourses.nptel.ac.in/noc22_mg55/preview

https://nptel.ac.in/courses/105103023

https://nptel.ac.in/courses/105106653

Topics relevant to "EMPLOYABILITY SKILLS": Quantifying alternatives for decision making, Cash flow diagrams and Equivalence- Single payment in the future, Present payment compared to uniform series payments, Future payment compared to uniform series payments for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mrs. Divya Nair
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3801	Course Title: Infrastructure Projects Financing Type of Course: Professional Elective/ Theory	L-T-P-C	3	0	0	3
Version No.	1.1					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The course introduces the characteristics of financing infrastructure projects. Furthermore, critical issues in infrastructure financing such as government role in infrastructure creation, regulation, frameworks for private sector participation, public private partnerships, and risk management are dealt in detail. The course includes few case studies to demonstrate the application of the theoretical concepts on infrastructure financing.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Infrastructure Projects Financing and attain Employability Skills through Participative Learning techniques.					
Course Outcomes	On successful completion of the course the students shall be able to: 1) Describe Sources of financing infrastructure projects. 2) Explain PPP procurement process. 3) Prepare the project financing plan.					
Course Content:						
Module 1	Infrastructure Development	Article review	Article review on topics of Infrastructural development projects	20 Sessions		
Topics: Definition of infrastructure; Multiplier effects of infrastructure development on economic development of the nation, Sources of financing infrastructure projects: Traditional and private investments; Various financial instruments, Limitations of traditional procurement system of infrastructure; Legal frameworks and Incentives for private sector participation in infrastructure development.						
Module 2	Public Private Partnerships	Case Study	Case study report on PPP procurement process	15 Sessions		
Topics: Stakeholders' perspectives: Granting authority, Funders and Concessionaire, PPP procurement process; Lifecycle of PPP projects, Contractual package of PPP project; Bankable concession agreement, Case study – Procurement process of Indian PPP projects						
Module 3	Project Finance	Assignment	Preparing Project Financial Plan	10 Sessions		
Topics: Introduction to project financing concept, Analysis of project viability, Designing security arrangements, Preparing the project financing plan.						
Targeted Application & Tools that can be used: Entrepreneurship, infrastructure ventures						
Project work/Assignment: 1. Article Review: Article review on various topics of Infrastructural development projects 2. Case study:Students will submit case study reports on PPP procurement processes.						

3. Assignment: AT the end of the course, students will prepare a financial plan for the projects given.	
Text Books: T1. Merna, T.,& Njiru, C.(2002). Financing infrastructure projects (First ed.). London: Thomas Telford Limited. T2. Nevitt,P.K.,& Fabozzi, F. J.(2000).Project financing (8 ed.). London, UK:Euromoney Books. T3. Yescombe,E. R.(2013). Principles of Project Finance. Second edition, California: Academic Press.	
References: R1. Kurowski, L.,& Sussman, D.(2011). Investment project design - A guide to financial and economic analysis with constraints. New Jersey: John Wiley & Sons. R2. Pretorius, F., Lejot,P., McInnis,A., Arner, D.,& Hsu,B. F.-C.(2008).Project finance for construction and infrastructure: Principles and case studies. Oxford Blackwell Publishing. Weblinks/E-resources: https://nptel.ac.in/courses/105103133	
Topics relevant to "EMPLOYABILITY SKILLS": Project Management- PPP procurement process; Lifecycle of PPP projects, Contractual package of PPP project; Bankable concession agreement for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Mrs. Divya Nair
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3802	Course Title: Smart City energy system and management Type of Course: Professional Elective Theory		L-T-P-C	3	0	0	3
Version No.	1.1					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course is designed to create awareness about the modern-day smart city components and characteristics, how each sector could be transitioned via a smart approach making it more efficient and socially acceptable. Introduction to the smart city energy management system and the key challenges being faced worldwide are hereby discussed. Basic energy requirement of a smart cities is in form of a smart grid and its overview is also incorporated in this course.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Smart City energy system and management and attain Employability Skills through Participative Learning techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: 1) Understand the Smart city components and characteristics 2) Explain the concept of a Smart Energy City. 3) Discuss basic components of Energy management system in smart cities. 4) Discuss challenges faced by different sectors in Smart energy management					
Course Content:						
Module 1	Introduction to Smart cities	Quiz	Quiz	10 Sessions		
Topics: Smart City: Definition, Concepts and Necessity; broad overview of smart city components and characteristics, smart infrastructure and building, smart infrastructure depictions, smart transportations, smart energy, smart water and waste management, smart healthcare and smart technology.						
Module 2	Energy infrastructure of Smart Cities	Quiz	Quiz	10 Sessions		
Topics: Requirements of a smart energy city, key technologies and concepts of a smart energy city, Smart grid and its overview, Smart energy system approach versus smart grid system, Smart buildings, Demand response programs, features of a smart building, low carbon society.						
Module 3	Energy management in Smart cities	Assignment	Conceptual understanding	10 Sessions		
Topics: Smart Energy Management, existing policies landscape, Basic concepts of Energy management system in smart cities, corner stone of successful energy management system practice, Edge computing for IoT based Energy Management in Smart Cities - A way forward for achieving the smart energy management in smart cities.						
Module 4	Smart Energy management in different sectors & challenges	Presentation	Case study	15 Sessions		
Topics: Smart Energy management in different sectors: Enhancing sustainable energy management of buildings, Home Energy management model, AI and its applications in Home Energy Management System (HEMS), Introduction to ISO 50001 Energy Management System (EnMS), improving the water-energy nexus, achieving smart and low carbon mobility, optimizing waste management processes, enhancing efficiency of public service delivery. Key challenges faced.						

Targeted Application & Tools that can be used: Knowledge of the Smart cities energy system and management will cater to the employability of young graduates in the field of policy making and as consultants and advisors to the service providers.	
Project Work/Assignment: 1. **Quiz:** Quiz will be conducted to evaluate the student's understanding of foundational concepts. 2. **Assignment:** Students will submit the assignment for the conceptual questions. 3. **Presentation:** Students will present real world cases in group presentation.	
Text Books: 1. *Smart City Emergence 2019 Elsevier Inc.* *https://www.sciencedirect.com/book/9780128161692/smart-city-emergence*	
References: 1. Saraju P Mohanty, Uma Choppali, Elias Kougianos, *"Everything you wanted to know about Smart Cities",* IEEE Consumer Electronics Magazine, July 2016 2. Zoran Morvaj, Luca Garcic and Boran Morvaj, "*Smart Energy Cities- Transition towards a low carbon society*, UNDP, March 2012 Web Resources 1. https://iglus.org/smart-cities-mooc/ 2. https://www.coursera.org/learn/smart-cities	
Topics relevant to "EMPLOYABILITY SKILLS": Energy Management in Smart Cities, ISO 50001 Energy Management System (EnMS) – Implementation for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Mr. Navneet Singh/ Mr. Ajay H A
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3803	Course Title: IoT in Construction Type of Course: Professional Elective & Theory	L-T-P-C	3	0	0	3
Version No.	1.1					
Course Pre-requisites	Elements of Civil Engineering, Essentials of basic computing and networks					
Anti-requisites	NIL					
Course Description	This course deals with the fundamental concepts of Internet of Things (IoT) and its specific applications in the construction industry. The course discusses essential concepts of IoT as a tool, its hardware and software followed by its applications. Further, role of IoT in project planning, management of machinery and labour and its utility in development of smart cities is discussed. This interdisciplinary course aims at applying concepts of computer science engineering, electronics and communication engineering and electrical engineering in the field of construction industry through IoT.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of IoT in Construction and attain Employability Skills through Participative Learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: CO.1 Explain the concept of Internet of Things (IoT) and its applications CO.2 Discuss how IoT can help in site planning and project management CO.3 Discuss how IoT can help with machinery and construction CO.4 Explain the role IoT can play in constructing Smart Cities					
Course Content:						
Module 1	IoT Technology and Applications	Case study	Data Collection	6 Sessions		
Topics: Basic Concepts: Definition, Evolution, Scope; Technical challenges and Solution, Artificial Intelligence and Machine Learning, Hardware Architectures for IoT, Communication and Networking Technologies in IoT, Applications.						
Module 2	IoT in Site Planning and Project Management	Assignment	Simulation	8 Sessions		
Topics: Augmented Reality, Building Information Modeling (BIM), Digital Twins; Material and manpower tracking, Security and Privacy, Budget optimization and scheduling, Resource and Asset Management, Construction waste management, IoT based framework for situational awareness in Construction Industry						
Module 3	IoT in machinery and construction	Assignment	Arduino	8 Sessions		
Topics: Optimization of machinery performance, Predictive Maintenance, Autonomous machines, IoT in Equipment Handling, Fleet management- optimizing transit routes. Robot based construction, 3-D Printing technology, IoT in Concrete curing, Structural health monitoring Construction safety- Site and worker safety, wearable devices, activity tracking, Hazard management.						
Module 4	IoT in Smart Cities	Case Study	Data Collection	8 Sessions		
Topics: Efficient water supply, electricity supply, sanitation-solid waste management, urban mobility, digitalization, sustainable environment, Industrial IoT, AI empowered IoT for Smart security, health and education.						
Targeted Application & Tools that can be used						

Application areas: The course caters to employability of graduates in the niche field of IoT in various construction firms, consultancies and town planning organizations. With the growth of interdisciplinary research and applications, engineers from various domains can come together to build customized solutions to various problems. The course directly feeds the smart cities concept of the Government of India where engineers are required for developing smart systems. It also helps nurture skills of students to apply concepts learnt in regular courses with an advanced technological approach.
Professionally used software: Revit, Arduino

Project Work/ Assignment

Text Books

T1. Timothy Chou, A. Vincent Vasquez "*Precision Construction: Principles, Practices and Solutions for the Internet of Things in Construction*, Precision Story, 2018.

References

R1. Simone Cirani, Gianluigi Ferrari, Marco Picone, and Luca Veltri, *"Internet of Things: Architectures, Protocols and Standards"*, Wiley, 2018.

R2. Kanan, R., Elhassan, O., & Bensalem, R. "*An IoT-based autonomous system for workers' safety in construction sites with real-time alarming, monitoring, and positioning strategies."* Automation in Construction, 88(December 2017), 73–86.

R3. Azhar, S. (2011). "*Building information modeling (BIM): Trends, benefits, risks, and challenges for the AEC industry*." Leadership and Management in Engineering, 2011, 11(3), 241– 252.

