GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

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

School of Engineering
Department of Electrical and Electronics Engineering

Program Regulations and Curriculum

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

Program: BACHELOR OF TECHNOLOGY IN ELECTRICAL & ELECTRONICS ENGINEERING

B. Tech. [EEE]

2025-2029

Regulations No: PU/AC26.13/EEE21/EEE/2025-29

(***Resolution No. 13 of the 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)***

June 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 Electrical and Electronics Engineering

To excel in Electrical and Electronics Engineering education and research committed to produce globally competent professionals through innovation, sustainability, and societal advancement.

1.6 Mission of Department of Electrical and Electronics Engineering

1. Impart comprehensive education in Electrical and Electronics Engineering through state-of-the-art facilities and hands-on learning experience.
2. Foster design thinking, creativity, industry collaboration, and multidisciplinary research to cultivate an ecosystem of innovation and entrepreneurship.
3. Develop ethical professionals with integrity and a commitment to sustainability, driven by a passion for lifelong learning, individual growth, and societal well-being.

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 16.1 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 19.0 of Academic Regulations) in the prescribed maximum duration (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:

PEO-1: Graduates will excel in providing optimal solutions to real-time engineering problems in Electrical and Electronics engineering and multidisciplinary fields.
PEO-2: Graduates will develop the abilities for lifelong learning and pursue higher education in the core area.
PEO-3: Graduates will exhibit entrepreneurial qualities with a strong commitment to professional integrity.
PEO-4: Graduates will adapt good human values and professional ethics to serve society through their core expertise.

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 to develop to the solution of complex engineering problems.

PO2. Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.

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 the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.

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.

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**.**

PO6. The Engineer and The World: Analyze 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.

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

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 and 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.

8.2 Program Specific Outcomes (PSOs):

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

PSO-01: Solve complex engineering problems in Power System, Analog and Digital Electronics, Electrical Machines, Renewable Energy System, Embedded System and Electric vehicle and Industrial Automation using state of the art techniques.

PSO-02: Use modern engineering hardware and software tools in Electrical and Electronics Engineering to adapt in multi-disciplinary area and engage in life-long learning.

PSO-03: Consider societal and environmental implications while solving the problems in Electrical and Electronics Engineering, demonstrating professional ethics and communication with diverse stakeholders.

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. (Electrical and Electronics 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 Electrical and Electronics

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:

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

10.1.2 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.

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

10.1.4 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.

10.1.5 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 12.5 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**	**Minimum Performance Criteria**

<table>
<tr><td rowspan="3">Lecture-based Course
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.)</td><td rowspan="2">Continuous Assessments</td><td>Assignments, Seminars, Poster Presentations, Quizzes, Mini Projects, Term Papers, Hack-a-thons, Make-a-thons, Code-a-thons, etc. as prescribed in the Course Plan</td><td>25%</td><td rowspan="2">-</td><td rowspan="3">40%</td></tr>
<tr><td>Mid Term Examination (to be conducted by CoE centrally)</td><td>25%</td></tr>
<tr><td colspan="2">End Term Examination</td><td>50%</td><td>30%</td></tr>
<tr><td rowspan="2">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.)</td><td rowspan="2">Continuous Assessments</td><td>Laboratory Work / Practical exercises, conducted in every Laboratory / Practice session / activity, including Laboratory records, practice / project reports, attendance / class participation as applicable, and as prescribed in the Course Plan</td><td>75%</td><td rowspan="2">-</td><td rowspan="2">40%</td></tr>
<tr><td>End Term Examination (to be conducted at Department/ School Level during regular lab slots)</td><td>25%</td></tr>
<tr><td>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</td><td colspan="3">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.</td><td colspan="2">40%</td></tr>
</table>

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/PRC. 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-Clause 12.6.1 and 12.6.2 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 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 Clause13.3(as per Academic regulations) and transfer equivalent credits to partially or fully complete the mandatory credit requirements of Discipline 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 Discipline 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 13.3 (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 13.3.1 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 18.11 in the Academic regulations.

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.

13.3.11 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 (13.0), shall not be included in the calculation of the CGPA.

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

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

Table 3: B. Tech. (Electrical and Electronics 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)	6
7	Project Work (PRW)	16
8	Mandatory Courses (MAC)	0
	Total Credits	**160**

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. (Electrical and Electronics 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 Centres/ Departments of the University; and

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

17. Curriculum Structure – Basket Wise Course List:

Table 3.1 Humanities and Social Sciences including Management Courses (HSMC)								
S. No	**Course code**	**Course Name**	**L**	**T**	**P**	**C**	**Type of skill**	**Course caters to**
1	ENG1900	English for Technical Communication	2	0	0	2	EM	HP
2	ENG2501	Advanced English	2	0	0	2	EM	HP
3	APT4005	Aptitude for Employability	0	0	2	1	S	-
4	PPS3018	Preparedness for Interview	0	0	2	1	S	-
5	FIN1002	Essentials of Finance	3	0	0	3	S	-
6	DES1146	Introduction to Design Thinking	1	0	0	1	EN	-
		Total No. of Credits				**10**		

Table 3.2 Basic Science Courses (BSC)								
S. No	**Course code**	**Course Name**	**L**	**T**	**P**	**C**	**Type of skill**	**Course caters to**
1	MAT2301	Calculus and Differential Equations	3	1	0	4	S	-
2	MAT2302	Transform Techniques, Partial Differential Equations and Complex Variables	3	1	0	4	S	-
3	MAT2303	Linear Algebra and Vector Calculus	3	1	0	4	S	-
4	MAT2304	Numerical Methods, Probability Distributions and Sampling Techniques	3	1	0	4	S	-
5	PHY2502	Advanced Materials and Quantum Physics for Engineers	3	0	0	3	EM	-
6	PHY2505	Advanced Materials and Quantum Physics for Engineers Lab	0	0	2	1	S	-
7	CHE2503	Applied Chemistry for Engineers	3	0	0	3	S	ES
8	CHE2504	Applied Chemistry for Engineers Lab	0	0	2	1	S	-
		Total No. of Credits				**24**		

Table 3.3 Engineering Science Courses (ESC)								
S. No	**Course code**	**Course Name**	**L**	**T**	**P**	**C**	**Type of skill**	**Course caters to**
1	CIV1200	Foundations of Integrated Engineering	2	0	0	2	S	-
2	MEC1006	Engineering Graphics	2	0	0	2	S	-
3	EEE1200	Basics of Electrical and Electronics Engineering	3	0	0	3	S	-
4	EEE1250	Basics of Electrical and Electronics Engineering Lab	0	0	2	1	S	-
5	CSE1500	Computational Thinking with Python	2	0	2	3	EM	-
7	CSE2280	C Programming and Data Structures	3	0	0	3	EM	-
8	CSE2281	C Programming and Data Structures Lab	0	0	4	2	EM	-
9	CSE2264	Essentials of AI	3	0	0	3	EM	-
10	CSE2265	Essentials of AI Lab	0	0	2	1	EM	-
11	ECE1511	Design Workshop	1	0	2	2	EM	-
		Total No. of Credits				**22**		

Table 3.4 Professional Core Courses (PCC)								
S. No	**Course code**	**Course Name**	**L**	**T**	**P**	**C**	**Type of skill**	**Course caters to**
1	EEE2500	Network Theory	3	1	0	4	S	-
2	ECE2021	Digital Electronics	3	0	0	3	S	-
3	ECE2500	Signals and Systems	3	0	0	3	S	-
4	EEE2501	Electromagnetic Field Theory	3	1	0	4	S	-
5	EEE2502	DC Machines and Special Machines	3	1	0	4	S	-
6	EEE2503	AC Machines	3	0	0	3	S	-
7	ECE2501	Linear Integrated Circuits	3	0	0	3	S	-
8	ECE2521	Embedded system design using Microcontrollers	4	0	0	4	S	-
9	EEE2504	Control Systems Engineering	3	0	0	3	S	-
10	EEE2505	Electrical and Electronics Measurements and Instrumentation	3	0	0	3	S	-
11	EEE2506	Transmission and Distribution	3	1	0	4	S	HP
12	EEE2507	Electrical Power Generation and Economics	3	0	0	3	S	
13	EEE2508	Power Electronics	3	1	0	4	S	-
14	EEE3057	Power System Analysis	3	1	0	4	S	-
15	EEE3058	Electrical Drives	3	1	0	4	S	ES
16	ECE2051	Digital Electronics Lab	0	0	2	1	2	-
17	ECE2550	Signals and Systems Lab	0	0	2	1	S	-
18	EEE2560	DC Machines and Special Machines Lab	0	0	2	1	S	-
19	EEE2561	AC Machines Lab	0	0	2	1	S	-
20	ECE2551	Linear Integrated Circuits Lab	0	0	2	1	S	-
21	ECE2571	Embedded system design using Microcontrollers Lab	0	0	2	1	S	
22	EEE2562	Measurements and Instrumentation Lab	0	0	2	1	S	
23	EEE2563	Control Systems Engineering Lab	0	0	2	1	S	-
24	EEE2564	Electrical CAD Lab	0	0	2	1	S	-
25	EEE2565	Power Electronics Lab	0	0	2	1	S	-
26	EEE3566	Power System Simulation Lab	0	0	2	1	S	
Total No. of Credits						**64**		

Table 3.5 Professional Core Courses (PCC)								
S. No	**Course code**	**Course Name**	**L**	**T**	**P**	**C**	**Type of skill**	**Course caters to**
1	EEEXXXX	Professional Elective - I	3	0	0	3	EM / EN	-
2	EEEXXXX	Professional Elective - II	3	0	0	3	EM / EN	-
3	EEEXXXX	Professional Elective - III	3	0	0	3	EM / EN	-
4	EEEXXXX	Professional Elective - IV	3	0	0	3	EM / EN	-
5	EEEXXXX	Professional Elective - V	3	0	0	3	EM / EN	-

6	EEEXXXX	Professional Elective - VI	3	0	0	3	EM / EN	-
					Total No. of Credits	18		

Table 3.6 Open Elective Courses (OEC)

S. No	Course code	Course Name	L	T	P	C	Type of skill	Course caters to
1	XXXXXXX	Open Elective - I	3	0	0	3	EM / EN	-
2	XXXXXXX	Open Elective - II	3	0	0	3	EM / EN	-
					Total No. of Credits	**6**		

Table 3.7 Project Work (PRW)

S. No	Course code	Course Name	L	T	P	C	Type of skill	Course caters to
1	EEE7000	Internship	-	-	-	2	SD / EM / EN	ES / HP
2	EEE7100	Minor Project	-	-	-	4	SD / EM / EN	ES / HP
3	EEE7300	Capstone Project	-	-	-	10	SD / EM / EN	ES / HP
					Total No. of Credits	**16**		

Table 3.8 Mandatory Courses (MAC)

S. No	Course code	Course Name	L	T	P	C	Type of skill	Course caters to
1	CHE7601	Environmental Studies	-	-	-	0	S	-
2	LAW7601	Indian Constitution	-	-	-	0	S	-
3	PPS1025	Industry Readiness Program – I	2	0	0	0	S	-
4	PPS1026	Industry Readiness Program – II	2	0	0	0	S	-
5	APT4002	Introduction to Aptitude	2	0	0	0	S	-
6	APT4004	Aptitude Training - Intermediate	2	0	0	0	S	-
7	APT4006	Logical and Critical Thinking	2	0	0	0	S	-
8	CIV7601	Universal Human Values (MOOC Course)	-	-	-	0	S	-
					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 full fill 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 Handout.

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 Minor Project Work

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

18.2.1 The Minor 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 Minor 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 18.3.2 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 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 Capstone Project 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.

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. 8: Professional Electives Courses/Specialization Tracks– Minimum of 9 credits is to be earned by the student in a particular track and overall 18 credits.

Track 1: General Basket

S. No	Course code	Course Name	L	T	P	C	Type of skill	Course caters to
1	EEE3008	Materials in Electrical Systems	3	0	0	3	EM	-
2	EEE3003	Switchgear and Protection	3	0	0	3	EM	ES
3	EEE3006	High Voltage Engineering	3	0	0	3	EM	-
4	EEE3009	AI applications for Electrical Engineering	3	0	0	3	EM	-
5	EEE3010	Electrical Estimation and Costing	3	0	0	3	EM	-
6	EEE3011	Testing and Commissioning of Electrical Equipment's	3	0	0	3	EN	HP
7	EEE3013	VLSI Systems	3	0	0	3	EM	-

8	EEE3014	Digital Signal Processing Systems	3	0	0	3	EM	-
9	EEE3015	Industrial Automation with PLC and SCADA	3	0	0	3	EM	-
10	ECE3205	Object Oriented Programming with JAVA	2	0	2	3	EM	-

Track 2: Power and Energy system Basket

S. No	Course code	Course Name	L	T	P	C	Type of skill	Course caters to
1	EEE3400	Solar photovoltaic & Wind Energy Systems	3	0	0	3	EM	ES
2	EEE3401	Electrical Power Utilization	3	0	0	3	EM	HP
3	EEE3402	Power System Operation & Control	3	0	0	3	EM	-
4	EEE3403	Energy Auditing & Demand Side Management	3	0	0	3	EN	HP
5	EEE3404	Microgrid Operation & Control	3	0	0	3	EM	ES
6	EEE3405	Smart Grid Technologies	3	0	0	3	EM	-
7	EEE3406	Big Data Analytics in Power Systems.	3	0	0	3	EM	-
8	EEE3407	Energy Storage Systems	3	0	0	3	EM	ES
9	EEE3408	Electrical Distribution System	3	0	0	3	EM	-
10	EEE3409	Power Market and Policy	3	0	0	3	EM	ES
11	EEE3410	Power Electronics Applications in Power Systems	3	0	0	3	EM	

Track 3: Automotive Electronics Basket

S. No	Course code	Course Name	L	T	P	C	Type of skill	Course caters to
1	EEE3500	Electric Vehicle Technology	3	0	0	3	EN	-
2	EEE3501	Battery Management Systems	3	0	0	3	EN	ES
3	EEE3502	Automotive Embedded systems	3	0	0	3	EM	-
4	EEE3503	Power Electronics Applications for Electrical Vehicles	3	0	0	3	EN	-
5	EEE3504	AI Techniques for EVs and HEVs	3	0	0	3	EM	ES
6	EEE3505	Micro Electro Mechanical Systems	3	0	0	3	EM	-
7	EEE3506	Sensors and Transducers	3	0	0	3	EM	-
8	EEE3507	Advanced Driver Assistance Systems (ADAS)	3	0	0	3	EM	-
9	EEE3508	Electric Mobility and Charging Infrastructure	3	0	0	3	EM	-
10	EEE3509	Vehicle Electrification and Renewable Integration	3	0	0	3	EM	-