Web link: https://onlinecourses.nptel.ac.in/noc21_cs17/preview
PU e-Library Resources
1. https://search.ebscohost.com/login.aspx?direct=true&db=iih&AN=149962766&site=ehost-live
2. https://search.ebscohost.com/login.aspx?direct=true&db=iih&AN=156087416&site=ehost-live

Topics relevant to "EMPLOYABILITY SKILLS": Cyber physical systems, Artificial Intelligence and Machine Learning, Building Information Modeling (BIM), Budget optimization and scheduling, Optimization of machinery performance, Predictive Maintenance, IoT in Smart Cities for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Dr. Jagdish H Godihal
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

<table>
<tr><td>Course Code: CIV3804</td><td colspan="4">Course Title: Construction Economics and Financing for Smart Cities
Type of Course: Professional Elective and Theory</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="9">1.2</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="9">NIL</td></tr>
<tr><td>Anti-requisites</td><td colspan="9">NIL</td></tr>
<tr><td>Course Description</td><td colspan="9">The purpose of this course is to the incorporate the knowledge of Construction economics, a specialized branch of general economics. It involves the application of the economic techniques and expertise to study the construction firm, the construction process in smart city and the construction industry. The course is both conceptual and analytical in nature and needs fair knowledge of Mathematics. The course develops the critical thinking for decision making and analytical skills to choose construction resources for the construction project. By participating in the course, students will be able to understand the economics of construction projects in Smart cities and the decision-making process, enabling an efficient monitoring system through a better understanding of profit or loss.</td></tr>
<tr><td>Course Objective</td><td colspan="9">The objective of the course is to familiarize the learners with the concepts of Construction Economics and Financing for Smart Cities and attain Employability Skills through Problem Solving methodologies.</td></tr>
<tr><td>Course Out Comes</td><td colspan="9">On successful completion of the course the students shall be able to:
1) Distinguish between the different methods of quantifying techniques.
2) Analyze the economy of equipment based on its life cycle cost.
3) Prepare plans for dispute resolution in construction contracts.</td></tr>
<tr><td>Course Content:</td><td colspan="9"></td></tr>
<tr><td>Module 1</td><td colspan="3">Introduction to Construction Economics</td><td>Assignment</td><td colspan="2">Numerical Solving Task</td><td colspan="2">20 Sessions</td></tr>
<tr><td colspan="10">Topics:
Role of construction in economic development, Principle of supply and demand in Urban development, Engineering economics: Basic principles – Time value of money, Cash flow diagrams, Equivalence- Single payment in the future, Present payment compared to uniform series payments, Future payment compared to uniform series payments, Cost structures and Value in Construction for Smart cities: Life- cycle – costing , Comparison of alternatives: Present, future and annual worth method of comparing alternatives, Cost – benefit Analysis in Smart Infrastructure Projects.</td></tr>
<tr><td>Module 2</td><td colspan="3">Construction in Finance for Smart Cities</td><td>Quiz</td><td colspan="2">Memory recall based quiz</td><td colspan="2">15 Sessions</td></tr>
<tr><td colspan="10">Topics:
Overview of Infrastructure Financing, Project Finance Vs Corporate Finance, PPPs and Smart Cites – Models of PPP, Risk allocation and Contracts – Case studies, Financing Renewable energy and climate resilient construction. Digital tools in Construction Finance-digital twin for economic evaluation .</td></tr>
<tr><td>Module 3</td><td colspan="3">Estimate & Project Evaluation</td><td>Case Study</td><td colspan="2">Presentation of Case studies</td><td colspan="2">10 Sessions</td></tr>
<tr><td colspan="10">Topics:
Types of Estimates, Approximate estimates – Unit estimate, Factor estimate, parametric estimate. Financial Modelling for smart city Projects: IRR, RoR, NPV and payback period in technical projects, Sensitivity Analysis , Case studies in Smart City development</td></tr>
<tr><td colspan="10">Targeted Application & Tools that can be used:</td></tr>
</table>

Cost – Benefit Analysis for Infrastructure Projects, Resource Allocation and Budget Forecasting, Life Cycle costing, Financial Modelling tools such as Excel with Macros and MATLAB.

Project Work/ Assignment:

1. Assignment- Problems on Arithmetic Gradient, Geometric Gradient, Present & Annual worth and Rate of Return.
2. Quiz- Multiple choice questions from Infrastructure financing
3. Case studies- Students will give presentations on the allotted topics from projects on Smart city development (Masdar City –UAE, Songdo – South Korea ,Barselona Spain etc)

Text Books

1. Yescombe, E. R (2014), Principles of Project Finance (2nd Edi)
2. Merna, T, & Njiru C(2002), Financing Infrastructure Projects
3. Blank, L. T. and Tarquin,A. J,"Engineering Economy", Ninth Edition, WCB/McGraw-Hill, 2024.

References

1. Pretorius, F etal (2007): Project Finance for Construction and Infrastructure: Principle and Case Studies
2. Nevitt, P.K, and Fabozzi, F.J. (2000) 8th Ed – Project Financing.

Web-based Resources

https://nptel.ac.in/courses/105103023

https://nptel.ac.in/courses/105106653

https://npte.ac.in/courses/105104178

Topics relevant to "EMPLOYABILITY SKILLS": Cash flow diagrams and Equivalence- Single payment in the future, Present payment compared to uniform series payments, Future payment compared to uniform series payments for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mrs. Divya Nair
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3805	Course Title: Big Data Analytics for Civil Engineers Type of Course: Professional Elective Theory	L-T-P-C	2	0	2	3
Version No.	1.1					
Course Pre-requisites	CSE1700 CSE1701					
Anti-requisites	NIL					
Course Description	The purpose of this course is to enable the students of civil engineering to appreciate the growing importance of big data in their domain. They would develop the basic abilities of modelling and analyzing civil engineering related data using programming. The course is both conceptual and analytical in nature and needs fair knowledge of basic programming skills. The course also enhances the programming abilities through assignments. The associated laboratory provides an opportunity to validate the concepts taught and enhances the ability to visualize and even predict how civil engineering projects, structures, etc. would look like in real time.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Big Data Analytics for Civil Engineers and attain Employability Skills through Participative Learning techniques.					
Basic skill sets required for the laboratory:	The students shall be able to develop: 1) An attitude of enquiry. 2) Strong programming skills. 3) Data handling and analysis. 4) Confidence and ability to tackle new problems. 5) Assess errors and eliminate them. 6) Write Reports.					
Course Outcomes	On successful completion of this course the students shall be able to: CO.1 Explain the concept of big data analytics with its applications. CO.2 Demonstrate the use of big data analytics in Geotechnical, Structural Engineering and Transportation Engineering CO.3 Demonstrate the use of big data analytics in Water Resources and Environmental Engineering CO.4 Demonstrate the use of big data analytics in the management of Smart Cities CO.5					
Course Content:						
Module 1	Basics of Big Data Analytics	Assignment	Theory based	12 Sessions		
Topics: History and Evolution of Big Data, Characteristics of Big Data, Acquiring, Exploring, Pre-processing, analyzing data, communicating results and implementation; Programming models; Artificial Intelligence and Machine Learning, Neural networks, Real-world application examples.						
Module 2	Applications in Geotechnical Structural Engineering and Transportation Engineering	Project work	Simulation, Programming	14 Sessions		
Topics: Predictive Modeling of subsurface construction operations; Optimizations in design, Deterioration prediction and maintenance models; Optimal bridge inspection procedure, Augmented Reality, BIM, Automation in construction, Quality management, Risk control; Real time Analytics of traffic accidents, traffic volume data, connected and autonomous vehicles, speed tracking, Travel demand forecasting using Artificial Neural Networks, Urban link travel time predictions, Pavement Management Systems, Distress prediction models						

Module 3	Applications in Water management & Environmental control	Project work	Simulation, Programming	10 Sessions
Topics: Statistical models to identify aging sewer pipes impacted by groundwater flooding, Movement of pollutants and chemicals inside soil, predicting storm surge events. Environmental Impact Assessment models, pollutant level monitoring and prediction Geographic Information Systems and resource mapping				
Module 4	Applications in Smart Cities	Project work	Simulation, Programming	9 Sessions
Smart city Services analytics, Asset and Maintenance management, Connected vehicle, Connected Involved citizen, Smart Land use, Urban analytics, Strategic business models and partnering, Analytical performance management of smart cities.				

List of Laboratory Tasks:

Task 01: Predictive Modeling using Python/MATLAB
Level No. 01: Try to code few predictive models using some input parameters.
Level No. 02: Design a predictive model for future energy consumption in the University with new student intake numbers/pavement distress prediction model.

Task 02: Simulation
Level No. 01: Simulate functioning of a rotary intersection in VISSIM.
Level No. 02: Predict functioning of a rotary with future traffic volumes

Task 03: GIS
Level No. 01: Prepare contour map of a particular area.
Level No. 02: Analyze the local area for suitability of construction using GIS.

Targeted Application & Tools that can be used:

Application Areas include positions of data scientists in construction companies, quality control and risk managers who can predict future project risks.
Professionally Used Software: Python/MATLAB/VISSIM/REVIT/Plaxis/ArcGIS

Project work/Assignment:

Assignment: Theory based questions at introductory level based on the topics covered in Module 1.
Project work (any 1):

1. Real-Time Traffic Accident Risk Prediction and Visualization System using tools Python, TensorFlow/PyTorch, OpenStreetMap APIs, WebGL/Leaflet.js for visualization, Streamlit/Dash for interface.
2. Simulation of Deterioration and Maintenance Scheduling for Pavement Systems using regression or ML models.
3. Soil Pollutant Transport Simulation Using Finite Difference Method using Python (NumPy, Matplotlib)
4. Smart Land Use and Urban Analytics Simulator using Python with Pandas, GeoPandas, and Folium or Plotly Dash for interactive maps.
5. Connected Vehicle and Traffic Optimization Simulator Python with SUMO (Simulation of Urban Mobility) and TraCI API.

Textbooks

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, *"The Elements of Statistical Learning: Data Mining, Inference and Prediction"*, Springer, 2001.
2. Christopher M. Bishop, *"Pattern Recognition and Machine Learning"*, Springer, 2006.

References

1. Alavi A.H. and Gandomi A.H. (2016), "Big data in civil engineering", *Automation in Construction*.

PU e-Library Resources

1. Big Data Analytics by Venkat Ankam, Packt Publishing, Birmingham, 2016. https://research.ebsco.com/c/n5guci/search/details/yk6tbhgtcf?db=nlebk&limiters=None&q=big%20data%20analytics

2. Big Data Analytics for Connected Vehicles and Smart Cities by Bob McQueen, Artech House, Boston, 2017. https://research.ebsco.com/c/n5guci/search/details/z5y2fl6jbj?db=nlebk&limiters=None&q=big%20data%20analytics%20applications	
Topics relevant to "EMPLOYABILITY SKILLS": Machine Learning and Artificial Intelligence, BIM, Automation in construction, Quality management, Real time Analytics of traffic accidents, Travel demand forecasting using Artificial Neural Networks, Geographic Information Systems and resource mapping for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Mr. Aayush Kumar/Mr. Ajay H A
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3100	Course Title: Disaster Management and Mitigation Type of Course: Open Elective Theory	L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CHE7601 Environmental Studies					
Anti-requisites	NIL					
Course Description	The course introduces Disaster Management, focusing on natural disasters. The problem will be addressed in a holistic cross-sectorial and cross-disciplinary manner, including all stages of disaster management cycle: mitigation, preparation, response and recovery. This theory-based course also reveals participation by voluntary Agencies and Community at various stages of disaster management and disaster related infrastructure development.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Disaster Management and Mitigation and attain Skill Development through Participative Learning techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: CO.1 Explain the basic occurrence of natural and manmade disasters. CO.2 Describe the technological systems for disaster minimization. CO.3 Summarize the management practices to mitigate the disaster through case studies.					
Course Content:						
Module 1	Concepts of disaster	Assignment	Case studies	10 Sessions		
Topics: Occurrence, Cause and Impacts of natural and manmade disasters: Cyclone, flood, land slide, land subsidence, forest fire and earthquake, tsunami, river erosion, chemical spills, nuclear disasters, mine disasters.						
Module 2	Disaster Monitoring	Assignment	Case studies	12 Sessions		
Techniques of monitoring; forecasting and early warning; communications & ICT Tools; disaster risk reduction through prevention, preparedness, response, recovery, rehabilitation and reconstruction –Case study.						
Module 3	Management and Mitigation	Mini project	Comparison of management practices for disasters	14 Sessions		
Topics: management issues related to disaster, mitigation through capacity building, disaster mapping, assessment, pre-disaster risk & vulnerability reduction, post disaster recovery & rehabilitation; Participation by voluntary Agencies & Community in disaster management; Critical infrastructure in disaster management: Communications systems and networks, health facilities, emergency evacuation shelters, elements of transportation systems, waste disposal, water supplies. Methods for Disaster mitigation Case studies: Bhopal Gas disaster, Gujarat earthquake, Hiroshima and Nagasaki nuclear disaster, Tsunami disaster in Indonesia and Major floods in India.						
Targeted Application & Tools that can be used: Professionally Used Software: MS office, QGIS and GRASS						
Project Work/ Assignment: 1. Assignment: Students will submit in written Memory recall and Numerical solving task on module 1 and 2. 2. Seminar: Students will give presentation on relevant topics in group.						

Text Books:

T1. Disaster Management and Mitigation, Spectrum Publication. Dr. U. Sai Jyoti., 2018.

T2. Disaster Management and Mitigation Measures, Techknowledge Publication. Dr. Ravikant Pagnis, 2016

References:

R1. Disaster Management- Engineering and Environmental Aspects, Asiatech publishers, H Sarvothaman and K. J. Anandha Kumar, 2015.

R2. Disaster Management Guidelines. GOI-UNDP Disaster Risk Reduction Programme. (2009-2012).

R3. Disaster Risk Reduction in South Asia, Prentice Hall. Singh B.K., 2008,

R4. Handbook of Disaster Management: techniques & Guidelines, Rajat Publication. Ghosh G.K., 2006,

Web Source:

W1: https://www.intechopen.com/books/600

Topics relevant to "SKILL DEVELOPMENT": Techniques of monitoring and design against disasters and forecasting, disaster recovery & rehabilitation and disaster rescue operations for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Dr. Venkatesha Raju K and Dr. Jagdish Godihal
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3101	Course Title: Sustainability Concepts in Engineering Type of Course: Open Elective & Theory Only Course		L-T-P-C	3	0	0	3
Version No.	1.1					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course covers the fundamentals of sustainability as well as various perspectives on sustainable development and appropriate technologies for sustainable development. This course is important for all engineering discipline to derive significant benefits in the field of sustainability. The course also investigates aspects of improvements in health, and safety while using as few natural resources as possible and paying attention to the environment and resource sustainability. This is a theory-based course which will give an idea of different sustainable tools and Appropriate technologies for sustainable development.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Sustainability Concepts in Engineering and attain Skill Development through Participative Learning techniques.					
Course Outcomes	On successful completion of the course the students shall be able to: CO.1 Describe the sustainability concepts in engineering related to social-environmental and economic concepts. CO.2 Summarize the various sustainability tools for sustainable development. CO.3 Apply appropriate technologies for sustainable development.					
Course Content:						
Module 1	Introduction to Sustainability	Quiz	Quiz	15 Sessions		
Topics: Sustainability - Introduction, Need and concept of sustainability, Social-environmental and economic sustainability concepts. Sustainable development, Introduction to Ecological footprint, Challenges for Sustainable Development. Multilateral environmental agreements and Protocols - Clean Development Mechanism (CDM), Environmental legislations in India - Water Act, Air Act. Sustainability and development indicators and SDGs, UN's outlook of sustainable development and efforts, UN SDGs						
Module 2	Sustainable development tools	Assignment	Application of Sustainability tools	15 Sessions		
Topics: Resource/Environmental degradation, Climate change, Regional and Local Environmental Issues. Carbon credits and carbon trading, carbon foot print, Carbon sequestration – Carbon capture and storage (CCS). Life Cycle Analysis (LCA), Environmental management standards-ISO 14000 series, - Scope and Goal, Bio-mimicking.						
Module 3	Appropriate technologies for sustainable development	Quiz	Quiz	15 Sessions		
Topics: Energy sources: Basic Concepts-Conventional and non-conventional, solar energy -Fuel cells, Wind energy, Small hydro plants, biofuels, Energy derived from oceans, Geothermal energy. Circular Economy and Waste Management: Principle of Circular Economy, E-Waste, Plastic Waste and Bio-Waste management innovations, Waste to energy technologies Industrial Processes: Material selection, Pollution Prevention, Industrial Ecology, Industrial symbiosis, Domain related case studies.						

Targeted Application & Tools that can be used:

Targeted Application & Tools that can be used:

This course helps the students to understand the sustainable concepts and clean energy.

Professionally Used Software: GaBi, OpenLCA for Life Cycle Assessments

Project Work/Assignment:

1. **Quiz:** Quiz will be conducted to evaluate the student's understanding of foundational concepts related to sustainability and sustainability development.
2. **Assignment:** Students will be evaluated for their ability to apply key sustainability tools to real challenge
3. **Presentation:** Students will present real world cases in group presentation, to understand the application of theoretical knowledge on real-time problem.

Text Book

T1 Allen, D. T. and Shonnard, D. R., *Sustainability Engineering: Concepts, Design and Case Studies, Pearson*. 2011.

T2 Bradley. A.S; Adebayo, A.O., Maria, P., *Engineering applications in sustainable design and development, CL Engineering*. 2015.

References

R1 Jorge A. Vanegas, Sustainable Engineering Practice: An Introduction, Committee on Sustainability, American Society of Civil Engineers. 2004.

R2 Twidell, J. W. and Weir, A. D., Renewable Energy Resources, English Language Book Society (ELBS). 1986

Case study link:

https://www.researchgate.net/publication/307567464_Sustainable_Development_in_Practice_Case_Studies_for_Engineers_and_Scientists_Second_Edition

Web resources:

https://nptel.ac.in/courses/105105157- IIT Kharagpur, Prof. Brajesh Kumar Dubey

https://nptel.ac.in/courses/112104225 - IIT Kanpur Dr. Deepu Philip, Dr. Amandeep Singh

Topics relevant to "SKILL DEVELOPMENT": Industrial Processes: Material selection, Pollution Prevention, Industrial Ecology, Clean Development Mechanism (CDM) and Environmental legislations in India for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course handout

Catalogue prepared by	Ms. Shwetha A / Dr. Venkatesh Raju
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

<table>
<tr><td>Course Code: CIV3102</td><td colspan="4">Course Title: Occupational Health and Safety
Type of Course: Open Elective/ Theory Only</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="9">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="9">CIV1008 Basic Engineering Sciences</td></tr>
<tr><td>Anti-requisites</td><td colspan="9">NIL</td></tr>
<tr><td>Course Description</td><td colspan="9">This course introduces the student to the study of workplace occupational health and safety. Occupational Safety and Health Act (OSHA) sets safety and health standards for many work environments, and ensures that employers comply with those standards. The major objective of this course is to help the students develop a solid understanding of the Occupational Health and Safety legislation, processes, procedures, and techniques involved in workplace hazard identification, assessment, and control.</td></tr>
<tr><td>Course Objectives</td><td colspan="9">The objective of the course is to familiarize the learners with the concepts of Occupational Health and Safety and attain Entrepreneurial Skills through Participative Learning techniques.</td></tr>
<tr><td>Course Out Comes</td><td colspan="9">On successful completion of the course the students shall be able to:
CO.1 Explain the purpose of the Act and regulations pertaining to OHS.
CO.2 Recognize the occupational hazards and ergonomic issues.
CO.3 Summarize the required protective equipment and safety measures at work places.</td></tr>
<tr><td>Course Content:</td><td colspan="9"></td></tr>
<tr><td>Module 1</td><td colspan="3">Occupational Hazard and Control Principles</td><td>Assignment</td><td colspan="3">Data Collection/ Interpretation</td><td colspan="2">14 Sessions</td></tr>
<tr><td colspan="10">Topics:
Definition, Occupational Hazards and Risks. Key principles in occupational health and safety. National Safety Policy. Occupational Safety and Health Act (OSHA), Occupational Health and Safety Administration-Laws governing OSHA. Accident Prevention and Workers Compensation Scheme, investigation plan, Methods of acquiring accident facts, Importance of supervision in accident investigation, Indoor Pollution.</td></tr>
<tr><td>Module 2</td><td colspan="3">Ergonomics and safety at workplace</td><td>Assignment</td><td colspan="3">Case studies / Case let</td><td colspan="2">14 Sessions</td></tr>
<tr><td colspan="10">Topics:
Benefits, Task analysis, Workspace envelopes, Environmental conditions, standards, and ergonomic programs. Engineering controls and ergonomics applications in industries. Hazard cognition and analysis-Human error analysis and fault tree analysis. Fire safety, Fire resistant construction electrical safety and product safety.</td></tr>
<tr><td>Module 3</td><td colspan="3">PPE and Occupational Health and Safety considerations</td><td>Assignment</td><td colspan="3">Data Collection/ Interpretation</td><td colspan="2">14 Sessions</td></tr>
<tr><td colspan="10">Topics:
Occupational disease types and Health emergency. Personal Protective Equipment (PPE)-types and advantages. Effects and treatment for engineering industries and municipal solid waste. Environment management plans (EMP) for safety and sustainability. Handling of chemical and safety measures in water and wastewater treatment plants and construction sites</td></tr>
<tr><td colspan="10">Targeted Application & Tools that can be used:
This course helps the students to understand occupational health and safety standards and identify hazards in work place/ industries.
Professionally Used Software: MS Office</td></tr>
<tr><td colspan="10">Project Work/ Assignment:</td></tr>
<tr><td colspan="10">1. Assignment: Students will submit in written Memory recall and Numerical solving task on module 1 and 2.
2. Seminar: Students will give presentation on relevant topics in group.</td></tr>
</table>

Text Books:

T1. "Occupational safety and Health for Technologists, Engineers and Managers" Goetsch D.L, Prentice Hall publishing.

T2. "Essentials of safety management" Kaila and Singh, Himalaya publishing house.

T3. "Fire safety in Buildings". V.K Jain, New-Age Publishers.

References:

R1. "Industrial Safety and Pollution Control Handbook," National safety council and associate publishers Pvt Ltd. GOI Publication.

R2. "Industrial Accident prevention." Heinrich H.W. McGraw hill publication

R3. "Industrial Safety Management and Technology", Colling D.A. Prentice Hall

Web source:

W1: https://nap.nationalacademies.org/login.php?record_id=12639

Topics relevant to "ENTREPRENEURIAL SKILLS": Accident and Incident investigations, Fire safety and Ergonomics at workplace for developing Entrepreneurial Skills through Participative Learning techniques This is attained through the Presentation as mentioned in the assessment component.

Catalogue prepared by	Dr. Venkatesha Raju
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3103	Course Title: Sustainable Materials and Green Buildings Type of Course: Open Elective/ Theory	L-T-P-C	3	0	0	3
Version No.	1.1					
Course Pre-requisites	Nil					
Anti-requisites	NIL					
Course Description	The purpose of the Course is providing an overview of emerging delivery systems for high performance green buildings and the basis on which their sustainability can be evaluated. There are various benefits and advantages of sustainable construction, deals with Cost Reduction, Increased productivity, Improved health, Waste minimization, better use of materials, Environmental protection, Lesser noise pollution, Higher quality of life Emerging market, and Room for experimentation. This is a theory-based course which will give an idea of what is sustainable construction and its advantages etc.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Sustainable Materials and Green Buildings and attain Skill Development through Participative Learning techniques.					
Course Outcomes	On successful completion of the course the students shall be able to: CO.1 Understand the principles of sustainability and the role of innovative and alternative construction materials. CO.2 Explain passive design strategies and their impact on thermal comfort and building performance. CO.3 Apply smart digital technologies to improve sustainable construction, building performance, and data-driven green building management.					
Course Content:						
Module 1	Innovation in Sustainable Building Materials	Quiz	Memory recall questions	15 Sessions		
Topics: Sustainability - Challenges and Opportunities, Embodied Energy – Concept, Role of material innovation in sustainable construction, Next-generation cement alternatives: LC3 (Limestone Calcined Clay Cement), low-clinker cements, Nano-materials in concrete for durability and self-cleaning surfaces, Phase Change Materials (PCMs) and thermally responsive materials, Self-healing concrete and bio-concrete, Advanced insulation materials and low-emissivity building products, Thermal insulation materials: aerogels, hempcrete, cork boards, Case studies on sustainable material performance in real projects.						
Module 2	Passive and Climate-Responsive Building Design	Assignment	Theory based questions	15 Sessions		
Topics: Passive architectural strategies: orientation, shading, thermal mass, Vernacular and climate-sensitive architecture principles, Thermal comfort indices and adaptive thermal comfort models, Use of cool roofs, green facades, reflective surfaces, Integration of daylighting with visual comfort standards, Building envelope performance: wall-window ratio, glazing optimization, Advanced simulation tools -EnergyPlus, ClimateStudio, Ladybug Tools, Performance metrics for evaluating passive design strategies						

Module 3	Smart and Digital Technologies in Sustainable Construction	Case study	Presentations	15 Sessions

Topics:
Role of BIM (Building Information Modelling) in green construction, Integration of sensors and IoT for energy and occupancy monitoring, Digital twins and real-time data analytics for building performance, Green construction automation: 3D printing, robotics in modular housing, Construction site sustainability assessment using drones and GIS, Post-occupancy evaluation (POE) with smart technologies, Data-driven decision making for material selection and facility management, Industry case studies: smart campuses, net-zero buildings using digital workflows.

Targeted Application & Tools that can be used:
Professionally Used Software: MS office, Autodesk Insight 360, Autodesk Revit, and Autodesk FormIt 360.