Track 4: Power Electronics and Industrial Drives

S. No	Course code	Course Name	L	T	P	C	Type of skill	Course caters to
1	EEE3600	Special Electrical Machines	3	0	0	3	EN	-
2	EEE3601	Power Quality and Harmonics	3	0	0	3	EN	ES
3	EEE3602	Modern power electronics and AC drives	3	0	0	3	EM	-
4	EEE3603	Flexible A. C Transmission Systems (FACTS)	3	0	0	3	EN	-
5	EEE3604	HVDC transmission	3	0	0	3	EM	ES
6	EEE3605	Wireless Power Transfer and Emerging Technologies	3	0	0	3	EM	-
7	EEE3606	Electromagnetic Interference (EMI) and Protection	3	0	0	3	EM	-
8	EEE3607	Machine Modeling & Analysis	3	0	0	3	EM	-
9	EEE3608	Switched Mode Power Supplies	3	0	0	3	EM	-
10	EEE3609	FPGA for Power Electronic Converters	3	0	0	3	EM	-

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

Table 3.9 : Open Elective Courses Baskets: Minimum Credits to be earned from this Basket is 6

Chemistry Basket								
1	CHE3001	Smart Materials and 3D Printing	3	0	0	3	ES	-
2	CHE3002	Energy and Sustainability	3	0	0	3	ES	-
3	CHE3003	Nano technology and its applications	3	0	0	3	ES	-
4	CHE3004	Corrosion and control	3	0	0	3	ES	-
5	CHE3005	Green Chemistry and Sustainable Technology	3	0	0	3	ES	-
6	CHE3006	Food Technology	3	0	0	3	ES	-
Civil Engineering Basket								
1	CIV3100	Disaster mitigation and management	3	0	0	3	SD	ES / HP
2	CIV3101	Sustainability Concepts in Engineering	3	0	0	3	FC	ES
3	CIV3102	Occupational Health and Safety	3	0	0	3	SD	ES
4	CIV3103	Sustainable Materials and Green Buildings	3	0	0	3	SD	
5	CIV3104	Integrated Project Management	3	0	0	3	SD / EM	ES
6	CIV3105	Environmental Impact Assessment	3	0	0	3	SD / EM / EN	HP / GS
7	CIV3106	Infrastructure Systems for Smart Cities	3	0	0	3	EM / EN	ES
8	CIV3107	Geospatial Applications for Engineers	2	0	2	3	EM / EN	ES
9	CIV3108	Environmental Meteorology	3	0	0	3	SD / EM	ES
10	CIV3109	Project Problem Based Learning	3	0	0	3	SD	ES
11	CIV3110	Sustainability for Professional Practice	3	0	0	3	SD	ES
Commerce 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	COM1020	Business Accounting & Financial Analysis	2	1	0	3		
6	COM2005	Introduction to Insurance	3	0	0	3		
7	BBA2088	Management and Behavioral Practices	3	0	0	3		
Design Basket								
1	DES2001	Design Thinking	3	0	0	3	S.EM,EN	GS,ES,HP
Electrical and Electronics Engineering Basket								
1	EEE3100	IoT based Smart Building Technology	3	0	0	3	S	-

2	EEE3101	Basic Circuit Analysis	3	0	0	3	S	-
3	EEE3102	Fundamentals of Industrial Automation	3	0	0	3	S	-
4	EEE3103	Electric Vehicles & Battery technology	3	0	0	3	S	-
5	EEE3104	Smart Sensors for Engineering Applications	3	0	0	3	S	-
6	EEE3105	Microsensors and Nano sensors	3	0	0	3	S	-
Electronics and Communication Engineering Basket								
1	ECE3800	Fundamentals of Electronics	3	0	0	3	SD	
2	ECE3801	Microprocessor based systems	3	0	0	3	FC	EM
3	ECE3802	Artificial Neural Networks	3	0	0	3	FC	EM
4	ECE3803	Smart Electronics in Agriculture	3	0	0	3	FC	EM
5	ECE3804	Environment Monitoring Systems	3	0	0	3	SD / FC	EM/EN
6	ECE3805	Consumer Electronics	3	0	0	3	FC	EM
7	ECE3806	Product Design of Electronic Equipment	3	0	0	3	FC	EM
8	ECE3807	Introduction to Data Analytics	3	0	0	3	SD	
9	ECE3808	Machine Vision for Robotics	3	0	0	3	SD	
English Basket								
1	ENG1906	Law and Crime in Popular Imagination	3	0	0	3	SD	
2	ENG1909	Exploring Gender: Narratives from Campus to Community	3	0	0	3	SD	
3	ENG1910	Trauma Narratives: From Page to Pixel	3	0	0	3	SD	
4	ENG1911	'Nonsense' Across Media	3	0	0	3		
5	ENG1912	Language and Interpretation	3	0	0	3		
Law Basket								
1	LAW2015	Cyber Law	3	0	0	3	FC	HP
2	LAW5005	Law relating to Infrastructure Projects	3	0	0	3	FC	HP
Mathematics Basket								
1	MAT3031	Basic Statistics & Data Analysis	3	0	0	3	-	-
2	MAT3032	Mathematics for Machine Learning	3	0	0	3	-	-
3	MAT3033	Bioinformatics & Computational Biology	3	0	0	3	-	-
4	MAT3034	Time-Frequency Transforms for Signal Analysis	3	0	0	3	-	-
5	MAT3035	Mathematical Modeling	3	0	0	3	-	-
Mechanical Engineering Basket								
1	MEC3250	Engineering Drawing	1	0	4	3	EM	-
2	MEC3251	Supply Chain Management	3	0	0	3	EM	-
3	MEC3252	Six Sigma for Professionals	3	0	0	3	EM	-
4	MEC3253	Fundamentals of Aerospace Engineering	3	0	0	3	EM	-

5	MEC3254	Safety Engineering	3	0	0	3	EM	-
6	MEC3255	Additive Manufacturing	3	0	0	3	EM	-
7	MEC3256	Sustainable Technologies and Practices	3	0	0	3	EM	-
8	MEC3257	Industry 4.0	3	0	0	3	EM	-
Petroleum Engineering Basket								
1	PET3301	Energy Industry Dynamics	3	0	0	3	FC / SD / EM	ES
2	PET3302	Energy Sustainability Practices	3	0	0	3	FC / SD / EM	ES
Media Studies Basket								
1	BAJ 1024	Media Psychology	3	0	0	3	EM	
2	BAJ 1025	Creative Writing for Media	3	0	0	3	EM	
3	BAJ 1026	Multimedia Storytelling	3	0	0	3	EM	
4	BAJ 1027	Digital Advertising & Branding	3	0	0	3	EM	
5	BAJ 1028	Content Creation for social media	3	0	0	3	EM	

21.List of MOOC (NPTEL) Courses

21.1 NPTEL - Discipline Elective Courses for B. Tech. (Electrical and Electronics Engineering)

Sl. No	Course Code	Discipline	Course Name	Duration
1.	noc25-ee93	Electrical and Electronics Engineering	Phase-Locked Loops	12 Weeks
2.	noc25-ee102	Electrical and Electronics Engineering	Electrical Distribution System Analysis	12 Weeks
3.	noc25-ee118	Electrical and Electronics Engineering	Real-Time Digital Signal Processing	12 Weeks
4.	noc25-ee119	Electrical and Electronics Engineering	Design of Photovoltaic Systems	12 Weeks
5.	noc25-ee134	Electrical and Electronics Engineering	Charging Infrastructure	12 Weeks
6.	noc25-ee135	Electrical and Electronics Engineering	Power Electronics with Wide Band Gap Devices	12 Weeks
7.	noc25-ee136	Electrical and Electronics Engineering	Modeling, Analysis and Estimation of Three Phase	12 Weeks

			Unbalanced Power Network	
8.	noc25-ee145	Electrical and Electronics Engineering	Design of Electric Motor	12 Weeks
9.	noc25-ee150	Electrical and Electronics Engineering	Advanced Distribution System Analysis and Operation	12 Weeks
10.	noc25-ee163	Electrical and Electronics Engineering	Electronic Systems Design: Hands-on Circuits and PCB Design with CAD Software	12 Weeks
11.	noc25-ee183	Electrical and Electronics Engineering	Power Electronics Applications in Power Systems	12 Weeks

21.2 NPTEL - Open Elective Courses for B. Tech. (Electrical and Electronics Engineering)

Sl. No	Course Code	Discipline	Course Name	Duration
1.	noc25-cs91	Computer Science and Engineering	Introduction to Machine Learning	12 Weeks
2.	noc25-cs92	Computer Science and Engineering	Reinforcement Learning	12 Weeks
3.	noc25-cs106	Computer Science and Engineering	Deep Learning - IIT Ropar	12 Weeks
4.	noc25-cs110	Computer Science and Engineering	Programming In Java	12 Weeks
5.	noc25-cs140	Computer Science and Engineering	Problem Solving through Programming in C	12 Weeks
6.	noc25-cs159	Computer Science and Engineering	Artificial Intelligence: Concepts and Techniques	12 Weeks
7.	noc25-ge77	Multidisciplinary	Machine Learning for Core Engineering Disciplines	12 Weeks
8.	noc25-ee181	Electronics and Electrical Engineering Computer Science and Engineering	Machine Learning and Deep Learning - Fundamentals and Applications	12 Weeks

9.	noc25-ma61	Engineering & Science Mathematics	Mathematics for Machine Learning	12 Weeks
10.	noc25-cs88	Computer Science and Engineering	Artificial Intelligence: Search Methods for Problem Solving	12 Weeks

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

Semester 1 - Chemistry Cycle

Sl. No.	Course Code	Course Name	L	T	P	Credits	Contact Hours	Basket
1	MAT2301	Calculus and Differential Equations	3	1	0	4	4	BSC
2	CIV1200	Foundations of Integrated Engineering	2	0	0	2	2	ESC
3	CSE1500	Computational Thinking with Python	2	0	2	3	4	ESC
4	EEE1200	Basics of Electrical and Electronics Engineering	3	0	0	3	3	ESC
5	EEE1250	Basics of Electrical and Electronics Engineering Lab	0	0	2	1	2	ESC
6	ENG1900	English for Technical Communication	2	0	0	2	2	HSMC
7	PPS1025	Industry Readiness Program – I	0	0	2	0	2	MAC
8	CHE2503	Applied Chemistry for Engineers	3	0	0	3	3	BSC
9	CHE2504	Applied Chemistry for Engineers Lab	0	0	2	1	2	BSC
10	LAW7601	Indian Constitution	-	-	-	0	0	MAC
		Total	**15**	**1**	**8**	**19**	**24**	

HSMC = Humanities and Social Sciences including Management Courses, BSC = Basic Science Courses, ESC = Engineering Science Courses, PCC = Professional Core Courses, PEC = Professional Elective Courses, OEC = Open Elective Courses, PRW = Project Work, MAC = Mandatory Courses.

Semester 2 - Physics Cycle

Sl. No.	Course Code	Course Name	L	T	P	Credits	Contact Hours	Basket
1	MAT2302	Transform Techniques, Partial Differential Equations and Complex Variables	3	1	0	4	4	BSC
2	ENG2501	Advanced English	2	0	0	2	2	HSMC
3	ECE2021	Digital Electronics	3	0	0	3	3	PCC
4	ECE2051	Digital Electronics Lab	0	0	2	1	2	PCC
5	PHY2502	Advanced Materials and Quantum Physics for Engineers	3	0	0	3	3	BSC
6	PHY2505	Advanced Materials and Quantum Physics for Engineers Lab	0	0	2	1	2	BSC
7	MEC1006	Engineering Graphics	2	0	0	2	2	ESC
8	ECE1511	Design Workshop	1	0	2	2	3	ESC
9	PPS1026	Industry Readiness Program – II	0	0	2	0	2	HSMC
10	CHE7601	Environmental Studies	-	-	-	0	0	MAC
11	DES1146	Introduction to Design Thinking	1	0	0	1	1	HSMC

			Total	**15**	**1**	**8**	**19**	**24**	

HSMC = Humanities and Social Sciences including Management Courses, BSC = Basic Science Courses, ESC = Engineering Science Courses, PCC = Professional Core Courses, PEC = Professional Elective Courses, OEC = Open Elective Courses, PRW = Project Work, MAC = Mandatory Courses.