Project Work/ Assignment:

4. **Quiz:** Quiz will be conducted to evaluate the student's understanding of foundational concepts related to sustainability and life cycle analysis.
5. **Assignment:** Green Building construction and materials.
6. **Presentation:** Students will present real world cases in group presentation, to understand the application of theoretical knowledge on real-time problem.

Text Book
T1. Michael Bauer, Peter Mösle, Michael Schwarz, Green Building: Guidebook for Sustainable Architecture, Springer, 3rd Edition, 2022.
T2. Francis D.K. Ching, Ian M. Shapiro, Green Building Illustrated, Wiley, 2nd Edition, 2020.
T3. Charles J. Kibert, Sustainable Construction: Green Building Design and Delivery, Wiley, 5th Edition, 2022.

References
R1. Vidya Bhushan, *Sustainable Building Materials and Construction*, New Age International Publishers, 2021.
R2. Deepa Asolekar, R. Gopichandran, *Sustainable Development for Engineers: A Handbook and Resource Guide*, CRC Press, 2020.

Web Resources: https://nptel.ac.in/courses/105/102/105102195/
Web Resources: https://onlinecourses.nptel.ac.in/noc19_ce40/preview

E book link R1: https://web.s.ebscohost.com/ehost/detail/detail?vid=3&sid=cbc51846-7bf7-482b-8aac-fbd99ab97ee4%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#
E book link R2: https://web.s.ebscohost.com/ehost/detail/detail?vid=4&sid=cbc51846-7bf7-482b-8aac-fbd99ab97ee4%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#

Topics relevant to "SKILL DEVELOPMENT": Green Building Certifications, LEED (Leadership in Energy and Environmental Design), GRIHA and IGBC certifications; Zero Energy Building –Introduction, design and construction for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Dr. Shwetha A
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

<table>
<tr><td>Course Code:
CIV3104</td><td colspan="4">Course Title: Integrated Project Management
Type of Course: Open Elective & Theory</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="9">1.2</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="9">Understanding of Process of execution in projects of relevant engineering discipline.</td></tr>
<tr><td>Anti-requisites</td><td colspan="9">NIL</td></tr>
<tr><td>Course Description</td><td colspan="9">This course provides insights into the fundamentals of project management useful in any engineering discipline. It also covers planning and scheduling, as well as quality and safety standards for any project. The course is both conceptual and analytical in nature and needs fair knowledge of Mathematics and skills of logical reasoning. The course provides hands-on experience on leading project management software to build PERT, CPM, and other planning techniques. The course also covers concepts of safety, quality, and contract management projects.</td></tr>
<tr><td>Course Objective</td><td colspan="9">The objective of the course is to familiarize the learners with the concepts of Integrated Project Management and attain Entrepreneurial Skills through Problem Solving methodologies.</td></tr>
<tr><td>Course Outcomes</td><td colspan="9">On successful completion of this course the students shall be able to:
1) Explain the basic concepts of project Management.
2) Prepare project plan, network and schedule for various projects.
3) Prepare resource management plan and quality management plans.</td></tr>
<tr><td>Course Content:</td><td colspan="9"></td></tr>
<tr><td>Module 1</td><td colspan="2">Basics of Project Management</td><td colspan="2">Quiz</td><td colspan="2">Memory recall based quiz</td><td colspan="2">15 Sessions</td></tr>
<tr><td colspan="10">Topics:
Introduction to Project, Phases of a Project, Activities involved in a project, Stake holders of a Project, Structure of a project Organization, Traits of a Project Manager, Competencies of a project manager, Cost estimates and budget: Client's and contractors perspective, contracts</td></tr>
<tr><td>Module 2</td><td colspan="2">Project Planning and Scheduling</td><td colspan="2">Assignment</td><td colspan="2">Numerical solving task</td><td colspan="2">20 Sessions</td></tr>
<tr><td colspan="10">Topics:
Concepts of Work breakdown structure, planning terminologies, Bar Charts, Network diagram and logic, Duration estimation of an activity, Network analysis, Float of an activity and its types, Planning technique - Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), Introduction to Graphical evaluation and review technique (GERT).</td></tr>
<tr><td>Module 3</td><td colspan="2">Resource & Quality Management</td><td colspan="2">Article review</td><td colspan="2">Article review on TQM techniques</td><td colspan="2">10 Sessions</td></tr>
<tr><td colspan="10">Topics:
Resource allocation, resource leveling and smoothening, Time-cost trade-off, Project control: S-curve, earn value analysis.
Quality - Definition of Quality, Elements of quality, Quality control, Quality Assurance, Cost of Quality, Total quality management (TQM), ISO standards.</td></tr>
<tr><td colspan="10">Targeted Application & Tools that can be used:
Application Area is Management of projects in terms of time, cost, quality and safety in any engineering discipline or any organization in general.
Professionally Used Software: MS Project, Oracle Primavera.</td></tr>
</table>

Project Work/ Assignment:	
1. Quiz:- Multiple choice questions on Phases of projects, stake holders, competencies and cost estimates 2. Assignment :-Problems pertaining to CPM and PERT Network analysis 3. Article review: - Article review on TQM techniques and presentations	
Textbooks: 1. K Nagarajan, "Project Management" eighth edition, New age International publishers , 2017. 2. Dr. Sanjiv Marwah, "Project management" First edition, Dreamtech press, 2011.	
References: 1. "Project management body of knowledge" by Project management institute. Weblinks/ E-Resources: 1. Scheduling techniques in Projects: https://swayam.gov.in/nd1_noc19_ce24/preview 2. Project Planning and Control: https://swayam.gov.in/nd1_noc19_ce30/preview 3. Project Management: https://swayam.gov.in/nd1_noc19_mg30/preview	
Topics relevant to development of"Entrepreneurship": Project life cycle, risk management, project planning for developing Entrepreneurial Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Mrs. Divya Nair
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3105	Course Title: Environmental Impact Assessment Type of Course: Open Elective	L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	-					
Anti-requisites	Nil					
Course Description	The main objective of this Course to assess the impact of any engineering projects on the environment. This Course introduces the methodology of environmental impact assessment (EIA) as a vital tool for sound environmental management and decision-making. The Course provides an overview of the concepts, methods, issues and various forms and stages of the EIA process. It examines the development of EIA overseas and in India. Different levels and systems of EIA are examined to highlight the diversity of approach and impact of the EIA process.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Environmental Impact Assessment and attain Entrepreneurial Skills through Participative Learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: CO.1 Explain the EIA notification and Environmental clearance process in India CO.2 Summarize the prediction and assessment of impacts on environment CO.3 Describe the public participation and EIA for relevant projects.					
Course Content:						
Module 1	EIA Scope and process in India	Assignment	Memory Recall task	13 sessions		
Topics: Introduction, Purpose and scope of EIA, EIA- Guiding principles, REIA, CEIA, Relationship between EIA, EIS and FONSI, Benefits of EIA , Categorization of projects, Stages in Prior Environmental Clearance Process, Validity of EC						
Module 2	Prediction and Assessment of Impacts on the Environment	Assignment	Memory Recall task	15 sessions		
Topics: Prediction and Assessment of Impacts on the Environment: Air, Water and noise environment. Identification and analysis of impacts. EIA methodologies. Mitigation and Compensation: Objectives and Principles of mitigation, Compensation for impacts, Identification of Analysis of Potential Environmental impacts						
Module 3	Public participation and EIA for various projects	Seminar	Case studies-Participative learning	17 sessions		
Topics: Introduction, Participation in the EIA process, objectives of public participation, Techniques of public participation, Approaches to public participation. EIA for water resource development projects, Highway projects, nuclear power plant projects, Mining project (Coal, iron ore), Thermal power plants and Infrastructure constructional activities. Case studies in EIA.						

Targeted Application & Tools that can be used: This Course helps student to assess impact of engineering projects on environment and to prepare EIA report on any projects. GIS software for analysis of impact on lake and ground water quality
Project Work/Assignment: 1. Assignment: Students will submit in written Memory recall task on module 1 and 2. 2. Seminar: Students will give presentation on case studies in group.
Text Book(s): T1. Larry W Canter, "Environment impact Assessment", McGraw Hill Publication, 2015
Reference Book(s): R1. Jain R.K –Van, "Environment impact Analysis", Nostrand Reinhold Co, 2016 Web source: https://archive.nptel.ac.in/courses/124/107/124107160/
Topics relevant to "ENTREPRENEURIAL SKILLS": EIA report for Construction projects for developing Entrepreneurial Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mr. Bhavan Kumar
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

<table>
<tr><td>Course Code: CIV3106</td><td colspan="3">Course Title: Infrastructure Systems for Smart Cities
Type of Course: Open Elective and Theory only</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="8">1.2</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Anti-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Course Description</td><td colspan="8">This course helps the students learn to identify urban problems, effective and feasible ways to coordinate urban technologies, various types of models and methods for effective implementation of smart cities concepts with new technologies for urban utilities, communication and dissemination. New forms of Urban Governance and Organization.</td></tr>
<tr><td>Course Objectives</td><td colspan="8">The objective of the course is to familiarize the learners with the concepts of Infrastructure Systems for Smart Cities and attain Employability Skills through Participative Learning techniques</td></tr>
<tr><td>Course Outcomes</td><td colspan="8">On successful completion of the course the students shall be able to:
1. Describe the principles and governance structure of smart cities
2. Explain the process and components of inclusive urban planning for smart cities
3. Apply smart solutions to address challenges in urban infrastructure and services</td></tr>
<tr><td>Course Content:</td><td colspan="8"></td></tr>
<tr><td>Module 1</td><td colspan="2">Urban Infrastructure</td><td>Case Study</td><td colspan="3">Case Study report on Smart City documentation of Indian cities</td><td>17 Sessions</td></tr>
<tr><td colspan="9">Topics:
Components of Urban Infrastructure, Smart City: Concepts, Benefits and Challenges, Evolution of smart city; Dimensions of smart city development; Smart city documentation of GOI; Smart Cities: Mission Statement and Guidelines; Overview of disruptive technologies for smart city; Smart governance; Case Study - Smart Cities Lighthouse projects.</td></tr>
<tr><td>Module 2</td><td colspan="2">Planning interventions of Urban Infrastructure</td><td>Article review</td><td colspan="3">Article review on Urban consultation and capability framework in Smart cities</td><td>10 Sessions</td></tr>
<tr><td colspan="9">Topics:
Urban Planning; Understanding Inclusive Planning: components; process of urban consultations; urban strategic planning for smart cities; Capability Framework of Smart Cities.</td></tr>
<tr><td>Module 3</td><td colspan="2">Smart Urban Infrastructure</td><td>Presentation</td><td colspan="3">Presentation on Smart solution case studies</td><td>18 Sessions</td></tr>
<tr><td colspan="9">Topics:
Innovative Approaches for Smart Cities; Perspectives: Technical infrastructure, Application domain, System integration, Data processing. Smart mobility – Traffic dashboards, Data cycle for dashboards; Smart Water supply and Sanitation, Smart Environment and Solid waste management.</td></tr>
<tr><td colspan="9">Targeted Application & Tools that can be used:
Application areas: Smart mobility; Smart water supply and sanitation, Smart environment and Smart solid waste management.
Professionally used software/Platform: GIS/Python/IoT</td></tr>
<tr><td colspan="9">Project Work/ Assignment:
1. Case Study: Students will submit a case Study report on Smart City documentation of various Indian cities
2. Article review: Article review on Urban consultation and capability framework in Smart cities.
3. Presentation: There will be a group presentation, where the students will present smart solutions adopted in various smart cities.</td></tr>
</table>

Textbooks:

1. Joseph N. Pelton; Indu B. Singh (2018), "Smart Cities of Today and Tomorrow: Better Technology, Infrastructure and Security" publication: Copernicus; 1st ed. 2019 edition.
2. UN-Habitat; "Inclusive and sustainable urban planning: a guide for Municipalities"; Volume 3: Urban Development Planning (2007); United Nations Human Settlements Programme (ISBN: 978- 92-1-132024-4).
3. Giffinger, Rudolf; Christian Fertner; Hans Kramar; Robert Kalasek; Nataša Pichler-Milanovic; Evert Meijers (2007),"Smart cities – Ranking of European medium-sized cities". Smart Cities. Vienna: Centre of Regional Science.

References

1. "Draft Concept Note on Smart City Scheme". Government of India - Ministry of Urban Development (http://indiansmartcities.in/downloads/CONCEPT_NOTE-12.2014__REVISED_AND_LATEST_.pdf)
2. Kent E. Calder (2016),"Singapore Smart City, Smart State" Brookings Institution Press publication.

PU e-Library Resource

1. https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1586504&site=ehost-live

Topics relevant to "Employability Skills": System integration, Data processing, Advanced Decision Support for mobility, water, environment and waste management for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout

Catalogue prepared by	Mr. Ajay H A/ Dr. Jagdish H Godihal/ Mr. Gopalakrishnan N
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3107	Course Title: Geospatial applications for Engineers Type of Course: Open Elective Theory & Lab integrated	L-T-P-C	2	0	2	3
Version No.	1.1					
Course Pre-requisites	Surveying					
Anti-requisites	Nil					
Course Description	This course will introduce the fundamentals of geospatial technologies like remote sensing, GIS and GPS to students. Mainly the course focuses on topics such as Introduction, historical developments, present and future trends in Remote Sensing techniques, Geographic Information System & Global Positioning System and their role in engineering applications. After completing this course, students shall be able to do the operational processes of spatial data acquisition, editing and quality assessment metadata development, geo-database design, spatial query and display and spatial analysis. Students will also be exposed to Google Earth and common open-source GIS tools.The related laboratory offers an opportunity to validate the concepts taught and enhances the ability to visualize the realistic circumstances.					
Course objectives	The objective of the course is to familiarize the learners with the concepts of Geospatial applications for Engineers and attain Entrepreneurial Skills through Experiential Learning techniques.					
Course Outcomes	On successful completion of the course the students shall be able to: 1] Explain the basic principles and functions of geospatial technologies. 2] Interpret the operational process of spatial and non-spatial data collection and analysis. 3] Apply the knowledge of geospatial technologies to find the solutions of various engineering and other problems.					
Course Content:						
Module 1	Introduction	Assignment	Theory based questions	10 Sessions		
Topics: Introduction to Geospatial basics – General description of geospatial, & its components and descriptions of remote sensing, GPS, GIS and Google earth.						
Module 2	Computations of geospatial data	Assignment	Theory based questions	10 Sessions		
Topics: Introduction to spatial and non-spatial data. Software and hardware requirement. Map projections. Installation of GIS softwares, General tools used, Primary & Secondary data collection, analysis and spatial query process to produce desired outputs. Digital map preparation.						
Module 3	Drone techniques in Geospatial technologies	Case study	Presentations	10 Sessions		
Topics: Drone: Basics, types, data collection, analysis and applications of GIS related to Civil engineering, agriculture domain, petroleum and other general use.						
List of Laboratory Tasks: Experiment No 1: Determination of locations of objects using GPS. Level 1: Finding of locations of various objects. Level 2: Interpretation of location data of different objects in a particular area.						

Experiment No. 2: Landuse / land cover change detection study
Level 1: Landuse / land cover pattern of past two decades to find landuse changes using Remote sensing images and GIS.
Level 2: Statistical data analysis using the level 1 data output.

Experiment No. 3: Spatial query and creating map outputs using GIS and Remote Sensing
Level 1: Spatial query using spatial and non-spatial data
Level 2: Making of map outputs using the level 1 data.

Experiment No. 4: Geo-tagging for Efficient, Cost-Effective Project Management
Level 1: Demonstration of Geo-tagging using Google map
Level 2: Collection of location data and geo-tagging of the same.

Targeted Application & Tools that can be used:

The main application area includes infrastructure projects - data collection, analysis and presentation. The information can be used by Government, private companies and other engineers to communicate and work effectively in multidisciplinary Projects.
Professionally used software like GIS (QGIS / ARCINFO) and Image processing software (GRASS / ERDAS.) The customized based programs would also be incorporated wherever necessary.

Project Work/ Assignment:

1) Assignment 1: - Components and descriptions of remote sensing, GPS, GIS and Google earth.
2) Assignment 2: - Computations of geospatial data.
3) Case Study:- Drone techniques in Geospatial technologies.

Text Book(s):

T1. Thomas M. Lillesand, Ralph W. Kiefer, Jonathan W. Chipman, Remote Sensing and Image Interpretation, Wiley, 7th Edition, 2020.
T2. Kang-Tsung Chang, Introduction to Geographic Information Systems, McGraw Hill, 9th Edition, 2023.
T3. Basudeb Bhatta, Remote Sensing and GIS, Oxford University Press, 3rd Edition, 2021.

Reference Book(s):

R1. Emilio Chuvieco, Fundamentals of Satellite Remote Sensing: An Environmental Approach, CRC Press, 3rd Edition, 2020.
R2. George Joseph, C. Jeganathan, Fundamentals of Remote Sensing, Orient Blackswan, 4th Edition, 2018.
R3. Satheesh Gopi, Global Positioning System: Principles and Applications, Tata McGraw Hill, 2nd Edition, 2020.
R4. Erik Westra, Python Geospatial Analysis Essentials, Packt, 2nd Edition, 2021.
R5. David R. Green, Jane Smith, Unmanned Aerial Remote Sensing: UAVs for Environmental Applications, CRC Press, 2020.

Web links:

https://www.omnisci.com/learn/geospatial
https://earth.google.com/web/
https://unctad.org/system/files/official-document/dtlstict2012d3_en.pdf

E-resources:

https://search.ebscohost.com/login.aspx?direct=true&db=e000xww&AN=548255&site=ehost-live
https://onlinecourses.nptel.ac.in/noc22_ce26/preview
https://onlinecourses.nptel.ac.in/noc22_ce78/preview

Topics related to development of "EMPLOYABILITY":

Course introduces the basic technologies like remote sensing, GIS and GPS to students. Mainly the course focuses on topics such as preamble, historical developments, present and future trends in Geographic Information System & Global Positioning System and their role in engineering applications for developing Entrepreneurial Skills through Experiential

Learning techniques. This is attained through the Lab Experiments as mentioned in the assessment component.	
Catalogue prepared by	Dr. Shwetha A
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: CIV3108	Course Title: Environmental Meteorology Type of Course: Open Elective/ Theory	L-T-P-C	3	0	0	3
Version No	1.0					
Course Pre-requisites	CHE7601 Environmental Studies and CIV1008 Engineering Geology					
Anti-requisites	-Nil-					
Course Description	This course introduces the fundamental physical processes in atmospheric heat, energy, temperature, pressure, wind, clouds, precipitation, and stability. It provides the basis for understanding weather systems, such as thunderstorms, tornadoes, and hurricanes. These processes are also applied to climatic patterns and the impacts of human activity on weather and climate, such as air pollution and climate change.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Environmental Meteorology and attain Skill Development through Participative Learning techniques.					
Course Outcomes	On successful completion of the course the students shall be able to: CO.1 Distinguish weather and climate with their parameters. CO.2 Classify the precipitation, clouds and wind with measurement. CO.3 Explain the meteorological principles for pollutant dispersion and transport in ambient air. CO.4 Discuss the types of monsoon and climate change scenario in India.					
Course Content:						
Module 1	Fundamentals of Meteorology	Assignment	Case Study	14 Sessions		
Topics: Motions of the earth and seasons. Earth-Sun relationship. Insolation and its latitudinal and seasonal variation. Difference between weather and climate. Elements of weather and climate, climatic controls, energy balance in atmospheric; elementary ideas about weather systems, climatic classifications; climates in India; monsoons of India.						
Module 2	Weather parameters and measurement	Assignment	Data collection and analysis	14 Sessions		
Topics: Air temperature- warming and cooling of air near ground, measurement of temperature; Humidity- expressions of humidity, measurement of humidity; clouds classification and types; Precipitation- process, types of precipitation, measurement of precipitation-recording, non-recording, radar, satellite. Estimation of precipitation, averaging techniques- thiessen polygon and isohyets. Wind - forces affecting wind, types of wind and measurement of wind. ☐						
Module 3	Pollution meteorology	Assignment	Data collection and analysis	14 Sessions		
Topics: Application of meteorological principles to transport and diffusion of pollutants; Diffusion and turbulence, mixing height; Effect of meteorological factors on air pollution, size and structure of plume, dispersion of air pollutants – Gaussian model, reaction of pollutants in air forming smog, PAN, Acid rain.						
Module 4	Pollution Climatology	Case Study	Data collection and analysis	12 Sessions		
Topics: Preliminary concepts of climate change; seasons in India; Monsoons; El nino and ENSO; Drivers of climate change- greenhouse gases, aerosols – reflective and black carbon, land use changes. Energy balance, feed-back processes in climate system, concepts of global						

warming potential (GWP), radiative forcing. Climate change scenarios of India: impact of climate change on agriculture, forest, water resources, monsoon system of India.

Targeted Application & Tools that can be used:

This Course helps student to understand measurement of significant weather parameters, plume behaviour with pollutant dispersion models and drivers of climate change and greenhouse gases.

3. Assignment: Students will submit in written Memory recall and Numerical solving task on module 1 and 2.
4. Seminar: Students will give presentation on relevant topics in group.

Text Book

T1. Arya, S.P. 1999. Air Pollution, Meteorology and Dispersion, Oxford University Press, London.
T2. Ranganathan, ""Meteorology and Weather", Suhas Printers, Bangalore.

References

R1. Barry, R.G. and R.J. Shorty. Atmosphere, Weather and Climate.
R2. K. Siddhartha, 2018, "Climatology", Kitab Mahal.
R3. Kelkar RR, 2010, "Climate Change – A holistic view" BS publications, Hyderabad.

Web Sources

W1: https://www.mdpi.com/books/reprint/770-advances-in-hydro-meteorological-monitoring

Topics relevant to "SKILL DEVELOPMENT": Types of wind and measurement of wind, Effect of meteorological factors on air pollution, Climate change scenarios of India for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course handout

Catalogue prepared by	Dr. Venkatesha Raju K.
Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on __ June 2025

Course Code: MEC3078	Course Title: Production and Operations Management Type of Course: Open Elective Theory		L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The purpose of this course is to enable the students to understand various components of Production management, Production planning, Production scheduling and model production management tools. The course is both conceptual and analytical in nature. The course develops the analytical, critical thinking, and decision making skills. The course also enhances the problem solving abilities through assignments.					
Course Objective	This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies					
Course Outcomes	On successful completion of this course the students shall be able to: (1) Recognize the importance of production management in industry. 2) Describe Facility location problems and aggregate planning. 3] Solve problems in sequencing and Scheduling in production environment. 4] Summarize the various modern production management tools.					
Course Content:						
Module 1	Introduction to Production Management	Assignment	Data Collection and Analysis	08 Sessions		
Topics: Introduction, Production Management, Scope of Production Management, Production System, Types of Production Systems - Flow Shop, Job Shop, Batch Manufacturing and the Project, Benefits of Production Management, Productivity, Decisions of Production Management.						
Module 2	Production Planning and Control	Case Study	Simulation and data analysis task	12 Sessions		
Topics: Characteristics of Production Planning and Control, Objectives of Production Planning and Control, Facility Location, Factors Influencing Plant Location, Single Facility Location Problem, Minimax Location Problem, Gravity Location Problem, Classification of Layout, Aggregate Planning, MRP Concept, MRP Calculations.						
Module 3	Sequencing and Scheduling	Assignment	Data Collection and Analysis	12 Sessions		
Topics: Concept of Single Machine Scheduling - Shortest Processing Time (SPT) Rule to Minimize Mean Flow Time, Weighted Mean Flow Time, Earliest Due Date (EDD) Rule to Minimize Maximum Lateness, Introduction to Branch and Bound Technique to Minimize Mean Tardiness. Flow Shop Scheduling - Introduction, Johnson's algorithm, Extension of Johnson's Rule, Branch and Bound Technique, CDS Heuristic.						
Module 4	Modern Production Management Tools	Case Study	Data collection and Programming	10 Sessions		

Topics: Just-In-Time Manufacturing, Computer Integrated Manufacturing and Flexible Manufacturing System, Total Quality Management, Poka Yoke, Kaizen, Business Process Reengineering, Supply Chain Management, Lean Manufacturing, Quality Function Deployment.	
Targeted Application & Tools that can be used: Application Area include almost all manufacturing organizations (Automotive – Suzulki, Toyota, Hyundai, KIA, Ford etc.,) Processing industries (Petroleum – Reliance, Shell, HP etc., Cement industries – Dalmiya, Ultra Tech),. Professionally Used Software: DYNAMIC 3i Production Planning, IQMS, Fishbowl	
Project work/Assignment: Project: Assuming yourself as an entrepreneur, carryout the analysis facility location for your new project. Assignment: 1] Consider an flow shop environment and use the suitable algorithms to solve the problem considered. Assignment 2: From your perspective, which are the modern tools of production management will have huge impact in the transition to industry 4.0 from current setting.	
Text Book 1. Pannerselvam. R, Production and Operations Management, PHI. 2012 2. Richard B. Chase, Nicholas J. Aquilano, F. Robert Jacobs, Production and Operations Management: Manufacturing and Services, Irwin/McGraw-Hill, 1998	
References 1. Chary, S. N. Production and operations management. McGraw Hill Education, 2017. 2. Singh S.P. Production and operations management. Vikas Publishing House Pvt. Ltd., 2014. Website: https://praxie.com/top-operations-management-tools-and-templates/ Journal of Production and Operations Management, Knimbus Open Journals. https://presiuniv.knimbus.com/openFullText.html?DP=http://uijs.ui.ac.ir/jpom/index.php?slc_lang=en&sid=1	
Catalogue prepared by	Dr. Ramachandra C G
Recommended by the Board of Studies on	BOS NO: 15th BOS held on 22/07/2022
Date of Approval by the Academic Council	Academic Council Meeting No. 18, Dated 03/08/2022.