Semester 3

Sl. No.	Course Code	Course Name	L	T	P	Credits	Contact Hours	Basket
1	MAT2303	Linear Algebra and Vector Calculus	3	1	0	4	4	BSC
2	CSE2280	C Programming and Data Structures	3	0	0	3	3	ESC
3	CSE2281	C Programming and Data Structures Lab	0	0	4	2	4	ESC
4	EEE2500	Network Theory	3	1	0	4	4	PCC
5	ECE2500	Signals and Systems	3	0	0	3	3	PCC
6	ECE2550	Signals and Systems lab	0	0	2	1	2	PCC
7	EEE2507	Electrical Power Generation and Economics	3	0	0	3	3	PCC
8	FIN1002	Essentials of Finance	3	0	0	3	3	HSMC
9	APT4002	Introduction to Aptitude	0	0	2	0	2	MAC
10	CIV7601	Universal Human Values (MOOC)	-	-	-	0	0	MAC
		Total	**18**	**2**	**6**	**23**	**26**	

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Semester 4

Sl. No.	Course Code	Course Name	L	T	P	Credits	Contact Hours	Basket
1	MAT2304	Numerical Methods, Probability Distributions and Sampling Techniques	3	1	0	4	4	BSC
2	EEE2502	DC Machines and Special Machines	3	1	0	4	4	PCC
3	EEE2560	DC Machines and Special Machines Lab	0	0	2	1	2	PCC
4	ECE2521	Embedded system design using Microcontrollers	4	0	0	4	4	PCC
5	ECE2571	Embedded system design using Microcontrollers Lab	0	0	2	1	2	PCC
6	EEE2501	Electromagnetic Field Theory	3	1	0	4	4	PCC
7	ECE2501	Linear Integrated Circuits	3	0	0	3	3	PCC
8	ECE2551	Linear Integrated Circuits Lab	0	0	2	1	2	PCC
9	APT4004	Aptitude Training - Intermediate	0	0	2	0	2	MAC
		Total	**16**	**3**	**8**	**22**	**27**	

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Semester 5

Sl. No.	Course Code	Course Name	L	T	P	Credits	Contact Hours	Basket
1	EEE2503	AC Machines	3	0	0	3	3	PCC
2	EEE2561	AC Machines Lab	0	0	2	1	2	PCC
3	EEE2504	Control Systems Engineering	3	0	0	3	3	PCC
4	EEE2563	Control Systems Engineering Lab	0	0	2	1	2	PCC
5	EEE2505	Electrical and Electronics Measurements and Instrumentation	3	0	0	3	3	PCC
6	EEE2562	Measurements and Instrumentation Lab	0	0	2	1	2	PCC
7	EEEXXXX	Professional Elective - I	3	0	0	3	3	PEC
8	EEEXXXX	Professional Elective - II	3	0	0	3	3	PEC
9	CSE2264	Essentials of AI	3	0	0	3	3	ESC
10	CSE2265	Essentials of AI Lab	0	0	2	1	2	ESC
11	APT4006	Logical and Critical Thinking	0	0	2	0	2	MAC
		Total	**18**	**0**	**10**	**22**	**28**	

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Semester 6

Sl. No.	Course Code	Course Name	L	T	P	Credits	Contact Hours	Basket
1	EEE2508	Power Electronics	3	1	0	4	4	PCC
2	EEE2565	Power Electronics Lab	0	0	2	1	2	PCC
3	EEE2506	Transmission and Distribution	3	1	0	4	4	PCC
4	EEEXXXX	Professional Elective - III	3	0	0	3	3	PEC
5	EEEXXXX	Professional Elective - IV	3	0	0	3	3	PEC
6	XXXXXXX	Open Elective - I	3	0	0	3	3	OEC
7	APT4005	Aptitude for Employability	0	0	2	1	2	HSMC
8	EEE2564	Electrical CAD Lab	0	0	2	1	2	PCC
9	EEE7100	Minor Project	-	-	-	4	-	PRW
		Total	**15**	**2**	**6**	**24**	**23**	

HSMC = Humanities and Social Sciences including Management Courses, BSC = Basic Science Courses, ESC = Engineering Science Courses, PCC = Professional Core Courses, PEC = Professional Elective Courses, OEC = Open Elective Courses, PRW = Project Work, MAC = Mandatory Courses.

Semester 7

Sl. No.	Course Code	Course Name	L	T	P	Credits	Contact Hours	Basket
1	EEE3057	Power System Analysis	3	1	0	4	4	PCC
2	EEE3566	Power System Simulation Lab	0	0	2	1	2	PCC
3	EEE3058	Electrical Drives	3	1	0	4	4	PCC
4	EEEXXXX	Professional Elective - V	3	0	0	3	3	PEC
5	EEEXXXX	Professional Elective - VI	3	0	0	3	3	PEC

6	XXXXXXX	Open Elective - II	3	0	0	3	3	OEC
7	PPS3018	Preparedness for Interview	0	0	2	1	2	HSMC
8	EEE7000	Internship	-	-	-	2	0	PRW
		Total	**15**	**2**	**4**	**21**	**21**	

HSMC = Humanities and Social Sciences including Management Courses, BSC = Basic Science Courses, ESC = Engineering Science Courses, PCC = Professional Core Courses, PEC = Professional Elective Courses, OEC = Open Elective Courses, PRW = Project Work, MAC = Mandatory Courses.

Semester 8

Sl. No.	Course Code	Course Name	L	T	P	Credits	Contact Hours	Basket
1	EEE7300	Capstone Project	-	-	-	10	0	PRW
		Total	**0**	**0**	**0**	**10**	**0**	

HSMC = Humanities and Social Sciences including Management Courses, BSC = Basic Science Courses, ESC = Engineering Science Courses, PCC = Professional Core Courses, PEC = Professional Elective Courses, OEC = Open Elective Courses, PRW = Project Work, MAC = Mandatory Courses.

23. Course Catalogue

Course code: ENG1900	**Course Title: English for Technical Communication** **School core and Theory Only**	**L- T- P- C**	**2**	**0**	**0**	**2**
Version No.	1.0					
Course Pre-requisites	+2 Level					
Anti-requisites	**NIL**					
Course Description	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.					
Course Outcomes	On successful completion of the course the students shall be able to: 1. Identify the difference between general and technical communication. 2. Describe 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					

Course Content: Theory

Module 1	**Technical communication**	**Quiz**	**Listening**	**9 Hours**

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

Module 2	**Technical Reading**	**Assignment**	**Reading**	**12 Hours**

Reading Comprehension

Note making & Notetaking

Content Analysis

Activity:

- Reading technical articles and answering comprehension questions

- Note making techniques

Module 3	Technical Writing	Assignment	Writing	12hours

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	12Hours

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.

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

ENG2501	**Advanced English**	**L- T- P- C**	2	0	0	2
Version No.	2.0					
Course Pre-requisites	ENG1002 Technical English					
Anti-requisites	**NIL**					
Course Description	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.					
Course Outcomes	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.					

Course Content: Theory

Module 1	**Foundations of Effective Communication**	**Case Studies/ Role play**	**Cross-Cultural Competency**	**4 Classes**
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				
Module 2	**Mastering Speech Delivery**	**JAM**	**Public Speaking Confidence**	**4 Classes**
Topics: • Introduction to Prompt Engineering • Speech Preparation and Organization • Techniques for Effective Impromptu Speaking • Practice Speech Delivery				
Module 3	**Critical Reading and Logical Analysis**	**Worksheet**	**Critical Thinking and Analysis**	**4 Classes**

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

Course Code: APT4005	**Course Title: Aptitude For Employability Type of Course: Practical Only**	**L- T-P-C**	0	0	2	1

Version No.		1.0
Course Pre-requisites		Students should have the basic concepts of Quantitative aptitude, Verbal ability along with its applications in real life problems.
Anti-requisites		Nil
Course Description		This course is designed to enable the students to enhance their skills in quantitative aptitude and verbal ability skills.
Course Objective		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.
Course Outcomes		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.
Course Content:		

Module 1	Quantitative Ability	Lab-10hrs		Platform Assessment-10hrs	**20 Hours**
	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.				
Module 2	Verbal Ability	Lab-5hrs		Platform Assessment-5hrs	**10 Hours**
	Topics: - Parts of Speech, Subject Verb Agreement, Spotting Error, Cloze Test, Verbal Analogies, Reading Comprehension, Idioms & Phrases, Para Jumbles				
	Targeted Application & Tools that can be used: Application area: Placement activities and Competitive examinations. Tools: LMS				

Evaluation	**Continuous Evaluation** • Topic wise evaluation
	Text Book 1. Fast track objective by Rajesh Verma 2. R S Aggarwal 3. S.P Bakshi
	References 1. www.indiabix.com 2. www.testbook.com 3. 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.

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.				

<table>
<tr><td>Course Out Comes</td><td></td><td colspan="4">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</td></tr>
<tr><td>Course Content:</td><td></td><td colspan="4"></td></tr>
<tr><td>Module 1</td><td colspan="2">Resume Building</td><td>Classroom activity</td><td></td><td>10 Hours</td></tr>
<tr><td></td><td colspan="5">Topics: Resume structure, use of templates, Do’s and Don'ts, ATS methods, Cover Letter and Video Resume
Activity: Real world scenarios</td></tr>
</table>

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

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.

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: 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 calculus to solve problems related to polar curves and its applications in determining the bentness of a curve. 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	**Differential Calculus**		**(10 Classes)**
Polar Coordinates, polar curves, angle between radius vector and the tangent, angle between two curves, pedal equations, curvature and radius of curvature. Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.			
Module 2	**Integral Calculus**	**Assignment**	**(10 Classes)**
Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. Rolle's theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.			
Module 3	**Multivariable Calculus**		**(10 lectures)**
Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.			
Module 4	**Differential Equations**	**Assignment**	**(15 lectures)**
Definition, types of Differential Equations, Applications, Variable Separable, Homogeneous, Exact, linear and Bernoulli's equations, Euler'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, $e^{ax}v(x)$, $x^n v(x)$ - 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: PDEs are used to model biological processes, such as the spread of diseases and the development of biological tissues. Tools Used: Python.			
Assignment:			
1. 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, 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 6. 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.

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 Classes)**
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 Classes)**
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 Classes)**
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 Classes)**

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 Classes)**

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.

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 Classes)***
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**			***(9Classes)***

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 lectures)***

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 lectures)***

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.

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 Classes)**
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 Classes)**
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 Classes)**
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 Classes)**
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 Classes)**
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.

Course Code: PHY2502	**Course Title:** Advanced Materials and Quantum Physics for Engineers **Type of Course: 1] School Core**	L-T-P-C	**3**	0	0	3
Version No.	1.0					
Course Pre-requisites	**Class 11 and 12 physics**					
Anti-requisites	**NIL**					
Course Description	The purpose of this course is to enable the students to understand the fundamentals, working and applications of optoelectronic devices and to develop the basic abilities to appreciate the applications of advanced microscopy and quantum computers. The course develops the critical thinking and analytical skills.					
Course Out Comes	On successful completion of the course the students shall be able to: CO1: To understand the concepts of electrical conducting properties of metal, semiconductor and superconductivity. CO2 To understand the principles of quantum mechanics. CO3: Discuss the quantum concepts used in quantum computers. CO4: Explain the applications of lasers and optical fibers in various technological fields.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of " Applied Physics for Electrical and Electronics cluster"and to attain the basic knowledge related to semiconductors, superconductors and dielectrics.					
Course Content:						
Module 1	**Fundamentals of Materials**	Assignment	**No. of Classes: 10**			
Topics: Concept of energy bands, Charge carriers, Carrier concentration, Concept of Fermi level, Hall effect, Magnetic Materials, Superconductors:						
Module 2	**Advanced devices and Applications**	Assignment	**No. of Classes: 07**			
p-n junctions, Zener diode, Transistor characteristics, Optoelectronic devices: Solar cells, I-V characteristics and LEDs						

Module 3	**Fundamentals of Quantum Mechanics**	Term paper	. **No. of classes: 06**
Topics: De-Broglie hypothesis, Matter waves, Properties, de-Broglie wavelength associated with an electron, Heisenberg's Uncertainty Principle, Wave function-properties and physical significance and normalization of wave function. Wave Function in Ket Notation: Matrix form of wave function			
Module 4	**Lasers And Optical Fibers**	Term paper	. **No. of classes :07**
Interactions of radiations with matter, Characteristics of laser, conditions and requisites of laser, Modern day applications of laser. Principle of optical fibers, Numerical aperture and acceptance angle (Qualitative), Applications: Point to point communication with block diagram			

Targeted Application & Tools that can be used:

1. Areas of application are optoelectronics industry, Solar panel technologies, quantum computing software, electronic devices using transistors and diodes, memory devices, endoscopy, SQUIDS in MRI, Advanced material characterizations using SEM and STM.
2. Origin, excel and Mat lab soft wares for programming and data analysis.

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

1. Prepare a comprehensive report on non-conventional energy resources in Karnataka and their pros and cons.
2. Write a report on importance of quantum entanglement in supercomputers.

Text Book

1. Engineering Physics by Avadhanalu, Revised edition, S. Chand Publications,2024.
2. Principles of Quantum Mechanics by R Shankar, 2nd edition, springer Publications, 2011.
3. Introduction to Quantum Mechanics, David J Griffiths, Cambridge University Press, 2019

References:

1. Elementary Solid state Physics: Principles and Applications by M.A. Omar, 1st Edition, Pearson Publications, 2002.
2. Optoelectronics: An Introduction by John Wilson and John Hawkes, 3rd edition, Pearson Publications, 2017.
3. Engineering Physics by Gaur and Gupta, Dhanpat Rai Publications, 2012

Topics relevant to "SKILL DEVELOPMENT": Fundamentals of materials, Lasers and optical fibers.

for Skill Development through Participative Learning Techniques. This is attained through the Assignment/ Presentation as mentioned in the assessment component in course handout.

Course Code: PHY2505	**Course Title:** Advanced Materials and Quantum Physics for Engineers Lab **Type of Course: Basic Science Course**	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 laboratory provides an opportunity to validate the concepts taught and enhances the ability to use the concepts for technological applications. The laboratory tasks aim to develop following skills: **An attitude of enquiry, confidence and ability to tackle new problems, ability to interpret events and results, observe and measure physical phenomena, select suitable equipment, instrument and materials, locate faults in systems.**					
Course Out Comes	On successful completion of the course the students shall be able to: CO1: To understand the concepts of electrical conducting properties of metal, semiconductor and superconductivity. CO2: Interpret the results of various experiments to verify the concepts used in optoelectronics and advanced devices.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of " Applied Physics for Electrical and Electronics cluster" and attain **Skill Development** through **Experiential Learning** techniques					

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 N0 2: To determine the wavelength of semiconductor diode Laser and to estimate the particle size of lycopodium powder using diffraction.

Level 1: Determination of Wavelength of Laser
Level 2: Finding the particle size of lycopodium powder.

Experiment No. 3: To determine the proportionality of Hall Voltage, magnetic flux density and the polarity of Charge carrier.
Level 1: To determine the proportionality of Hall Voltage and magnetic flux density
Level 2: To determine the polarity of Charge carrier.

Experiment No. 4: To study the I-V characteristics of a given zener diode in forward and reverse bias conditions.

Level 1: To study I –V characteristics of the given Zener diode in reverse bias and to determine break down voltage.
Level 2: To study I –V characteristics of the given Zener diode in forward bias and to determine knee voltage and forward resistance.

Experiment No. 5: To study input and output characteristics of a given Transistor.

Level 1: To determine the input resistance of a given transistor.
Level 2: To determine current transfer characteristics and transistor parameters of a given transistor.

Experiment No. 6: Determination of Fermi energy and Fermi temperature of a given metal and bimetallic wire.

Level 1: Determination of Fermi energy and Fermi temperature of given metal wire.

Level 2: Determination of Fermi energy and Fermi temperature of given bimetallic wire.

Experiment No. 7: To study the current vs voltage characteristics of CdS photo-resistor at constant irradiance and To measure the photo-current as a function of the irradiance at constant voltage.

Level 1 To study the current vs voltage characteristics of CdS photo-resistor at constant irradiance.
Level 2: To measure the photo-current as a function of the irradiance at constant voltage.

Experiment No. 8: To study the I-V characteristics and I-R characteristics of a solar cell as a function of the irradiance.
Level 1: To study the I-V characteristics
Level 2: I-R characteristics of a solar cell as a function of the irradiance.