Course Code: CIV7000	Course Title: Internship Type of Course: School Core	L-T-P-C	-	-	-	2
Version No.	1.0					
Course Pre-requisites	None					
Anti-requisites	Nil					
Course Description	The Internship course enables students to gain practical experience by working in a professional environment relevant to their discipline. Students apply theoretical knowledge to real-world projects, enhance technical skills, and develop professional competencies, including teamwork, communication, and problem-solving. This course provides a bridge between academic studies and industrial practices, ensuring readiness for professional roles.					
Course Objectives	The objective of the course is to impart Employability Skills through Experiential Learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: CO.1 Demonstrate the application of academic knowledge in practical scenarios. CO.2 Develop skills in problem-solving and critical thinking in a workplace setting. CO.3 Demonstrate professional behaviours, including effective communication and teamwork. CO.4 Develop insights into industrial processes, ethics, and organizational practices					
Course Content:						
This course involves a full-time internship at a professional organization. The student will work on a designated project under the supervision of an industry mentor and a faculty coordinator. The scope of work will include: 1. Familiarization with industry-specific tools and techniques. 2. Active participation in organizational processes and tasks. 3. Completion of a well-defined project. 4. Submission of a comprehensive internship report and presentation.						
Catalogue prepared by	Mr. Dayalan J					
Recommended by the Board of Studies on	BOS Meeting No: 20, Dated: 6th June 2025					
Date of Approval by the Academic Council	Academic Council Meeting No 26 dated __ June 2025					

Course Code: CIV7100	Course Title: Minor Project – Extensive Survey Type of Course: Professional Elective	L-T-P-C	-	-	-	4
Version No.	1.0					
Course Pre-requisites	CIV2101 - Surveying					
Anti-requisites	NIL					
Course Description	The Extensive Survey Project course aims to provide students with hands-on experience in the application of surveying techniques and principles in real-world scenarios. Students will work in teams to carry out field surveys, analyze collected data, and prepare detailed reports. The course emphasizes collaborative learning, problem-solving, and the use of advanced survey tools such as Total Station, DGPS and Drone to solve complex engineering problems.					
Course Objective	The objective of the course is to impart **Employability Skills** through **Experiential Learning** techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: CO.1 Demonstrate the conduction of survey for various projects in field. CO.2 Examine data collected from field surveys to derive meaningful insights. CO.3 Prepare detailed survey reports and maps using appropriate tools and software.					
Course Content:						

Topics: New Tank Project, Water Supply and Sanitation Project, Highway Project, Old tank project and Aerial Survey.

The Extensive Survey Project includes the following components:

5. Planning and Preparation: Selection of survey sites, defining objectives, and preparing survey plans.
6. Field Survey Work: Conducting surveys using tools such as Total Station, Theodolite, DGPS, and UAVs for data collection.
7. Data Processing and Analysis: Using software like AutoCAD, ArcGIS, QGIS or Pix4D Mapper / Matic for processing survey data.
8. Report Preparation: Developing detailed project reports, including maps, drawings, and analysis outcomes.
9. Final Presentation: Presenting survey results and findings to peers and faculty.

Text Books

1. Extensive Survey Manual, Presidency University, 2025
2. B.C. Punmia, "Surveying Vol. 1 and 2", Laxmi Publications pvt. Ltd., New Delhi-2009
3. Advance Methods and Techniques in Drone Surveying Book, Dr. E. V. Raghava Rao PRASHAS RESEARCH CONSULTING PVT. LTD
4. GPS for Land Surveyors, Third Edition, Jan Van Sickle, CRC Press; 2nd edition.

References

1. Chandra. A.M, "Plane Surveying and Higher Surveying", New Age International (P) Limited Publishers, Chennai, 2015
2. Kanetkar T P and S V Kulkarni, "Surveying and Levelling", Vol 1 and 2, Pune Vidyarthi Griha Prakashan, 2017

Topics relevant to "Employability Skills": All projects are relevant to employability skills.

Catalogue prepared by	Mr. Bhavan Kumar M

Recommended by the Board of Studies on	BoS No. 20 held on 06 June 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26 held on June 2025

Course Code: CIV7300	Course Title: Capstone Project Type of Course:	L-T-P-C	-	-	-	10
Version No.	1.0					
Course Pre-requisites	None					
Anti-requisites	Nil					
Course Description	The Capstone Project is a culmination of the learning outcomes achieved during the program, where students undertake a comprehensive project to solve real-world problems or contribute to their field of study. The course emphasizes innovation, interdisciplinary learning, and problem-solving. Students work under the guidance of a faculty mentor to design, implement, and evaluate their projects, fostering research skills and industry-readiness.					
Course Objectives	The objective of the course is to impart Employability Skills through Experiential Learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: CO.1 Develop a project plan and execute it within the given constraints and timeframe. CO.2 Apply theoretical concepts and practical skills to solve complex problems. CO.3 Demonstrate effective project management, including documentation and reporting. CO.4 Summarize project outcomes professionally through oral and written communication.					
Course Content:						
The Capstone Project involves the following key activities: 10. Identification of a research problem or project topic in consultation with a faculty guide. 11. Literature review and methodology development. 12. Design and implementation of the project. 13. Data collection, analysis, and interpretation (if applicable). 14. Preparation of a comprehensive project report and final presentation.						
Catalogue prepared by	Mr. Dayalan J					
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 4th June 2025					
Date of Approval by the Academic Council	Academic Council Meeting No					

Course Code: CHE7601	Environmental Studies Type of Course: MOOC course	L- T- P- C	-	-	-	-
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course is designed to improve the learners' SKILL DEVELOPMENT by using PATICIPATIVE LEARNING techniques. This course aims to familiarize students with fundamental environmental concepts and their relevance to business operations, preparing them to address forthcoming sustainability challenges. It is designed to equip students with the knowledge and skills needed to make decisions that account for environmental consequences, fostering environmentally sensitive and responsible future managers. This course is designed to cater to Environment and Sustainability					
Course Objective	The objective of the course is 'SKILL DEVELOPMENT' of the student by using 'PARTICIPATIVE LEARNING' techniques					
Course Outcomes	On successful completion of this course the students shall be able to: 1. Describe the issues related to natural resources, ecosystems and biodiversity 2. Identify environmental hazards affecting air, water and soil quality 3. Recognize the importance of healthy environment and finding the sustainable methods to protect the environment 4. Convert skills to address immediate environmental concerns through changes in environmental processes, policies, and decisions					
Course Content:						
Module 1	Understanding Environment, Natural Resources, and Sustainability					
Topics: Classification of natural resources, issues related to Population growth and their overutilization, and strategies for their conservation. Water, air, soil, mineral, energy and food source. Effect of human activities on natural resources. Concept of sustainability- Sustainable Development Goals (SDGs)- targets and indicators, challenges and strategies for SDGs; Sustainable practices in managing resources, including deforestation, water conservation, Desalination – types, energy security, and food security issues, Life Cycle thinking and Circular Economy.						
Module 2	Ecosystems, Biodiversity, and Sustainable Practices					
Topics: Ecosystems and ecosystem services: Various natural ecosystems, Major ecosystem types in India and their basic characteristics; forests, wetlands, grasslands, agriculture, coastal and marine; Ecosystem services- classification and their significance. The importance of biodiversity, Types of biodiversity, Biodiversity and Climate Change, the threats it faces, hotspots, and the methods used for its conservation. Strategies for in situ and ex situ conservation, mega diverse nation.						
Module 3	Environmental Pollution, Waste Management, and Sustainable Development					

Topics:
Types of pollution- Chemical, - Biological, Biomedical, noise, air, water, soil, thermal, radioactive and marine pollution, and their impacts on society. Urbanization and Urban environmental problems; effects, and mitigation.
Causes of pollution, such as global climate change, ozone layer depletion, the greenhouse effect, and acid rain, with a particular focus on pollution episodes in India. Importance of adopting cleaner technologies; Solid waste management;

Sustainable Materials and Technologies: Biodegradable and compostable materials, Recycled and reclaimed materials (E-waste management), Sustainable manufacturing processes.

Module 4	Social Issues, Legislation, and Practical Applications			

Topics:
Overview of key environmental legislation and the judiciary's role in environmental protection, including the Water (Prevention and Control of Pollution) Act of 1974, the Environment (Protection) Act of 1986, and the Air (Prevention and Control of Pollution) Act of 1981. Hazardous waste Rule 1989, Biomedical Waste handling 1998, Fly Ash Rule 1999, Municipal Solid Waste Rule 2000, Battery Rules 2001, E- Waste Rules 2011, Plastic waste management Rules 2016, Construction Demolition waste Rules 2016 National Biodiversity Action Plan (NBAP)
Major International Environmental Agreements: Convention on Biological Diversity (CBD), The Biological Diversity (Amendment) Act, 2023, United Nations Framework Convention on Climate Change (UNFCCC); Kyoto Protocol; Paris Agreement.
Major International organisations and initiatives: United Nations Environment Programme (UNEP), United Nations Educational, Scientific and Cultural Organization (UNESCO), Intergovernmental Panel on Climate Change (IPCC).

Targeted Application & Tools that can be used:
Application areas are Energy, Environment and sustainability
Tools: Online Tools – NPTEL and Swayam.

Project work/Assignment:

Assessment Type
- Online exams (MCQs) will be conducted by the department of Chemistry

Online Link*:
1) Lecure by Dr. Samik Chowdhury, Dr. Sudha Goel, NPTEL course: Environmental Science, https://nptel.ac.in/courses/109105203, 2024.
2) Lecture by Dr. Padmavati, Dr Narendran Thiruthy, NPTEL Course: Biodiversity Protection, Farmers and Breeders Rights, https://nptel.ac.in/courses/129105008, 2024.

* Other source links are available in below Resources link.

Text Book

1. G. Tyler Miller and Scott Spoolman (2020), Living in the Environment, 20th Edition, Cengage Learning, USA
2. Poonia, M.P. Environmental Studies (3rd ed.), Khanna Book Publishing Co.
3. Bharucha, E. Textbook of Environmental Studies (3rd ed.) Orient Blackswan Private Ltd.
4. Dave, D., & Katewa, S. S. Text Book of Environmental Studies. Cengage Learning India Pvt Ltd.
5. Rajagopalan, R. Environmental studies: from crisis to cure (4th ed.). Oxford University Press.
6. Basu, M., & Xavier Savarimuthu, S. J. Fundamentals of environmental studies. Cambridge University Press.
7. Roy, M. G. Sustainable Development: Environment, Energy and Water Resources. Ane Books.
8. Pritwani, K. Sustainability of business in the context of environmental management. CRC Press.
9. Wright, R.T. & Boorse, D.F. Environmental Science: Toward A Sustainable Future (13th ed,). Pearson.

Reference Books

1. Varghese, Anita, Oommen, Meera Anna, Paul, Mridula Mary, Nath, Snehlata (Editors) (2022), Conservation through Sustainable Use: Lessons from India. Routledge.
2. William P. Cunningham and Mary Ann Cunningham (2020), Principles of Environmental Science: Inquiry & Applications, 9th Edition, McGraw-Hill Education, USA.
3. Richard A. Marcantonio, Marc Lame (2022). Environmental Management: Concepts and Practical Skills. Cambridge University Press.
4. Manahan, S.E. (2022). Environmental Chemistry (11th ed.). CRC Press. https://doi.org/10.1201/9781003096238
5. Theodore, M. K. and Theodore, Louis (2021) Introduction to Environmental Management, 2nd Edition. CRC Press

Resources:

1. https://nptel.ac.in/courses/109105203
2. https://archive.nptel.ac.in/courses/120/108/120108004/
3. https://nptel.ac.in/courses/127105018
4. https://onlinecourses.nptel.ac.in/noc23_lw06/preview
5. https://onlinecourses.swayam2.ac.in/ini25_bt02/preview
6. https://archive.nptel.ac.in/courses/120/108/120108002/
7. https://onlinecourses.swayam2.ac.in/ini25_bt02/preview
8. https://nptel.ac.in/courses/102104088
9. https://nptel.ac.in/courses/124107165
10. https://nptel.ac.in/courses/109106200
11. https://archive.nptel.ac.in/content/storage2/courses/120108004/module1/lecture1.pdf
12. https://onlinecourses.swayam2.ac.in/nou25_ge19/preview
13. https://onlinecourses.swayam2.ac.in/ini25_hs01/preview
14. http://kcl.digimat.in/nptel/courses/video/105105184/L32.html
15. https://nptel.ac.in/courses/105105169

Topics relevant to Skill Development:

1. An attitude of enquiry.
2. Write reports

The topics related to Environment and Sustainability :

All topics in theory component are relevant to Environment and Sustainability.

Catalog prepared by	Faculty members of the Department of Chemistry
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	

Course Code: LAW7601	Indian Constitution Type of Course: MOOC course	L-T-P-C	-	-	-	0
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course is designed to improve the learners' SKILL DEVELOPMENT by using PATICIPATIVE LEARNING techniques. This course aims to familiarize students with fundamentals of Indian Constitution concepts and their relevance to 75+ Years of Republic of India (https://constitution75.com/) as well as #AzaadiKaAmrutMahotsav / Azadi Ka Amrit Mahotsav (https://amritmahotsav.nic.in). It is designed to equip students with the knowledge about the Constitution of India. This course aims to introduce the constitutional law of India to students from all walks of life and help them understand the constitutional principles as applied and understood in everyday life. The objective of making the Constitution of India, familiar to all students, and not only to law students, this course aims and objectifies legal understanding in the simplest of forms. This course is designed to cater to Constitutional Studies.					
Course Objective	The objective of the course is 'SKILL DEVELOPMENT' of the student by using 'PARTICIPATIVE LEARNING' techniques					
Course Outcomes	On successful completion of this course the students shall be able to: 1. Describe the basic understanding of the Indian Constitution and the concepts and issues relevant to day-to-day life of the nation and to equip the Citizen with the zeal of capacity building. Recognizing and identify the values of the Constitution of India. 2. Enabling the Citizen-centric Awareness of Rights and Responsibilities of the State 3. Explain the role of the State actors in building India. 4. Understanding the Gandhian vision over the power of the LSG (Local Self-Governance)					
Course Content:						
Module 1	Understanding the Making of the Constitution: The Constituent Assembly & The Constitution of India					
Topics: Historical Context of Constituent Assembly - Compositions & Functions of Constituent Assembly What is a Constitution? – Why have a Constitution? – Constitutional Change - Features of Indian Constitution – Preamble of Indian Constitution						
Module 2	Citizen's Fundamental Rights and State's Responsibilities (Directive Principles)					
Topics: Introduction to Fundamental Rights - Right to Equality – Facets of Right to Equality - Right to Freedom - Constitutional Position of Some Democratic Rights - Right Against Exploitation - Right to Freedom of Religion - Right to Constitutional Remedies						

Directive Principles of the State Policy

Module 3	Organs Of the Government			

Topics:
Executive: The President of India - Powers and Functions of President of India - Emergency Powers and the Position of the President
Legislature: Union Council of Ministers - Prime Minister - The Rajya Sabha - The Lok Sabha - Relation between the Lok Sabha & Rajya Sabha - Office of the Speaker – Important Parliamentary Committees
Judiciary: The Structure and Organization of the Judiciary & the High Court - The Supreme Court - Role of The Supreme Court - Judicial Activism in India - Basic Structure Doctrine & PIL

Module 4	Federalism & Decentralization			

Topics:

What is Federalism? - Centre-State Legislative Relations - Centre-State Administrative Relations - Centre-State Financial Relations
The 5th & 6th Schedules - Municipality- (History of Indian Municipality, Organization & Functions) – Panchayat 1 (Idea of Panchayat, Organization and Powers of Panchayats in India)

Targeted Application & Tools that can be used:
Application areas to familiarize students with fundamentals of Indian Constitutional concepts.
Tools: Online Tools – NPTEL and Swayam.

Project work/Assignment:

Assessment Type
- Online end term exam will be conducted as notified by the Presidency University.

Online Link*:
1) Prof. Amitabha Ray, SWAYAM Course: "Constitutional Government & Democracy in India"
https://onlinecourses.swayam2.ac.in/cec19_hs13/preview

* Other source links are available in below Resources link.

Text Book

1. Durga Das Basu --- Introduction to the Constitution of India, 23rd Edition (Gurgaon; LexisNexis, 2018).
2. MP Jain's Constitutional Law of India, Lexis Nexis
3. V.N Shukla's Indian Constitutional Law, M.P Singh 13th Edition
4. MV Pylee's Constitution of India
5. J.C.Johari -- The Constitution of India: A Politico-Legal Study (Greater Noida: Sterling Publishers Pvt. Ltd. 2013).
6. Himangshu Roy and M.P.Singh – Indian Political System, 4th Edition (Bengaluru; Pearson Education, 2018)
7. Vidya Bhushan & Vishnoo Bhagwan--- Indian Administration (S. Chand, 2011)
8. S.R.Maheswari --- Indian Administration (Orient Blackswan, 2001)
9. Dr. A.Avasthi & A.P. Avasthi --- Indian Administration (L.N. Agarwal Educational Publishing, 2017).
10. B. L. Fadia --- Indian Government and Politics (Sahitya a. Bhawan, 13th Revised Edition, 2017).
11. P.M.Bakshi – The Constitution of India (Prayagraj, UP; a. Universal Law Publishing, January, 2018)

Reference Books

1. HM Seervai, Constitutional Law of India, 4th Ed. Vol I, II, & III
2. Uday Raj Rai, Constitutional Law-I
3. Democracy and Constitutionalism in India, Oxford University Press 2009

Resources:

1. https://onlinecourses.nptel.ac.in/noc20_lw03/course?&force_user=true
2. https://onlinecourses.swayam2.ac.in/cec19_hs13/course?&force_user=true
3. https://nptel.ac.in/courses/129106003
4. https://nptel.ac.in/courses/129106411
5. https://nptel.ac.in/courses/129105608
6. https://nptel.ac.in/courses/129106002

Topics relevant to Skill Development:

1. An attitude of inquiry.
2. Write reports

The topics related to Constitutional Studies and its application :

All topics in theory component are relevant to Indian Constitution.

Catalog prepared by	Faculty members of the Department of Law.
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	

<table>
<tr><td>Course Code:
CIV7601</td><td colspan="5">Course Title: Universal Human Values and Ethics
Type of Course: MAC course</td><td>L-T-P-C</td><td>-</td><td>-</td><td>-</td><td>0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="10">NIL</td></tr>
<tr><td>Anti-requisites</td><td colspan="10">NIL</td></tr>
<tr><td>Course Description</td><td colspan="10">The purpose of the course is to develop a holistic perspective in students' life. The course adopts a self-reflective methodology of teaching and is designed to equip the students to explore their role in all aspects of living as a part of the society. It presents a universal approach to value education by developing the right understanding of reality through the process of self-exploration.

This self-exploration develops more confidence and commitment in students enabling them to critically evaluate their pre-conditioning and present beliefs. As an outcome of the holistic approach, the students will be able to practice the ethical conduct in the social and professional life. The prime focus throughout the course is toward affecting a qualitative transformation in the life of the student rather than just a transfer of information.

This course is designed to cater to Human Values and Professional Ethics.</td></tr>
<tr><td>Course Objective</td><td colspan="10">The objective of the course is 'SKILL DEVELOPMENT' of the student by using 'SELF LEARNING' techniques</td></tr>
<tr><td>Course Outcomes</td><td colspan="10">On successful completion of this course the students shall be able to:
CO.1 Recognize the importance of Value Education through the process of self-exploration
CO.2 Explain the human being as the co-existence of the self and the body in harmony.
CO.3 Describe the role of foundational values in building harmonious relationships.
CO.4 Summarize the importance of a holistic perspective in developing ethical professional behavior.</td></tr>
<tr><td>Course Content:</td><td colspan="10"></td></tr>
<tr><td>Module 1</td><td colspan="3">Introduction to Value Education</td><td colspan="3">Online Assessment</td><td colspan="2">MCQ Quiz</td><td colspan="2">5 Sessions</td></tr>
<tr><td colspan="11">Topics:
Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations.</td></tr>
<tr><td>Module 2</td><td colspan="3">Harmony in the Human Being</td><td colspan="3">Online Assessment</td><td colspan="2">MCQ Quiz</td><td colspan="2">5 Sessions</td></tr>
<tr><td colspan="11">Topics:
Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health</td></tr>
<tr><td>Module 3</td><td colspan="3">Harmony in the Family and Society</td><td colspan="3">Online Assessment</td><td colspan="2">MCQ Quiz</td><td colspan="2">5 Sessions</td></tr>
<tr><td colspan="11">Topics:
Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.</td></tr>
</table>

Module 4	Implications of the Holistic Understanding – A Look at Professional Ethics	Online Assessment	MCQ Quiz	5 Sessions

Topics:
Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Strategies for Transition towards Value-based Life and Profession

Targeted Application & Tools that can be used:
Application areas are Personal life, Education and Career, Workplace , Society and Environmental Responsibility
Tools: Online Tools – NPTEL and Swayam.

Project work/Assignment:

Assessment Type

- Online exams (MCQs) will be conducted by the Department of Civil Engineering through Linways.

Online Link*:

3) UHV II - https://www.youtube.com/watch?v=NhFBzn5qKIM&list=PLWDeKF97v9SO8vvjC1KyqteziTbTjN1So&pp=0gcJCWMEOCosWNin
4) Lecture by Dr. Kumar Sambhav, NPTEL course: Universal Human Values, https://onlinecourses.swayam2.ac.in/aic22_ge23/preview
5) Lecture by Dr. Padmavati, Dr Narendran Thiruthy, NPTEL Course: Biodiversity Protection, Farmers and Breeders Rights, https://nptel.ac.in/courses/129105008, 2024.

* Other source links are available in below Resources link.

Text Book

10. A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
11. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2019.
12. Premvir Kapoor, Professional Ethics and Human Values, Khanna Book Publishing, New Delhi, 2022.

Reference Books

6. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
7. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986.
8. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
9. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
10. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
11. A N Tripathy, 2003, Human Values, New Age International Publishers.
12. E G Seebauer& Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press
13. M Govindrajran, S Natrajan& V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
14. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
15. William P. Cunningham and Mary Ann Cunningham (2020), Principles of Environmental Science: Inquiry & Applications, 9th Edition, McGraw-Hill Education, USA.