Experiment No. 9: Calculate the numerical aperture and study the losses that occur in optical fiber cable. .
Level 1: Calculate the numerical aperture.
Level 2: study the losses that occur in optical fiber cable.

Experiment No. 10: To determine the magnetic susceptibility of a given diamagnetic and paramagnetic substances using Quincke's method.
Level 1: To determine the magnetic susceptibility of a given diamagnetic substance.
Level 2: To determine the magnetic susceptibility of a given paramagnetic substance.

Experiment No. 11: To study the hysteresis loop of an iron core and to find its coercivity and retentivity. To show the effect of varying voltage and frequency on hysteresis loop.
Level 1: To study the hysteresis loop of an iron core and to find its coercivity and retentivity. .
Level 2: To show the effect of varying voltage and frequency on hysteresis loop.

Experiment No. 12: Determining the wavelength of the electrons for different accelerator voltages by applying the Bragg condition and Confirming the de Broglie equation for the wavelength.
Level 1: Determining the wavelength of the electrons for different accelerator voltages by applying the Bragg condition.
Level 2: Confirming the de Broglie equation for the wavelength.

Experiment No. 13: To measure the transition temperature and resistivity of a high temperature superconductor.
Level 1: To measure the transition temperature.
Level 2: To determine the resistivity of a high temperature superconductor.

Experiment No. 14: Plotting I-V characteristics in forward and reverse bias for LEDs and Determination of knee voltage.

Level 1: Plotting I-V characteristics in forward and reverse bias for LEDs
Level 2: Determination of knee voltage.

Experiment No. 15: Determination of Stefan's constant and verification of Stefan-Boltzmann Law.
Level 1: Determination of Stefan's constant
Level 2: Verification of Stefan-Boltzmann Law.

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

1. Prepare a comprehensive report on non-conventional energy resources in Karnataka and their pros and cons.
2. Write a report on importance of quantum entanglement in supercomputers.

Topics relevant to "SKILL DEVELOPMENT": Fundamentals of materials, Lasers and optical fibers.

for Skill Development through Participative Learning Techniques. This is attained through the Assignment/ Presentation as mentioned in the assessment component in course handout.

Course Code: CHE2503	**Course Title: Applied Chemistry for Engineers (ECE & EEE)** **Type of Course: Theory only course-School core BES basket**	**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 concepts and applications of chemistry in electrical and electronics engineering. The course also aims to enhance the knowledge of chemical composition and properties of chemical molecules as/in electronic materials & devices, advanced renewable energy systems. It will also cultivate an ability to identify chemistry in each of smart engineered materials and interpret solutions for the challenges connected to display and memory systems, sensor and smart technologies, advanced energy storage & conversion systems, nanofabrication and environmental management. It targets to strengthen the fundamental concepts of chemistry and then builds an interface with their industrial applications. **This course is designed to cater to Environment and Sustainability. Specifically, this course will address Sustainable Development Goal (SDG) No. 12 (Responsible consumption and production), Target 12.4 and 12.5.**					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **'Applied Chemistry for Engineers '** through **Participative Learning** techniques**.**					

Course Outcomes	On successful completion of this course the students shall be able to: 1. Apply the band theory of solids for elucidation of types of electronic materials 2. Explain the role of photo & electroactive materials in display systems and organic, polymeric and hybrid materials in memory systems 3. Explain the role of electrochemical sensors and synthetic materials in modern sensing and packaging solutions 4. Analyze various electrochemical energy systems including photovoltaics in terms of their principles, classifications & applications and their waste management for sustainable energy solutions 5. Explain the importance of nanomaterials and thin film deposition techniques in device fabrication
Course Content:	

Module 1	**Introduction to electronic materials**	Seminar	Data Collection and analysis	**8 Classes**
Conductors, Semiconductors & Insulators: Definition of conductors, semiconductor and insulators based on band theory. **Semiconductors:** Introduction, production of electronic grade silicon from Czochralski process (CZ) and Float Zone (FZ) methods, Chemical and electronic properties & applications of inorganic semiconductors (SiGe, GaAs, InP). **Self-learning topics:** Properties and functions of Cu & Quartz				
Module 2	**Chemistry of display & memory systems**	Seminar	Data Collection and analysis	**9 Classes**
Display Systems: Photo and electroactive materials, Liquid crystals for display (LCD) - Introduction, types, principle, properties, Basics of LED: Organic light emitting diode (OLED) and light emitting electrochemical cell (LEC). **Memory Systems:** Introduction, concepts of electronic memory, Classification of electronic memory device – Transistor, capacitor, resistor, charge transfer and memristor, Types of materials for memory systems - organic molecules, polymeric materials, organic-inorganic hybrid materials, Applications **Self-learning topics:** Biocomposite based memory devices				
Module 3	**Chemistry of sensors & smart materials**	Seminar	Data Collection and analysis	**8 Classes**
Sensors: Introduction, types; chemiresistor, principle and applications of electrochemical sensors with examples (glucose & VOC sensing), advanced sensor technologies mimicking human sensory organs (e-skin, e-nose) MEMS & NEMS – Introduction, components, classification, applications. **Smart materials (RFID & IONT):** Introduction, applications of carbonaceous/polymeric materials in smart packaging systems and data analysis **Self-learning topics:** Fullerene as advanced materials in organic electronics, Gas sensor-Application CO sensing				
Module 4	**Advanced energy systems & e-waste management**	Assignment	Data analysis and analysis	**10 Classes**
Electrochemical energy systems: Introduction to electrochemistry **Battery -** Basic concepts of batteries and characteristics, classification, Lithium-ion batteries; Next generation batteries **Supercapacitor -** Classification, principle and applications in hybrid vehicles **Fuel cells** - H_2-O_2 fuel cell, Principle, working and their applications. **Green hydrogen** - Importance and principle of generation				

Photovoltaics: Principle, Types (organic & inorganic solar cells, quantum dot sensitized solar cells(QDSSC's))
E-waste Management & Green Chemistry: Introduction, e-waste hazard, battery waste recycling and management, Carbon footprint and sequestration, 12 principles of green chemistry
Self-learning topics: Methanol fuel cell, Metal-air battery

Module 5	**Nanotechnology and device fabrication**	Assignment	Data Collection and analysis	**10 Classes**

Nanotechnology: Introduction, Classification of nanomaterials based on dimensionality, quantum confinement, Size dependent properties, Synthesis- Sol-gel method for thin films, Synthesis, properties and applications of carbon nanomaterials - CNT & Graphene
Nanofabrication: lithography, Nano imprinting and applications, Manufacturing of semiconductor chips
Thin Film Deposition Techniques: Principle and applications of Chemical vapor deposition (CVD), Types – Plasma enhanced chemical vapor deposition (PECVD) and Metal-Organic chemical vapor deposition (MOCVD).
Self-learning topics: Applications of nanotechnology in Nanoelectronics and health & hygiene.

Targeted Application & Tools that can be used:
Application areas are semiconducting, automobiles, electronics industry
Tools: MS Excel, MS Powerpoint, Molview, Chemdraw

Project work/Assignment:

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/Student seminar
- End Term Exam
- Self-Learning

Text Book

1. Wiley, "Engineering Chemistry", Wiley.
2. Springer, "Introduction to Electronic Materials and Devices", Springer.
3. Springer, " Textbook of Nanoscience and Nanotechnology", Springer.

Reference Books

1. Advanced Semiconducting Materials and Devices, K M Gupta & Nisha Gupta (2016), Springer
2. The Chemistry of Nanomaterials: Synthesis, Properties and Applications (2018), Cambridge University Press
3. Chemistry in microelectronics, Yannick Le Tiec, 2013, Wiley Publications, ISBN: 9781848214361.
4. Electronics properties of materials, Rolf E, Hummel, 2012, Springer Publications New York, 4th Edition,

ISBN 9781441981639.

5. Smart nanomaterials for sensor application, Li S, Ge Y, Li H, 2012, Bentham Science Publishers,

ISBN: 9781608055425.

6. Energy storage and conversion materials, Skinner S, 2019, Royal society of chemistry,

ISBN: 9781788010900.

E resources

https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_97006
https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_48504&xIndex=2

https://research.ebsco.com/c/n5guci/search/details/sfc3dnpvkb?db=nlebk&limiters=None&q=chemistry%20of%20materials https://www.mdpi.com/books/pdfview/book/1069 https://www.mdpi.com/books/pdfview/book/333 https://www.bloomsburycollections.com/book/fuel-an-ecocritical-history/ https://eng.oversea.cnki.net/kns55
Skill Sets All topics in theory component are relevant to Environment and Sustainability.

Course Code: CHE2504	**Course Title: Applied Chemistry for Engineers Lab** **Type of Course: School core and Laboratory only**	**L-T-P- C**	**0**	**0**	**2**	**1**
Version No.	1.0					
Course Pre-requisites	Before undertaking this Applied Chemistry for Engineers Lab course, students are expected to possess foundational knowledge of chemistry, including an understanding of acids and bases, metal and metal ions, oxidizing and reducing agents, various types of titrations, and the proper use of laboratory glassware. 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 circuit branches of engineering. The experiments are carefully designed to complement the theoretical concepts, that bridges the gap between chemical science and electrical science, like sensors, conducting polymers etc., providing hands-on experience to deepen understanding and reinforce learning. **This course is designed to cater to Environment and Sustainability. Specifically, this course will address Sustainable Development Goal (SDG) No. 4 (Quality Education) Target 4.4 and 6 (Clean Water and Sanitation) Target 6.3.**					
Course Objective	The objective of the course is to **familiarize the learners with the concepts of " Applied Chemistry for Engineers Lab (ECE & EEE)" and attain SKILL DEVELOPMENT through EXPERIENTIAL LEARNING techniques**.					
Course Outcomes (COs)	**On successful completion of the course, students shall be able to:** CO1: Examine the amount of acids in domestic and industrial waste using conductometric and pH sensors. CO2: Determine the amount of metal ions in electronic waste using potentiometric and optical sensors. CO3: Employ the suitable titration method to quantify the metal ions in industrial waste. CO4: Apply viscometry method to find the viscoelastic property of organic solvents. CO5: Recognize the suitable method to prepare, fabricate and recover the industrially important materials.					
Course Content:	**Total 15 sessions**					

Experiment 1	Experimental	Data Collection	Analysis and Interpretation
Conductometric method of determination of strength of a strong acid in battery electrolyte (Conductometric sensor)			
Experiment 2	Experimental	Data Collection	Analysis and Interpretation
Determination of pKa of organic acid in industrial wastewater using pH meter (pH sensor).			
Experiment 3	Experimental	Data Collection	Analysis and Interpretation
Estimation of Iron using potassium dichromate by Potentiometric method (Electrochemical sensor).			
Experiment 4	Experimental	Data Collection	Analysis and Interpretation
Colorimeter estimation of copper in industrial effluent (optical sensor).			
Experiment 5	Experimental	Data Collection	Analysis and Interpretation
Conductometric method for the determination of strength of a mixture of acids (e-waste recycling).			
Experiment 6	Experimental	Data Collection	Analysis and Interpretation
Determination of viscosity coefficient of lubricant by Ostwald's viscometer (Viscoelastic property).			
Experiment 7	Experimental	Data Collection	Analysis and Interpretation
Iodometric estimation of metals (copper) in electronic discards.			
Experiment 8	Experimental	Data Collection	Analysis and Interpretation
Estimation of iron using Std. Potassium permanganate solution**.**			
Experiment 9	Experimental	Data Collection	Analysis and Interpretation
Flame photometric estimation of sodium in e-waste management (Optical sensor)			
Experiment 10	Experimental	Data Collection	Analysis
Synthesis of polyaniline for gas sensor application (Demonstration experiment).			
Experiment 11	Experimental	Data Collection	Analysis
Recovery of precious metals from e-waste (Electroless plating) (Demonstration experiment)			
Experiment 12	Experimental	Data Collection	Analysis
Fabrication of materials by 3D printing techniques –Demo only (digital technologies into manufacturing processes)			
Any 8 experiments will be conducted out of 12			
Continuous Internal Assessment: • Midterm exam • Experimental Evaluation			

- Viva-voce
- End Term exam

Text Book

1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S. Chand Publications, New Delhi (2022)
2. Vogel's text book of practical organic chemistry 5th edition
3. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
4. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi5.Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.

References

Engineering Chemistry Laboratory Manual (English, Paperback, Dr Manoj Kumar Solanki), Edu-creation Publishing

E-resources:

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

Video Links:

1. https://www.youtube.com/watch?v=gd1YQr-74sw
2. https://www.youtube.com/watch?v=wVJ8WQax0rQ
3. https://www.youtube.com/watch?v=aWwEGCNtKwk
4. https://www.youtube.com/watch?v=JhBs_8DrPYo
5. https://www.youtube.com/watch?v=5bFAx2b_6A8
6. https://www.youtube.com/watch?v=_IVVZnAFfrM
7. https://www.youtube.com/watch?v=BBhuXOh9vOM
8. https://www.youtube.com/watch?v=j-nW3Jhc794

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 plan.

Course Code: CIV1200	**Course Title:** Foundations of Integrated Engineering **Type of Course:** Theory Only	**L- T- P- C**	2	0	0	2
Version No.	1.0					
Course Pre-requisites	**NIL**					
Anti-requisites	**NIL**					
Course Description	This interdisciplinary course introduces first-year engineering students to foundational principles and practices across key engineering domains, emphasizing real-world problem-solving, sustainability, and ethical innovation. Students explore how civil, mechanical, electrical, and IT systems intersect with emerging technologies like IoT, AI, and geomatics to address global challenges. Through case studies, learners gain deeper understanding of smart infrastructure, prototyping mechanical/electronic systems, and securing IT solutions. Topics include bioinformatics for environmental monitoring, GIS-enabled urban planning, renewable energy integration, and cybersecurity fundamentals. The course cultivates a holistic understanding of engineering's role in sustainable development, safety, and ethical decision-making, preparing students to contribute meaningfully to multidisciplinary projects in a technology-driven world.					
Course Objective	The objective of the course is skill development of student by using Participative Learning techniques.					

Course Outcomes	On successful completion of this course the students shall be able to: 1] Recall key principles of Agile, DevOps, and bioinformatics used in interdisciplinary engineering contexts. 2] Explain the role of GIS, LiDAR, and sustainable materials in designing smart infrastructure and disaster management systems. 3] Describe core components of mechanical systems and their real-world applications. 4] Describe the functionality of IoT-enabled wearable devices, embedded systems, and renewable energy integration in smart grids. 5] List foundational IT concepts such as cloud computing architectures, cybersecurity threats, and blockchain applications.			
Course Content:				
Module 1	**Foundations of Engineering Practice**	Assignment	Case studies	**6 Sessions**
Real-world problem-solving using data logic and practical applications, Collaboration and Innovation through multi-domain project, Engineering Ethics & Environmental Impact Emerging Fields: Automation, and Introduction to bioinformatics and its application Sustainability & Safety: Circular economy principles, carbon footprint analysis.				
Module 2	**Civil Engineering & Geomatics**	Assignment	Article Review	**6 Sessions**
Smart Infrastructure & Geomatics: GIS mapping, LiDAR, drone surveys for urban planning, Geospatial data analysis for disaster management. Sustainable Construction: 3D-printed structures, self-healing concrete, Digital twins for infrastructure monitoring. Green Innovations: Net-zero energy buildings, rainwater harvesting systems.				
Module 3	**Mechanical Engineering in Action**	Assignment & Quiz	Data Collection	**6 Sessions**
Advanced Manufacturing: Collaborative robots (cobots), additive manufacturing and 3D printing, Reverse engineering and prototyping. Energy Systems: Solar/wind energy harvesting, piezoelectric applications. Biomechanics: Prosthetics design, ergonomic product lifecycle.				
Module 4	**Electrical & Electronics Engineering**	Assignment & Quiz	Data Collection and visualization	**6 Sessions**
Smart Devices & Systems: Embedded systems, Wearable technology, Edge computing and hardware platforms Energy Innovations: EV charging infrastructure, wireless power transfer, Smart grid integration with renewables.				
Module 5	**Fundamentals of IT**	Assignment & Quiz	Case studies	**6 Sessions**
Core IT Topics: Networking basics, Cloud computing Cybersecurity & Data: Encryption, phishing prevention, zero-trust models, Database management. Emerging Tech: Blockchain for supply chains, AI/ML basics, IoT integration with cloud platforms				
Targeted Application & Tools that can be used: Application Areas include Interdisciplinary problem-solving, Smart city planning, disaster management, Robotics prototyping, renewable energy systems, Wearable health tech, smart grids, Secure cloud systems. Tools: 3D Printers, Autocad, Tinkercad, ArcGIS / QGIS, Arduino/Raspberry Pi				
Text Book: 1. William Oakes & Les Leone, "Engineering Your Future: An Introduction to Engineering", Oxford University Press, 9th Edition, 2021				

2. Barry F. Kavanagh, "Introduction to Geomatics", Pearson, 5th Edition, 2021
3. Ian Gibson, David Rosen, & Brent Stucker, "Additive Manufacturing Technologies", Springer, 3rd Edition, 2021
4. Sudip Misra, "The Internet of Things: Enabling Technologies, Protocols, and Use Cases", Wiley, 2nd Edition, 2022
5. James Kurose & Keith Ross, "Computer Networking: A Top-Down Approach", Pearson, 8th Edition, 2020

References

1. Supratim Choudhuri, "Bioinformatics for Beginners: Genes, Genomes, and Molecular Evolution", Academic Press, 1st Edition, 2023,
2. Robert McGinn, "The Ethical Engineer: Contemporary Concepts and Cases", Princeton University Press, 1st Edition, 2020
3. Charles J. Kibert, "Sustainable Construction: Green Building Design and Delivery", Wiley, 5th Edition, 2022
4. Anthony M. Townsend, "Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia", W.W. Norton & Company, 1st Edition, 2020
5. David Buchla, "Renewable Energy Systems: A Smart Energy Systems Approach", Pearson, 2nd Edition, 2023
6. Charles Platt, "Make: Electronics: Learning Through Discovery", Make Community, 3rd Edition, 2021
7. Charles J. Brooks, Christopher Grow, & Philip Craig, "Cybersecurity Essentials", Wiley, 2nd Edition, 2021

Web-resources:

1. Post-parametric Automation in Design and Construction
https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1155197&site=ehost-live
2. Smart Cities : Introducing Digital Innovation to Cities
https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1993146&site=ehost-live
3. Innovation Energy: Trends and Perspectives or Challenges of Energy Innovation
https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=2323766&site=ehost-live
4. Additive Manufacturing: Opportunities, Challenges, Implications
https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1134464&site=ehost-live

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	CAMD					

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) Describe competency of Engineering Graphics as per BIS conventions and standards. (2) Illustrate 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	**4 sessions**
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 sessions**
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	**8 sessions**
Topics: Introduction, Projection of right regular prisms, pyramids, cone, hexahedron and tetrahedron in different positions (Problems resting on HP only and First angle projection). [8 Hours: Application Level**]**				
Module 4	Isometric Projections of Solids (Using isometric scale only)	Assignment	Spatial Visualization	**8 sessions**
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 in charge.

Webresources :

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.

Course Code: EEE1200	Course Title: Basics of Electrical and Electronics Engineering Type of Course: ESC - Theory	L-T-P- C	3	0	0	3

Version No.	**1.0**
Course Pre-requisites	**Nil**
Anti-requisites	**Nil**
Course Description	This is a fundamental Course is designed to know the use of basics of electrical and electronics engineering principles in various fields of Engineering. The course emphasises the characteristics and applications of electrical and electronic devices. The course also emphasizes the working, analysis of electrical circuits. Additionally, this course ensures a foundation for future interdisciplinary applications in electrical machines manufacturing, power system, robotics, automation, communication, and oil refineries.
Course Objective	The objective of the course is to familiarize the learners with the concepts of the Basics of Electrical and Electronics Engineering to attain **Skill Development** through **Participative Learning** techniques.
Course Outcomes	**On successful completion of the course, the students shall be able to:** 1. Solve DC and AC electrical circuits using KVL and KCL. 2. Calculate various electrical parameters in AC systems. 3. Illustrate the working principle of the transformer, induction machine, and special machines to obtain characteristics. 4. Analyze the behavior of the semiconductor diode, zener diode, and rectifier circuit. 5. Determine the operating parameters of BJT and MOSFET.

Course Content:

Module 1	Introduction to Electrical Circuits	Assignment/Case Study	Numerical solving Task	**09 Sessions**
Topics: DC Circuits: Ohm's law, Kirchhoff's voltage and Kirchhoff's current laws, concept of circuit and network, types of elements, series-parallel connections of a resistive network. Electromagnetic Induction: Faraday's laws of electromagnetic induction, types of inductance, self-inductance, Mutual inductance, and coefficient of coupling, Practical Applications.				
Module 2	AC Circuits	Assignment/Case Study	Numerical solving Task	**09 Sessions**
Topics: AC Circuits: Generation of sinusoidal voltage, Basic terminologies in AC quantity, Analysis of R, L, C, Series RL, Concept of active power, reactive power, and power factor, real-world applications. Three-phase AC Circuits: Introduction to the three-phase system, Advantages of three-phase system over the single-phase system, and relation between line and phase values in Star and Delta connections, Practical Applications.				
Module 3	Fundamentals of Electrical Machines	Assignment/Case Study	Numerical solving Task	**09 Sessions**
Topics: Electrical Machines: Single-phase transformers: Principle of operation, Types and construction of transformers. EMF equation. AC Motor: Principle Operation of Induction Motors and its characteristics, Industrial and Domestic Application. Special Machines: BLDC, Stepper motor and applications.				
Module 4	Semiconductor and Diode Applications	Assignment/Case Study	Numerical solving Task	**09 Sessions**
Topics: Types of semiconductors (intrinsic and extrinsic), P-N junction diode - Ideal and practical behaviour, Diode forward and reverse characteristic, and Zener diode and its characteristics, half-wave and full-wave rectifier, applications.				
Module 5	Transistor and Switching device	Assignment/Case Study	Numerical solving Task	**09 Sessions**
Transistor characteristics, Current components, types of BJT Configurations and their current gains. Operating point, Applications. MOSFET: Construction, Principle of Operation, Depletion MOSFET, Comparison of BJT and MOSFET, Practical Applications.				

Self-Learning Topics:

Series RC, Clipping and clamping circuits, Voltage regulator, Stabilization Techniques, Voltage divider bias and its stability factor, Multistage amplifier, Darlington pair.
Special Machines: Servo Motor, Synchronous motors.

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 that involves the basics to a high level of electrical core company and electronic circuit design.
Professionally Used Software: Multisim/ PSpice, MATLAB, SmartDraw, AutoCAD Electrical.
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.

Text Book:

1. Kothari D. P. & Nagrath I. J., "Basic Electrical and Electronics Engineering", Tata McGraw-Hill Education.
2. 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.
3. A. P. Malvino, Electronic Principles,7th Edition, Tata McGraw-Hill,2007.
4. J. Millman, C. C. Halkias and C. D. Parikh, "Millman's Integrated Electronics", McGraw-Hill Education, 2nd Edition.

References

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

Online Resources:

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 Electronic Circuit", by Prof. Shouribrata Chatterjee, IIT Delhi https://www.youtube.com/watch?v=9g9dowLjmCA&list=PLp6ek2hDcoNDAw1BehPFazZ5ogPV8UlQa
9. Video lectures on "PN Junction Diodes", by Prof. Chitralekha Mahanta, IIT Guwahati. https://www.youtube.com/watch?v=L28F1Oenyds

E-content:

1. Juha Pyrhonen, Valeria Hrabovcova, R. Scott Semke, "The Fundamentals of Electric Machines", book chapter, pp. 36-65, 2016, doi: 10.1002/9781119260479.ch3 https://ieeexplore.ieee.org/document/10518719
2. Tran Dang Khoa; S. Horita, "A New Working Principle of Ferroelectric Gate FET Memory with an Additional Electrode," in IEEE conference, August 2002, doi: 10.1109/MIEL.2002.1003309. https://ieeexplore.ieee.org/document/1003309

Topics relevant to "Skill Develipment": 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 the assessment component mentioned in the course plan.

Catalogue prepared by	Dr. D P Somashekar
Recommended by the	21st BOS held on 09/06/2025

Board of Studies on	
Date of Approval by the Academic Council	26th Academic Council Meeting held on 25/07/2025

Course Code: EEE1250	**Course Title: Basics of Electrical and Electronics Engineering Laboratory** **Type of Course: ESC - 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, instruments 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.** To judge magnitudes without actual measurement.					
Course Outcomes	**On successful completion of the course, the students shall be able to:** 6. Verify basic electrical laws such as Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL) for given electrical circuit. 7. Calculate current, voltage, power, impedance, and power factor in AC RL, RC, and RLC circuits using experimental setups. 8. Determine efficiency and loading effects in single-phase transformers through load and no-load conditions. 9. Plot the performance characteristics of a DC shunt motor by conducting a suitable experiment. 10. Plot the characteristics of PN junction diodes, Zener diodes, and NPN transistors under various biasing conditions. 11. Interpret output waveforms, ripple factor, and voltage gain to assess the performance of rectifier and amplifier 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 a 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:

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

References

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

Online Resources:

1. https://presidencyuniversity.linways.com
2. https://www.digimat.in/nptel/courses/video/108105112/L01 "Fundamentals of Electrical Engineering-Basic Concepts, Examples"
3. 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.

Topics relevant to "HUMAN VALUES & PROFESSIONAL ETHICS": Standard Test methods, safety procedure.

Catalogue prepared by	Dr. D P Somashekar
Recommended by the Board of Studies on	12th BoS, Held on 09/06/2025
Date of Approval by the Academic Council	26th Academic Council Meeting held on 25/07/2025

Course Code: CSE1500	**Course Title: Computational Thinking Using Python** **Type of Course: Integrated**	**L- T- P- C**	2	0	2	3
Version No.	2.0					

<table>
<tr><td>Course Pre-requisites</td><td colspan="4">NIL</td></tr>
<tr><td>Anti-requisites</td><td colspan="4">NIL</td></tr>
<tr><td>Course Description</td><td colspan="4">This course introduces students to the essential skills of computational thinking and their practical application through the Python programming language. By combining problem-solving strategies with coding, students will learn to decompose complex challenges, identify patterns, abstract general principles, and design algorithms to build functional programs</td></tr>
<tr><td>Course Objective</td><td colspan="4">The objective of the course is to familiarize the learners with the concepts of Computational Thinking and use the Computational Thinking Principles to solve the computational Problems using Python Language</td></tr>
<tr><td>Course Outcomes</td><td colspan="4">Upon successful completion of this course, students will be able to:
• Explain and apply the core principles of computational thinking:
○ Decomposition
○ Pattern Recognition
○ Abstraction
○ Algorithm Design
• Use Python to implement solutions to real-world problems.
• Write and debug Python code using functions, loops and conditions
• Design simple programs and algorithms to automate repetitive or complex tasks.
• Collaborate effectively and communicate problem-solving approaches using pseudocode and Python.</td></tr>
<tr><td>Course Content:</td><td colspan="4"></td></tr>
<tr><td>Module 1</td><td>Pillars of Computational Thinking</td><td>Understand</td><td></td><td>20 Sessions</td></tr>
<tr><td colspan="5">What is computational thinking? Why is it important? Pillars of computational thinking: decomposition; pattern recognition; data representation and abstraction; algorithms,
Applying computational thinking to case studies
Introduction to Python, Data representation: variables, Conditionals, Basic Example programs to illustrate the programming constructs</td></tr>
<tr><td>Module 2</td><td>Algorithm Design & Problem-Solving Strategies</td><td>Application</td><td></td><td>20 Sessions</td></tr>
<tr><td colspan="5">Introduction to Algorithms, Introduction to Problem Solving techniques: Brute Force, Divide and conquer, Common algorithms: find-max, linear search, binary search and other simple Algorithms
Iteration, Loops, Strings, Arrays, Lists</td></tr>
<tr><td>Module 3</td><td>Applied Computational Thinking using Python</td><td>Application</td><td></td><td>20 Sessions</td></tr>
<tr><td colspan="5">Sets, Tuples, Dictionaries, User defined functions, Introduction to python built-in libraries.</td></tr>
<tr><td colspan="5">Targeted Application & Tools that can be used:
Google Colab, Python</td></tr>
<tr><td colspan="5">Text Book
1. "Computational Thinking for the Modern Problem Solver" – David D. Riley & Kenny A. Hunt</td></tr>
</table>

2. "Mastering Python 3 Programming: Ultimate Guide to Learn Python Coding Fundamentals and Real-World Applications" Subburaj Ramaswamy, BPB publications
References 1. • **Sweigart, Al.** *Automate the Boring Stuff with Python: Practical Programming for Total Beginners.* No Starch Press, 2015. https://automatetheboringstuff.com • **Severance, Charles.** *Python for Everybody: Exploring Data Using Python 3.* CreateSpace Independent Publishing, 2016. https://www.py4e.com • **Wing, Jeannette M.** "Computational Thinking." *Communications of the ACM*, vol. 49, no. 3, 2006, pp. 33–35. https://doi.org/10.1145/1118178.1118215 • **Downey, Allen B.** *Think Python: How to Think Like a Computer Scientist.* Green Tea Press, 2015. http://greenteapress.com/wp/think-python-2e/ . **E-Resources** https://edu.google.com/resources/programs/exploring-computational-thinking
Topics relevant to "SKILL DEVELOPMENT": Decomposition, Abstraction, Pattern recognition, Data Representation ,Algorithms

Course Code: **CSE2280**	**Course Title:** C Programming and Data Structures **Type of Course:** Theory	**L- T-P-C**	3	**0**	0	**3**
Version No.	2.0					
Course Prerequisites	The student needs to have a fundamental understanding of computers and basic syntax of programming language.					
Anti-requisites	**NIL**					
Course Description	C Programming and Data Structures course aims to teach fundamental programming concepts in C, alongside essential data structures for organizing and manipulating data efficiently. The course covers topics like data types, control structures, functions, arrays, and introduces more advanced concepts like memory management, file handling, and various data structures such as arrays, linked lists, stacks, and queues.					
Course Objective	The objective of this course is to equip learners with a comprehensive understanding of the C programming language and fundamental data structures. Through theoretical knowledge and practical implementation, students will gain the ability to design, implement, and apply efficient data storage and manipulation techniques to solve computational problems effectively. This course aims to develop strong problem-solving skills and a foundation for further studies in computer science.					