Resources:

16. https://onlinecourses.swayam2.ac.in/imb25_mg195/preview
17. https://onlinecourses.nptel.ac.in/noc25_mg141/preview
18. https://onlinecourses.swayam2.ac.in/ini25_hs52/preview
19. https://onlinecourses.nptel.ac.in/noc25_hs219/preview

20. https://onlinecourses.swayam2.ac.in/cec25_mg14/preview 21. https://onlinecourses.swayam2.ac.in/imb25_mg195/preview 22. https://onlinecourses.swayam2.ac.in/imb25_mg196/preview	
Topics relevant to Skill Development: 3. An attitude of enquiry. 4. Write reports The topics related to Human values and Professional ethics: All topics in are relevant to Human values and Professional ethics.	
Catalog prepared by	Mrs. Divya Nair
Recommended by the Board of Studies on	20th BoS dated 06 June 2025
Date of Approval by the Academic Council	Academic Council no. 26 dated __ June 2025

Course Code: PPS1025	Course Title: Industry Readiness Program – I Type of Course: Practical Only Course		L-T-P-C	0	0	2	0
Version No.	1.0					
Course Pre-requisites	• Students are expected to understand Basic English. • Students should have desire and enthusiasm to involve, participate and learn.					
Anti-requisites	NIL					
Course Description	This course is designed to enable students to set SMART goals, form professional & personal ethics for success and learn various email writing techniques. The course will benefit learners in presenting themselves effectively through various activities and learning methodologies.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "Employability for Young Professionals" and attain SKILL DEVELOPMENT through PARTICIPATIVE LEARNING techniques.					
Course Out Comes	On successful completion of this course the students shall be able to: CO 1 Define their career goals CO 2 Practice ethical habits for better career success CO3 Demonstrate effective email writing techniques					
Course Content						
Module 1	Goal Setting & Grooming	Classroom activities		10 Sessions		
Topics: SMART Goals, formal grooming through self-introduction activity Activity: Real world scenarios						
Module 2	Habit Formation	Role plays		10 Sessions		
Topics: Professional and Personal ethics for success and activity-based practice Activity: Students to present 2 min video on building professional ethics						
Module 3	Email Etiquettes	Individual and group presentation		10 Sessions		
Topics: Types of prompts to generate effective or desired results for email etiquettes Activity: Individual student presenting various search prompts						
Targeted Application & Tools that can be used: 1. TED Talks 2. You Tube Links 3. Activities						
Assignment proposed for this course Assignment 1: SMART Goal Assignment 2: AI tools for prompt search						

Continuous Individual Assessment Module 1: Presentation Module 2: Activity based assessment Module 3: Class assessment	
Topics relevant to skill development: Students acquire knowledge on SMART goals, implement grooming standards, practice ethical behavior in class and campus, acquire hands-on experience to use AI tools to get search prompts for desired email etiquettes.	
Catalogue prepared by	Faculty of L&D
Recommended by the Board of Studies on	BOS held on
Date of Approval by the Academic Council	Academic Council Meeting held on

<table>
<tr><td>Course Code: PPS1026</td><td colspan="4">Course Title: Industry Readiness Program – II
Type of Course: Practical Only Course</td><td>L-T-P-C</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
<tr><td>Version No.</td><td colspan="9">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="9">• Students are expected to understand Basic English.
• Students should have desire and enthusiasm to involve, participate and learn.</td></tr>
<tr><td>Anti-requisites</td><td colspan="9">NIL</td></tr>
<tr><td>Course Description</td><td colspan="9">This course is designed to enable students learn styles of communication, team building and use empathy in leadership. The course will benefit learners in preparing themselves effectively through various activities and learning methodologies.</td></tr>
<tr><td>Course Objective</td><td colspan="9">The objective of the course is to familiarize the learners with the concepts of “Industry Readiness for Young Professionals” and attain SKILL DEVELOPMENT through PARTICIPATIVE LEARNING techniques.</td></tr>
<tr><td>Course Out Comes</td><td colspan="9">On successful completion of this course the students shall be able to:
CO 1 Apply different communication skills for success in workplace
CO 2 Practice team building skills for career success
CO3 Demonstrate ethical leadership skills in workplace</td></tr>
<tr><td>Course Content</td><td colspan="9"></td></tr>
<tr><td>Module 1</td><td colspan="2">Effective Communication</td><td>Classroom activities</td><td colspan="4"></td><td colspan="2">10 Hours</td></tr>
<tr><td colspan="10">Topics: Practice effective communication skills (Verbal, Non-verbal, Written and Visual)

Activity: Use social media prompts to prepare self-introduction videos</td></tr>
<tr><td>Module 2</td><td colspan="2">Team Building</td><td>Group Activity</td><td colspan="4"></td><td colspan="2">10 Hours</td></tr>
<tr><td colspan="10">Topics: Skills of an effective team player

Activity: Student group activity to build class networking</td></tr>
<tr><td>Module 3</td><td colspan="2">Leadership</td><td>Case study</td><td colspan="4"></td><td colspan="2">10 Hours</td></tr>
<tr><td colspan="10">Topics: Types of leadership, using empathy in leadership

Activity: Individual presentation by students on corporate leaders.</td></tr>
<tr><td colspan="10">Targeted Application & Tools that can be used:
1. TED Talks
2. You Tube Links
Activities</td></tr>
</table>

Assignment proposed for this course Assignment 1: One minute reel Assignment 2: Team building assignment	
Continuous Individual Assessment Module 1: L-S-R-W class assessment Module 2: Team Presentation Module 3: Individual Assessment	
Topics relevant to Skill development:Students acquire knowledge on effective communication skills, team building skills and how to prepare themselves to be leaders in workplace using empathy and implement various skill sets during the course of their time in the university.	
Catalogue prepared by	Faculty of L&D
Recommended by the Board of Studies on	BOS held on
Date of Approval by the Academic Council	Academic Council Meeting held on

Course Code: APT4002	Course Title: Introduction to Aptitude			L-T-P-C	0	0	2	0
Version No.	1.0							
Course Pre-requisites	Students should know the basic Mathematics & aptitude along with understanding of English							
Anti-requisites	Nil							
Course Description	The objective of this course is to prepare the trainees to tackle the questions on various topics and various difficulty levels based on Quantitative Ability, and Logical Reasoning asked during the placement drives. There will be sufficient focus on building the fundamentals of all the topics, as well as on solving the higher order thinking questions. The focus of this course is to teach the students to not only get to the correct answers, but to get there faster than ever before, which will improve their employability factor.							
Course Objective	The objective of the course is to familiarize the learners with the concepts of Aptitude and attain Skill Development through Problem Solving techniques.							
Course Outcomes	On successful completion of the course the students shall be able to: CO1] Recall all the basic mathematical concepts they learnt in high school. CO2] Identify the principle concept needed in a question. CO3] Solve the quantitative and logical ability questions with the appropriate concept. CO4] Analyze the data given in complex problems. CO5] Rearrange the information to simplify the question							
Course Content:								
Module 1	Quantitative Ability	Assignment	Bloom's Level : Application	12 Hours				
Topics: Introduction to Aptitude, working of Tables, Squares, Cubes								
Module 2	Logical Reasoning	Assignment	Bloom's Level : Application	18 Hours				
Topics: Linear & Circular Arrangement Puzzle, Coding & Decoding, Blood Relations, Directions, Ordering and Ranking, Clocks and Calendars, Number Series, Wrong number series, Visual Reasoning								
Targeted Application & Tools that can be used: Application area: Placement activities and Competitive examinations. Tools: LMS								
Text Book 1. Quantitative Aptitude by R S Aggarwal 2. Verbal & Non-Verbal Reasoning by R S Aggarwal								

References 1. www.indiabix.com 2. www.youtube.com/c/TheAptitudeGuy/videos	
Topics relevant to Skill development: Quantitative and reasoning aptitude for Skill Development through Problem solving Techniques. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	L&D Department faculty members
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	

Course Code: APT4004	Course Title: Aptitude Training- Intermediate Type of Course: Practical Only Course	L-T-P-C	0	0	2	0
Version No.	1.0					
Course Pre-requisites	Students should have the basic concepts of Quantitative aptitude along with its applications in real life problems.					
Anti-requisites	NIL					
Course Description	This is a skill-based training program for the students. This course is designed to enable the students to enhance their skills in Quantitative Aptitude.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Aptitude and attain Skill Development through Problem Solving techniques.					
Course Out Comes	On successful completion of this course the students shall be able to: CO1: Recall all the basic mathematical concepts. CO2: Identify the principle concept needed in a question. CO3: Solve the quantitative and logical ability questions with the appropriate concept. CO4: Analyze the data given in complex problems.					
Course Content:						
Module 1	Quantitative Ability 1	Assignment	16 Hours			
Topics: Number System, Percentage, Ratio and Proportion, Average, Mixture and Allegation, Time and Work, Profit and Loss						
Module 2	Quantitative Ability 2	Assignment	14 Hours			
Topics: Time Speed and Distance, Boats and Streams, Simple Interest, Compound Interest, Probability, Permutation and Combination						
Targeted Application & Tools that can be used: Application area: Placement activities and Competitive examinations. Tools: LMS						
Continuous Evaluation:						
CA1 – Online Test CA2 – Online Test CA3 – Online Test Assignment						

Text Book:

1. Fast Track Objective by Rajesh Verma
2. R S Aggarwal
3. Rakesh Yadav

References:

1. www.indiabix.com
2. www.testbook.com
3. www.youtube.com/c/TheAptitudeGuy/videos

Topics relevant to Skill Development: Quantitative aptitude for Skill Development through Problem solving Techniques. This is attained through components mentioned in course handout.

Catalogue prepared by	Faculty of L&D
Recommended by the Board of Studies on	BOS held on
Date of Approval by the Academic Council	Academic Council Meeting held on

<table>
<tr><td>Course Code: APT4006</td><td colspan="2">Course Title: Logical and Critical Thinking

Type of Course: Mandatory Course</td><td>L-T-P-C</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
<tr><td>Version No.</td><td colspan="7">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="7">Students should have the basic concepts of Logical reasoning and Critical thinking, along with its applications in real life problems.</td></tr>
<tr><td>Anti-requisites</td><td colspan="7">Nil</td></tr>
<tr><td>Course Description</td><td colspan="7">This is a skill-based training program for the engineering students (Undergraduate). This course is designed to enable the students to enhance their skills in Logical reasoning and Critical thinking.</td></tr>
<tr><td>Course Objective</td><td colspan="7">The objective of the course is to familiarize the learners with concepts in in Logical reasoning and Critical thinking through problem solving techniques suitable for their career development.</td></tr>
<tr><td rowspan="4">Course Outcomes</td><td colspan="7">On successful completion of the course the students shall be able to:</td></tr>
<tr><td colspan="7">CO1] Understand all the concepts.</td></tr>
<tr><td colspan="7">CO2] Apply the concepts in problem solving (Bloom’s taxonomy Level 3)</td></tr>
<tr><td colspan="7">CO3] Analyze and structure the reasoning techniques and spatial visualization skills</td></tr>
<tr><td colspan="8">Course Content:</td></tr>
<tr><td>Module 1</td><td colspan="3">Logical Thinking</td><td>Assignment</td><td colspan="2"></td><td>16 Hours</td></tr>
<tr><td colspan="8">Topics:
Syllogisms, Cubes and Dices, Mirror and Water images, Paper cutting and Folding, Embedded figures & Completion of figures, Data Interpretation, Data sufficiency</td></tr>
<tr><td>Module 2</td><td colspan="3">Critical Thinking</td><td>Assignment</td><td colspan="2"></td><td>14 Hours</td></tr>
<tr><td colspan="8">Topics:
Analogy, Symbol and Notations, Statement and assumption, Cause of action, Statement and conclusion, Puzzles</td></tr>
<tr><td colspan="8">Targeted Application & Tools that can be used:
Application area: Placement activities and Competitive examinations.
Tools: LMS</td></tr>
<tr><td>Evaluation</td><td colspan="7">Continuous Evaluation
· Topic wise evaluation
· Internal Assessments</td></tr>
</table>

Text Book 1. A new approach to reasoning verbal, non-verbal & analytical by BS Sijwali 2. R S Aggarwal 3. Kiran publications	
References 1. www.indiabix.com 2. www.testbook.com 3. www.youtube.com/c/TheAptitudeGuy/videos	
Topics relevant to Skill Development Logical reasoning and Critical thinking for Skill Development through Problem solving Techniques. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	L&D Department Faculty Member
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	