<table>
<tr><td>Course Outcomes</td><td colspan="4">On successful completion of the course the students shall be able to:
C.O. 1: Explain the fundamental concepts of C programming, including data types, operators, control flow, and functions. [Understanding]
C.O. 2: Develop C programs utilizing advanced features such as structures, unions, pointers, and file handling. [Application]
C.O. 3: Implement various linear data structures like arrays, linked lists, stacks, and queues in C to solve specific problems. [Application]
C.O. 4: Apply non-linear data structures such as binary trees and hashing techniques for efficient data organization and retrieval. [Application]
C.O. 5: Analyze and implement different sorting and searching algorithms in C for efficient data manipulation. [Analysis]</td></tr>
<tr><td>Course Content:</td><td colspan="4"></td></tr>
<tr><td>Module 1</td><td>C Programming Fundamentals</td><td>Assignment</td><td></td><td>10 Sessions</td></tr>
<tr><td colspan="5">Topics:
Data Types – Variables – Operations – Expressions and Statements, Conditional Statements, Functions – Recursive Functions</td></tr>
<tr><td>Module 2</td><td>C Programming – Advanced Features</td><td>Assignment</td><td></td><td>11 Sessions</td></tr>
<tr><td colspan="5">Topics:
Structures – Union – Enumerated Data Types, Pointers: Pointers to Variables, Arrays, and Functions
File Handling, Pre-processor Directives</td></tr>
<tr><td>Module 3</td><td>Linear Data Structures</td><td>Term paper/Assignment</td><td></td><td>11 Sessions</td></tr>
<tr><td colspan="5">Topics:
Abstract Data Types (ADTs) – List ADT – Array-Based Implementation, Linked List – Singly, Doubly- Linked Lists – Circular Linked List, Stack ADT – Implementation of Stack – Applications, Queue ADT – Priority Queues – Queue Implementation – Applications</td></tr>
<tr><td>Module 4</td><td>Non-linear Data Structures</td><td>Term paper/Assignment</td><td></td><td>11 Sessions</td></tr>
<tr><td colspan="5">Topics:
Trees – Binary Trees – Tree Traversals – Expression Trees – Binary Search Tree, Hashing – Hash Functions – Separate Chaining – Open Addressing – Linear Probing – Quadratic Probing – Double Hashing – Rehashing. Insertion Sort – Quick Sort – Heap Sort – Merge Sort-Linear Search – Binary Search</td></tr>
<tr><td colspan="5">Targeted Application & Tools that can be used:</td></tr>
<tr><td colspan="5">Text Book(s):
T1. Pradeep kothari “Android Application Development - Black Book”, dream tech press
T2. Barry Burd (Author), “Android Application Development” ALL – IN – ONE FOR Dummies
T3. Jeff Mcherter (Author),Scott Gowell (Author), “Professional mobile Application Development” paperback, Wrox - Wiley India Private Limited
T4. Wei-Meng Lee (Author) “Beginning Android Application Development” Wrox – Wiley India Private Limited</td></tr>
<tr><td colspan="5">Reference(s):
1. "C PROGRAMMING AND DATA STRUCTURES for BE Anna University R21CBCS (III-ECE/EEE - CS3353)" by A. A. Puntambekar (Technical Publications, 2022)
2. "Data Structures and Algorithms Using C" by Amitava Nag & Jyoti Prakash Singh (S. Chand Publishing)
3. "PROGRAMMING IN C AND DATA STRUCTURES" by B.K.Mathan Nagan and T.Mahalakshmi (Charulatha Publications)
E-Resources: https://puniversity.informaticsglobal.com/login Or http://182.72.188.193/</td></tr>
</table>

Course Code: **CSE2281**	**Course Title:** C Programming and Data Structure **Type of Course:** Lab	**L-T-P-C**	0	**0**	4	2
Version No.	2.0					
Course Prerequisites						
Anti-requisites	**NIL**					
Course Description	A "C Programming and Data Structures Lab" course aims to provide practical experience in implementing data structures and algorithms using the C programming language. The lab focuses on hands-on learning, enabling students to develop C applications, implement data structures like arrays, linked lists, stacks, queues, and trees, and apply sorting and searching algorithms. Students will also learn about memory management, file handling, and other advanced C programming concepts.					
Course Objective	The primary course objectives of a C Programming and Data Structure Lab are to equip students with practical programming skills in C, to enable them to implement various data structures, and to familiarize them with fundamental algorithms like sorting and searching. Specifically, the course aims to develop C applications, implement linear and non-linear data structures, understand tree operations, and implement sorting and searching algorithms.					
Course Outcomes	On successful completion of the course the students shall be able to: C.O. 1: Explain the fundamental concepts of C programming, including data types, operators, control flow, and functions. [Understanding] C.O. 2: Develop C programs utilizing advanced features such as structures, unions, pointers, and file handling. [Application] C.O. 3: Implement various linear data structures like arrays, linked lists, stacks, and queues in C to solve specific problems. [Application] C.O. 4: Apply non-linear data structures such as binary trees and hashing techniques for efficient data organization and retrieval. [Application] C.O. 5: Analyze and implement different sorting and searching algorithms in C for efficient data manipulation. [Analysis]					
Course Content:						
Module 1	C Programming Fundamentals	Assignment			10 Sessions	
Write a C program to declare variables of different data types (integer, float, char, double) and perform basic arithmetic operations (+, -, *, /). Display the results with appropriate formatting. Conditional Statements: Write a C program to determine if a given integer is positive, negative, or zero using if-else statements. Write a C program to find the largest of three numbers entered by the user using nested if-else or if-else if-else statements. Loops: Write a C program to print the first n natural numbers using a for loop. Write a C program to calculate the factorial of a given number using a while loop. Functions: Write a C program to define a function add(int a, int b) that returns the sum of two integers. Call this function from the main function and display the result. Write a C program to calculate the area of a circle using a function that takes the radius as input.						

Arrays:
Write a C program to read 5 integer values into an array and display them.
Write a C program to find the sum and average of elements in an integer array.
An embedded system for a smart home needs to track the power consumption of three appliances over a day (in hourly intervals). Write a C program that takes 24 hourly power readings for each of the three appliances, stores them in 2D arrays, and then calculates and displays:
The total power consumed by each appliance for the day.
The appliance with the highest total power consumption.
The average power consumption across all appliances for each hour.
Scenario: Simple Calculator with Error Handling:
Develop a C program that acts as a simple calculator. It should take two numbers and an operator (+, -, *, /) as input. Implement functions for each operation. Include error handling to prevent division by zero and handle invalid operator input, displaying appropriate error messages.

Module 2	C Programming - Advanced Features	Assignment		15 Sessions

Define a structure to store the details of a student (roll number, name, marks in three subjects). Write a C program to read the details of a student and display them.
Demonstrate the use of a union to store either an integer or a floating-point value and print the stored value.
Pointers:
Write a C program to demonstrate the use of pointers to access and modify the value of an integer variable.
Write a C program to swap two numbers using pointers.
Pointers and Arrays:
Write a C program to access the elements of an array using pointer arithmetic.
Write a C program to pass an array to a function using pointers and calculate the sum of its elements within the function.
File Handling:
Write a C program to create a text file and write a few lines of text into it.
Write a C program to read the contents of a text file and display them on the console.
Preprocessor Directives:
Write a C program that uses #define to define a constant for the value of PI and uses it to calculate the area of a circle.
Demonstrate the use of #include to include a standard header file (e.g., stdio.h, math.h).
Higher-Level Thinking (Scenario-Based):

Scenario: Data Logging for a Sensor:
A temperature sensor is connected to a microcontroller. Write a C program that simulates reading temperature values at regular intervals (e.g., every 5 seconds). Store these readings along with a timestamp in a file. The program should also include a preprocessor directive to define the maximum number of readings to be stored.
Scenario: Student Record Management using Structures and Files:
Design a structure to store student records (name, roll number, total marks). Write a C program that allows the user to:
Add new student records to a file.
Read and display all student records from the file.
Search for a student record based on their roll number.

Module 3	Linear Data Structures	Term paper/Assignment		15 Sessions

Array-Based List Operations:
Write a C program to implement a simple array-based list with operations to insert an element at the end, delete the last element, and display the list.
Linked List Operations:
Write a C program to create a singly linked list and perform the following operations:

Insert a node at the beginning.
Display all the nodes in the list.
Stack Implementation using Arrays:
Write a C program to implement a stack using an array with push and pop operations. Demonstrate the stack operations.
Queue Implementation using Arrays:
Write a C program to implement a queue using an array with enqueue and dequeue operations. Demonstrate the queue operations.
Higher-Level Thinking (Scenario-Based):

Scenario: Simulation of a Simple Call Center Queue:
Model a simple call center queue using a linked list. Each node in the list represents a waiting customer. Implement functions to:
Add a new customer to the queue (enqueue).
Serve the next customer in the queue (dequeue).
Display the current number of customers in the queue.
Scenario: Undo/Redo Functionality using Stacks:
Simulate a basic text editor's undo/redo functionality using two stacks. One stack will store the sequence of actions performed (e.g., typing a character), and the other will store the undone actions. Implement functions for type, undo, and redo.

Module 4	Non-Linear Data Structures	Term paper/Assignment		15 Sessions

Binary Tree Traversal:
Create a simple binary tree (manually insert a few nodes). Write C programs to perform inorder, preorder, and postorder traversals of the tree and print the node values.
Binary Search Tree Operations:
Write a C program to insert nodes into a binary search tree and then search for a specific key in the tree.
Hashing:
Implement a simple hash function and demonstrate the insertion of a few key-value pairs into a hash table using separate chaining.
Sorting Algorithms:
Write a C program to implement the insertion sort algorithm and sort a given array of integers.
Write a C program to implement the bubble sort algorithm and sort a given array of integers.
Searching Algorithms:
Write a C program to implement linear search to find a given element in an array.
Write a C program to implement binary search to find a given element in a sorted array.
Higher-Level Thinking (Scenario-Based):
Scenario: Representing a Circuit Hierarchy using Trees:
Consider an electronic circuit with components and sub-circuits. Design a tree structure where each node represents a component or a sub-circuit. The root can represent the main circuit. Write a C program to:
Create a representation of a simple circuit hierarchy (manually insert nodes).
Implement a function to traverse the tree and print the names of all the components in a specific order (e.g., preorder to represent the overall structure first).
Scenario: Efficient Data Retrieval for Component Database using Hashing:
Imagine a database storing information about electronic components (part number, description, cost). Implement a hash table to store and retrieve component information based on the part number. Handle collisions using separate chaining. Write functions to:
Insert new component information.
Retrieve component information given a part number.
Scenario: Sorting Electronic Components based on Value:

You have an array of electronic components, each with a specific value (e.g., resistance, capacitance). Write a C program to sort these components in ascending order of their value using an efficient sorting algorithm like quicksort or mergesort.
Text Book(s): 1. "C PROGRAMMING AND DATA STRUCTURES for BE Anna University R21CBCS (III-ECE/EEE - CS3353)" by A. A. Puntambekar (Technical Publications, 2022) 2. "Data Structures and Algorithms Using C" by Amitava Nag & Jyoti Prakash Singh (S. Chand Publishing) 3. "PROGRAMMING IN C AND DATA STRUCTURES" by B.K.Mathan Nagan and T.Mahalakshmi (Charulatha Publications)

Course Code: **CSE2264**	**Course Title: Essentials of Artificial Intelligence** **Type of Course: Program Core Course - Theory**	**L-T-P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course introduces the student to the basics of artificial intelligence. In this course, the student first learns the various search methods for problem-solving, followed by knowledge-based logic representations. After that, the student will learn about uncertainty in AI, as well as approaches to solve such challenges such as Naïve Bayes Classifier and Hidden Markov Models. Topics: Uninformed search, Heuristic search, Local search, Adversarial search, Constraint satisfaction, logic, First Order Resolution, Probability, Naïve Bayes Classifier, and Hidden Markov Model (HMM).					
Course Objectives	The objective of the course is EMPLOYBILITY of student by using EXPERIENTIAL LEARNING techniques.					
Course Out Comes	On successful completion of this course the students shall be able to: 1. Explain different methods of searching, proving, and analysis in AI [Understand] 2. Implement various graphical and adversarial search algorithms. [Apply] 3. Prove, by resolution, different situations using First Order Logic [Apply] 4. Solve sequence labeling problems using HMM [Apply]					
Course Content:						
Module 1	**Search Methods for Problem-Solving**	**Problem-Solving Tests**	**NPTEL Assignments**	**No. of Sessions: 13**		

Introduction – History of AI, Agents and Environment, Types of AI and Learning. 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 (a.k.a Dijkstra's Single-Source Shortest Path), 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.

Module 2	**Advanced Search Methods**	**Problem-Solving Tests**	**NPTEL Assignments**	**No. of Sessions: 12**

Local Search – Local Search, Hill Climbing, Genetic Algorithms, Gradient Descent. **Adversarial Search** – Minimax Search, Alpha-Beta Pruning, Ideal Ordering. **Constraint Satisfaction** – Constraint Satisfaction Problems Definitions and Examples – Map Colouring, N Queens, Cryptarithmetic, Generalized CSP; Back-tracking Heuristics; Arc Consistency and Path Consistency

Module 3	**Knowledge-Based Logic Representation**	**Automated Theorem Proving using FOL Resolution**	**NPTEL Assignments**	**No. of Sessions: 10**

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

Module 4	**Uncertainty in AI**	**Representing problems as HMM**	**NPTEL Assignments**	**No. of Sessions: 06**

Probability – Probability Definitions. Conditional Probability. Bayes Theorem. Naïve Bayes Classifier. Using Naïve Bayes Classifier for Supervised Learning. **Hidden Markov Models** – Definition of HMM. Sequence Labeling and Markov Assumption. Sub-Problems in HMM and their solutions – Forward Probability and Viterbi Algorithm. Applications of Sequence Labeling in Natural Language Processing (Eg. Part-of-Speech Tagging). **Introduction to Deep Learning** – Artificial Neurons, Activation Functions, Multilayer Perceptron.

Targeted Application & Tools that can be used:

1. Implementation of a shortest-path finder using different search algorithms.
2. Implementation of a sequence labeler using Viterbi Algorithm.

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

1. Group project on one of the topics mentioned above (Eg. Adversarial search).

Textbook(s):

1. Stuart Russel and Peter Norvig. *Artificial Intelligence: A Modern Approach*. 4th Edition. Pearson Education. 2022.
2. Lavika Goel. *Artificial Intelligence: Concepts and Applications*. 1st Edition. Wiley. 2021.
3. Elaine Rich, Kevin Knight and Shivashankar B Nair. *Artificial Intelligence*. 4th Edition. MedTech Science Press. 2024.

References:

1. Deepak Khemani. *A First Course in Artificial Intelligence*. 1st Edition. 6th Reprint, 2018.
2. Munesh Chandra Trivedi. *A Classical Approach to Artificial Intelligence*. 2nd Edition. Khanna Publishers. 2018.
3. George Luger. *Artificial Intelligence: Structures and Strategies for Complex Problem Solving*. 6th Edition. Pearson Education. 2021.

Weblinks

1. NPTEL Courses: Mausam (IIT Delhi), "An Introduction to Artificial Intelligence" Link: https://nptel.ac.in/courses/106102220.
2. Shyamanta M. Hazarika (IIT Guwahati), "Fundamentals of Artificial Intelligence". Link: https://nptel.ac.in/courses/112103280. Useful for the full course.
3. Deepak Khemani (IIT Madras), "Artificial Intelligence: Search Methods for Problem-Solving".
   Link: https://nptel.ac.in/courses/106106226. Useful for Module 1 and 2
4. Deepak Khemani (IIT Madras), "Artificial Intelligence: Knowledge Representation and Reasoning".
   Link: https://nptel.ac.in/courses/106106140. Useful for Module 3.
5. Deepak Khemani (IIT Madras), "AI: Constraint Satisfaction". Link: https://nptel.ac.in/courses/106106158. Useful for Module 2.

Course Code: CSE2265	**Course Title:** **Essentials of AI Lab** **Type of Course:** **Program Core Course - Lab**	**L-T-P-C**	0	0	2	1
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course introduces the student to the basics of artificial intelligence. In this course, the student first learns the various search methods for problem-solving, followed by knowledge-based logic representations. After that, the student will learn about uncertainty in AI, as well as approaches to solve such challenges such as Naïve Bayes Classifier and Hidden Markov Models. Topics: Uninformed search, Heuristic search, Local search, Adversarial search, Constraint satisfaction, logic, First Order Resolution, Probability, Naïve Bayes Classifier, and Hidden Markov Model (HMM).					
Course Objectives	The objective of the course is EMPLOYBILITY of student by using EXPERIENTIAL LEARNING techniques.					
Course Out Comes	On successful completion of this course the students shall be able to: 1. Explain different methods of searching, proving, and analysis in AI [Understand] 2. Implement various graphical and adversarial search algorithms. [Apply] 3. Prove, by resolution, different situations using First Order Logic [Apply] 4. Solve sequence labeling problems using HMM [Apply]					
Course Content: **No. of Sessions: 15 (30 hours)**						
Experiment No. 1: File Handling Level 1: Read text files using Python Level 2: Parse text files using Python						

Experiment No. 2: Implementation of Graph Representations
Level 1: Implement graph representations by taking input from the console
Level 2: Implement graph representations by taking input from files.

Experiment No. 3 & 4: Implementation of Uninformed Search Algorithms
Level 1: Implement uninformed search algorithms – BFS and DFS – on unweighted graphs.
Level 2: Implement uninformed search algorithms – Uniform Cost Search and Dijkstra's SSSP – on weighted graphs

Experiment No. 5: Implementation of Heuristic Search Algorithms
Level 1: Calculate the upper-bounds of admissible heuristics using Dijkstra's SSSP.
Level 2: Implement Greedy Best-First Search and A* Search Algorithms.

Experiment No. 6 & 7: Implementation of Adversarial Search
Level 1: Implement a Game Tree
Level 2: Perform Alpha-Beta Pruning and Ideal Ordering

Experiment No. 8 & 9: Implementation of a CSP Solver
Level 1: Implement a CSP solver to solve a cryptarithmetic problem
Level 2: Implement a CSP solver for map colouring

Experiment No. 10: Using Python Packages for CSP
Level 1: Implement a CSP solver for Sudoku
Level 2: Implement a CSP solver for Addoku

Experiment No. 11: Implement a Family Tree Parser
Level 1: Perform logic programming using logpy.
Level 2: Implement a family tree parser

Experiment No. 12 & 13: Implement a Decision Maker
Level 1: Implement a Minesweeper solver
Level 2: Implement a Battleship solver

Experiment No. 14 & 15: Hidden Markov Model
Level 1: Implement a generic HMM
Level 2: Build a PoS Tagger using a HMM with the Brown Corpus and the Universal Dependencies Tagset.

Targeted Application & Tools that can be used:

3. Google Colab
4. Python IDEs like PyCharm

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

The course is a lab-based course with all the assessments centrally evaluated. Every experiment consists of **two sessions**. The first session involves exploring a solution to the problem. The second session involves solving a particular problem.

Textbook(s):

1. Stuart Russel and Peter Norvig. *Artificial Intelligence: A Modern Approach*. 4th Edition. Pearson Education. 2022.
2. Prateek Joshi and Alberto Artasanchez. *Artificial Intelligence with Python*. 2nd Edition. Packt. 2020.

References:

1. Deepak Khemani. *A First Course in Artificial Intelligence*. 1st Edition. 6th Reprint, 2018.
2. Munesh Chandra Trivedi. *A Classical Approach to Artificial Intelligence*. 2nd Edition. Khanna Publishers. 2018.

Course Code: ECE1511	**Course Title: Design Workshop** Type of Course: ESC	**L- T-P-C**	1	0	2	2
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	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.					
Course Objective	The objective of the course is **Employability Skills** of student by using **PARTICIPATIVE LEARNING** techniques.					
Course Outcomes	**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**.**					
Course Content:						
Module 1	**Basic concepts of Microcontrollers**	Hands-on	Interfacing Task and Analysis	**3 Sessions**		
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.						
Module 2	**Sensory Devices**	Hands-on	Interfacing Task and Analysis	**3 Sessions**		

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.

Module 3	**Introduction to Micro python**	Hands-on	Interfacing Task and Analysis	**4 Sessions**

Topics:
Introduction to Micro Python, Comparison with other programming languages, Setting up the Micro Python development environment, Basics of Micro Python 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	21th BoS, Held on 09/06/2025
Date of Approval by the Academic Council	26th Academic Council meeting held on 25th July 2025

Course Code : EEE2500	**Course Title: Network Theory** Type of Course: Professional Core & Theory only	L-T- P-C	3	1	0	4
Version No.	2.0					
Course Pre-requisites	MAT2301-Calculus and Differential Equation					
Anti-requisites	NIL					
Course Description	This Course aims at obtaining the solutions to problems in electrical networks using various network reduction techniques and theorems. The course is both conceptual and analytical in nature and uses the basic knowledge on mathematics to analyse electrical circuits.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Network Theory and attain Skill Development through Problem Solving methodologies					
Course Out Comes	On successful completion of the course the students shall be able to: 1. Apply network reduction techniques and source transformations to simplify electric circuits.					

	2. Compute electrical circuit parameters by applying suitable network theorems. 3. Interpret the transient behavior of RL and RC circuits using differential equations and Laplace transform techniques. 4. Analyze the frequency response and resonance characteristics of RL and RC circuits. 5. Determine the parameters of two-port networks (Z, Y, h, ABCD) and their interrelationships. 6. Calculate voltage, current, and power relations in balanced and unbalanced polyphase circuits.			
Course Content:				
Module1	Module:1 Network Reduction Techniques:	Assignment	Quiz	9L+3T Sessions
Topics: Types of electric circuit elements and sources, Source transformation, mesh analysis, Nodal analysis				
Module2	Module: 2 Network theorems:	Assignment	Simulation	12L+ 4T Sessions
Topics: Statement of all Network Theorems, Explanation of Super position theorem, Thevenin's theorem, Maximum power transfer theorem and numerical examples on these theorems (DC &AC)				
Module3	Module:3TransientAnalysis and Resonance	Assignment	Programming/Simulation	12L+ 4T Sessions
Topics: Initial conditions, transient analysis of RL, RC circuits, Laplace transforms of RL, RC circuits with step input, Concept of Resonance and frequency response for sinusoidal input.				
Module4	Module:4 Two port networks	Assignment	Quiz	12L+ 4T Sessions
Topics: Introduction, Z parameters-parameters, ABCD parameters and h-parameters. Analysis of Poly Phase circuits: Voltage, Current and Power relations in a balanced Star band Delta connected load.				
Targeted Application & Tools that can be used: Application Area is Electrical appliances used in residential properties, DC and AC circuits for Power electronic converters, Spark plug in automobiles, Battery Management system in Electric Vehicles.Professionally Used Software: Multisim, MATLAB Simulink				

Textbooks 1. Ravish.R.Singh,"ElectricalNetworks",McgrawHillcompany,2009 2. Charles K Alexander and Matthew NO Sadiku" Fundamentals of Electric Circuits (4th) Edition
References 1. VanValkenberg,"NetworkAnalysis",PrenticeHall,1974.PHI 2. J.A.Edminister,"Theory and Problemsof ElectricCircuits",Schaum'sOutlineSeries,4thEdition. Online resources 1. https://puniversity.informaticsglobal.com:2069/search/searchresult.jsp?newsearch=true&query Text=electric%20circuit%20analysis 2. https://www.tutorialspoint.com/network_theory/index.htm 3. https://nptel.ac.in/courses/108/105/108105159/ 4. CaseStudyhttps://www.scribd.com/document/420348012/Case-Study 5. E book: Electric Circuits: A Primer, Olivier, J. C , 2018 https://presiuniv.knimbus.com/user#/home
Topics relevant to "SKILL DEVELOPMENT": Network Reduction Techniques and Source transformation for Skill Development through Problem Solving methodologies. This is attained through assessment component mentioned in Course Plan.

Catalogue prepared by	Mr. Bishakh Paul
Recommended by the Board of Studies on	21st BoS, Held on 09/06/2025
Date of Approval by the Academic Council	18th Academic Council Meeting, dated on 3/8/2022

Course Code: ECE2021	**Course Title: Digital Electronics** **Type of Course:** **Program Core Theory only**	**L-T-P-C**	**3**	**0**	**0**	**3**
Version No.	2.0					
Course Pre-requisites	[1] Elements of Electronics/Electrical Engineering, 2] Basic concepts of number representation, Boolean Algebra					
Anti-requisites	NIL					

<table>
<tr><td>Course Description</td><td colspan="4">Digital Electronics: Learning of basics in digital electronic circuits that are used to process the digital signals. The course is designed to be one of the core course in electronics/ electrical engineering.Successful completion will provide the necessary foundation for more specialist learning in digital microelectronics, computer and communication engineering.The purpose of this course is to support the students to exhibit the Boolean Logic. The course is analytical in nature and needs fair knowledge of Boolean Theorems. The course shields theory and laboratory for Digital Electronics including basic principles, analysis and design.
Further it covers the different methods of Boolean function simplification- Study and classification of Digital circuits- Design and Implementations of Digital Logic circuits-Programmable logic circuit
The course also enhances the Design, Implementation and Programming abilities through laboratory assignments. The associated laboratory provides an opportunity to certify the theoreticknowledge.</td></tr>
<tr><td>Course Objective</td><td colspan="4">The objective of the course is to familiarize the learners with the concepts of Digital Electronics and attain SKILL DEVELOPMENT through EXPERIENTIAL LEARNING .</td></tr>
<tr><td>Course Outcomes</td><td colspan="4">On successful completion of this course the students shall be able to:
i. Discuss the concepts of number systems, Boolean algebra and logic gates.
ii. Apply minimization techniques to simplify Boolean expressions.
iii. Demonstrate the Combinational circuits for a given logic
iv. Illustrate the Sequential and programmable logic circuits</td></tr>
<tr><td>Course Content:</td><td colspan="4"></td></tr>
<tr><td>Module 1</td><td>Fundamentals of Number systems- Boolean algebra and digital logic</td><td>Application Assignment</td><td>Data Analysis task</td><td>8classes</td></tr>
<tr><td colspan="5">Topics:
Introduction to Number systems, Number base conversions, complement of numbers, Binary Codes, Boolean theorems and Boolean algebra, Boolean functions- canonical and standard forms, Digital logic gates. [Bloom’s level selected: Knowledge]</td></tr>
<tr><td>Module 2</td><td>Boolean function simplification</td><td>Application Assignment</td><td>Data Analysis task</td><td>12 Classes</td></tr>
<tr><td colspan="5">Topics:
Introduction, two variable, three variable, four variable K-Map - Don’t care conditions. -NAND & NOR Implementation. [Bloom’s level selected: Application]</td></tr>
<tr><td>Module 3</td><td>Combinational Logic circuits:</td><td>Application Assignment</td><td>Programming Task & Data Analysis task</td><td>10 Classes</td></tr>
<tr><td colspan="5">Introduction to Combinational circuits, Analysis, Design procedure, Binary Adder and Subtractor, Magnitude comparator,Multiplexers-Demultiplexers, Encoders - Decoders, HDL Models of combinational circuits. [Bloom’s level selected: Application]</td></tr>
<tr><td>Module 4</td><td>Sequential and Programmable logic circuits:</td><td>Application Assignment</td><td>Programming Task & Data Analysis task</td><td>15Classes</td></tr>
<tr><td colspan="5">Introduction to sequential circuits, Storage elements: latches and flip flops, Characteristic tables, characteristic equations, excitation table,Analysis of clocked sequential circuits, Mealy & Moore Models of finite state machines- Registers & Counters- HDL Models of Sequential circuits-ROMs, PLDs &PLAs. [Bloom’s level selected: Application]</td></tr>
<tr><td colspan="5">Text Book(s):
1. Mano, M. Morris and Ciletti Michael D., “Digital Design”, Pearson Education, 6th edition
2. Thomas L. Floyd “DIGITAL LOGIC DESIGN” , Pearson Education, fourth edition.</td></tr>
<tr><td colspan="5">Reference(s):
Reference Book(s):</td></tr>
</table>

R1. Jain, R. P., *"Modern Digital Electronics",* McGraw Hill Education (India), 4th Edition

R2. Roth, Charles H., Jr and Kinney Larry L., *"Fundamentals of logic Design"*, Cengage Learning, 7th Edition

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

1. **eBook1**: Mano, M. Morris and Ciletti Michael D., *"Digital Design"*, Pearson Education.
2. {[PDF] Digital Design By M. Morris Mano, Michael D Ciletti Book Free Download
3. **eBook2:**Floyd "DIGITAL LOGIC DESIGN" fourth edition- ePub, eBook- [PDF] DIGITAL LOGIC DESIGN FOURTH EDITION FLOYD | abri.engenderhealth.org.
4. NPTEL Course- NPTEL :: Electrical Engineering - NOC:Digital Electronic Circuits
5. Digital Logic Design PPT Slide 1 (iare.ac.in)
6. Lab Tutorial: Multisim Tutorial for Digital Circuits - Bing video

CircuitVerse - Digital Circuit Simulator online

Learn Logisim➠ Beginners Tutorial | Easy Explanation! - Bing video

Digital Design 5: LOGISIM Tutorial & Demo

7.https://presiuniv.knimbus.com/user#/home

E-content:

1. Z. Xin-Li and W. Hong-Ying, "The Application of Digital Electronics in Networking Communication," 2016 Eighth International Conference on Measuring Technology and Mechatronics Automation (ICMTMA), 2016, pp. 684-687, doi: 10.1109/ICMTMA.2016.168.
2. An encoding technique for design and optimization of combinational logic circuit DipayanBhadra;Tanvir Ahmed Tarique;Sultan Uddin Ahmed;Md. Shahjahan;KazuyukiMurase2010 13th International Conference on Computer and Information Technology (ICCIT)
3. A. Matrosova and V. Provkin, "Applying Incompletely Specified Boolean Functions for Patch Circuit Generation," 2021 IEEE East-West Design & Test Symposium (EWDTS), 2021, pp. 1-4, doi: 10.1109/EWDTS52692.2021.9581029.
4. A. Matrosova, V. Provkin and E. Nikolaeva, "Masking Internal Node Faults and Trojan Circuits in Logical Circuits," *2019 IEEE East-West Design & Test Symposium (EWDTS)*, 2019, pp. 1-4, doi: 10.1109/EWDTS.2019.8884434.

Topics relevant to "SKILL DEVELOPMENT": Adders, Multiplexers, Decoders / Encoders; Flip-Flops, Counters and Registers for **Skill Development** through **Experiential Learning techniques.** This is attained through **assessment component** mentioned in course handout.

Catalogue prepared by	Dr.G.Muthupandi
Recommended by the Board of Studies on	BOS Meeting NO: 12th BOS held on 10/08/2021
Date of Approval by the Academic Council	Academic Council Meeting No. 16th , Dated 23/10/2021

Course Code: ECE2500	**Course Title: Signals and Systems** **Type of Course: Program Core**	**L-T-P-C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	An understanding of basic concepts of linear circuits as examples of linear systems and a familiarity with complex numbers and calculus, including power series are desirable.					

Anti-requisites	**NIL**			
Course Description	This is an undergraduate level course that builds a mathematical foundation for understanding and analysing any physical system. This course will teach signal/system properties, sampling, frequency transforms and responses, feedback, control applications as well as computer analysis using MATLAB/Python. The course feeds into several applications, including Data Science, Machine Learning, Communications, Networks and Systems.			
Course Objective	**The objective of the course is SKILL DEVELOPMENT of student by using PARTICIPATIVE LEARNING techniques**			
Course Outcomes	On successful completion of this course the students shall be able to: 1. Describe basic operations on discrete-time signals and linear time invariant (LTI) systems 2. Determine the stability of the Linear Time Invariant (LTI) systems using their frequency responses. 3. Apply Fourier series to manipulate continuous time signals in frequency domain 4. Employ Fourier Transform to discrete time signals for frequency domain analysis. 5. Analyze LTI systems using Laplace transform and Z transform. 6. Analyze the transfer function to identify the type of filter			
Course Content:				
Module 1	Introduction to Signals and Systems	Assignment	Memory Recall based Quizzes	**14 Sessions**
Topics: Classification of signals, useful signal operations, Exponential and sinusoidal signals, Unit step and unit step functions, Basic system properties. Zero-input and zero-state response, unit impulse response, convolution, Graphical method for convolution, stability of systems, Response time and Rise time of system.				
Module 2	Fourier Series and Fourier Transform	Assignment / Quiz	Design and analysis of parameters (simulation)	**19 Sessions**
Topics: Linear time invariant systems to complex exponential signals, Fourier series representation of continuous time periodic signals, Convergence and properties of continuous-time Fourier series, Discrete time Fourier series and its properties, Representation of aperiodic signal, Fourier transform and its properties, Fourier transform of some useful signals, Generalized Fourier series: signals vs vectors, Modulation, System characterization. Representation of aperiodic signal, Discrete-time Fourier transform and its properties, Sampling, Duality in discrete-time Fourier series.				
Module 3	Laplace and z-transform and Filter Design	Assignment	Memory Recall based Quizzes	**9 Sessions**
Topics: Laplace transform, ROC, Inverse Laplace transform, Filter design by placements of poles and zeros of system functions, properties of Laplace transform, analysis and characterization of LTI systems using Laplace transform, unilateral Laplace transform. Z-transform, properties of z- transform, Frequency response from pole-zero location, analysis				

and characterization of LTI systems using z-transform, unilateral z-transform. IIR/ FIR Filters.

Text Books:

1. Alan V Oppenheim, Alan S Willsky and S.Hamid Nawab, "Signals and systems", Pearson Education, 2nd edition, 2003

Reference Books:

1. B P Lathi, "Linear Systems and Signals" (The Oxford Series in Electrical and Computer Engineering) 2004

2. Signals and systems, second edition - Simon Haykin, Barry VanVeen, Wiley, Wiley India,2007

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

1. Signals and Systems | MIT OpenCourseWare
2. Signals and Systems | Electrical Engineering and Computer Science | MIT OpenCourseWare
3. https://presiuniv.knimbus.com/user#/home

E-content:

1. L. Santhosh and A. Thomas, "Implementation of radix 2 and radix 22 FFT algorithms on Spartan6 FPGA," 2013 Fourth International Conference on Computing, Communications and Networking Technologies (ICCCNT), 2013, pp. 1-4, doi: 10.1109/ICCCNT.2013.6726840.

2. Saeed, Ahmed, et al. "Efficient fpga implementation of fft/ifft processor." International Journal of circuits, systems and signal processing 3.3 (2009): 103-110.

3. S. Bouguezel, M. O. Ahmad and M. N. S. Swamy, "An Alternate Approach for Developing Higher Radix FFT Algorithms," APCCAS 2006 - 2006 IEEE Asia Pacific Conference on Circuits and Systems, 2006, pp. 227-230, doi: 10.1109/APCCAS.2006.342373.

Topics related to development of "EMPLOYABILITY": CTFT, CTFS, DTFT, DTFS, Laplace Transform and Z Transform

Catalogue prepared by	Mrs. Pallabi Kakati
Recommended by the Board of Studies on	12th BOS held on 10/08/2021
Date of Approval by the Academic Council	Meeting No. 16th , Dated 23/10/2021

<table>
<tr><td>Course Code: EEE2501</td><td colspan="3">Course Title: Electromagnetic Field Theory
Type of Course: Professional Core & Theory only</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="8">2.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="8">MAT2301-Calculus and Differential Equation</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 provide a basic knowledge about Electromagnetic Fields. It uses the mathematical concepts of vector calculus for analysing the fields. The course enhances the ability to visualize the electric and magnetic fields by using simulation tools like MATLAB and Ansys etc.</td></tr>
<tr><td>Course Objective</td><td colspan="8">The objective of the course is to familiarize the learners with the concepts of Electromagnetic Field Theory 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. Choose the suitable coordinating system for Electromagnetic field systems.
2. Explain the concept of electrostatics fields.
3. Describe the principles of magneto statics fields.
4. Summarize the static and time varying field equations.</td></tr>
<tr><td>Course Content:</td><td colspan="8"></td></tr>
<tr><td>Module 1</td><td colspan="2">Introduction to vector analysis and coordinate systems</td><td>Assignment</td><td colspan="3">Task on choosing the proper coordinate system for Analysis in various applications</td><td>12L+4T Sessions</td></tr>
<tr><td colspan="9">Topics:Sources and effects of electromagnetic fields – Coordinate Systems – Vector fields –Del Operator, Gradient, Divergence, Curl – Differential length, area and volume in different coordinate systems.</td></tr>
<tr><td>Module 2</td><td colspan="2">Electrostatic fields</td><td>Assignment</td><td colspan="3">Virtual lab</td><td>12L+4T Sessions</td></tr>
<tr><td colspan="9">Topics:Coulomb’s law, Gauss’s law, Electric potential, Electric dipole and flux lines, Energy density in electrostatic field, Boundary conditions, Poisson’s and Laplace’s equation.</td></tr>
<tr><td>Module 3</td><td colspan="2">Magneto Static Fields</td><td>Project work</td><td colspan="3">Programming Task / Hardware model</td><td>12L+4T Sessions</td></tr>
<tr><td colspan="9">Topics:Lorentz Force, Biot–Savart’s Law, Ampere’s Circuit Law, Magnetic Potential, Boundary Conditions, Inductor, Magnetic Energy.</td></tr>
<tr><td>Module 4</td><td colspan="2">Time Varying Electric and Magnetic Fields</td><td>Project work</td><td colspan="3">Hardware model</td><td>9L+3T Sessions</td></tr>
<tr><td colspan="9">Topics:
Faraday’s law, Displacement current, Maxwell’s four equations in integral form and differential form. Poynting Vector and the flow of power, Power flow in a co-axial cable, Instantaneous, Average and Complex Poynting Vector. Wave Equation from Maxwell’s equation</td></tr>
<tr><td colspan="9">Targeted Application & Tools that can be used:
Application Area is in the operation of electrical systems, transmission lines, communication systems, Magnetic Levitation Trains, transformers and electrical machines.
Professionally Used Software: MATLAB, ANSYS,Vlab.</td></tr>
<tr><td colspan="9">Textbooks:
1. Sadiku, Mathew N. O. and Kulkarni, S. V. “Principles of Electromagnetics”, 6th Edition, Oxford University Press, Latest Version.
2. W H Hayt Jr, J A Buck, and M Jaleel Akhtar . “Engineering Electromagnetics | Ninth Edition, TMH Publications.</td></tr>
<tr><td colspan="9">References:</td></tr>
</table>

1. Cheng, David K., "Field & Wave Electromagnetics", 2nd Edition, Pearson Education, 2014. 2. Pramanik, Ashutosh, "Electromagnetism – Theory and Applications", 2nd Edition, Prentice-Hall of India Private Limited, New Delhi, 2009. Online Learning Resources: 1. https://ocw.mit.edu/resources/res-6-001-electromagnetic-fields-and-energy-spring-2008/ 2. https://nptel.ac.in/courses/117/103/117103065/ 3. Case study: https://iopscience.iop.org/article/10.1088/1742-6596/1826/1/012081/meta 4. https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2706929&site=ehost-live
Topics relevant to "SKILL DEVELOPMENT": Electric Field Intensity due to different charge distributions, Magnetic field Intensity due to current carrying conductor for Skill Development through Problem Solving methodologies. This is attained through assessment component mentioned in Course Plan.

Catalogue prepared by	Dr Jisha L K
Recommended by the Board of Studies on	21st BoS, Held on 09/06/2025
Date of Approval by the Academic Council	26th Academic Council meeting held on 25th July 2025

Course Code: EEE2502	**Course Title: DC Electrical Machines & Special Electrical Machines** **Type of Course:** Professional Core Theory only	**L- T-P-C**	**3**	**1**	0	**4**
Version No.	**1.0**					
Course Pre-requisites	EEE1200 Basic Electrical and Electronics Engineering EEE2500 Network Theory EEE2501 Electromagnetic Field Theory					
Anti-requisites	**Nil**					
Course Description	This course provides a thorough introduction to DC machines and special electrical machines, focusing on their real-world applications. Students will learn about the speed-torque characteristics and performance of these machines under various conditions. The course develops analytical skills to assess and optimize machine performance. Through hands-on assignments and mini projects, students will gain practical experience and enhance their ability to use modern tools for machine analysis. By the end, students will be equipped to solve problems related to the operation and control of DC and special electrical machines in diverse industries.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **DC Electrical Machines & Special Electrical Machines** 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** the performance of dc generator 2. **Choose** the dc motor for an application **3. Explain** the construction, principle of operation of switched reluctance motor and stepper motor 4. **Summarize** the working principle and characteristics of BLDC and PMS Motors.					

Course Content:				
Module 1	Energy Conversion and DC Generator	Assignment	Application of DC Machines	**11L+4T Sessions**
Topics: Principles of Energy conversion –. DC Generator – construction, principle of operation – emf equation – types of Characteristics commutation - armature reaction. losses and efficiency, condition for maximum efficiency. Applications				
Module 2	DC Motor	Assignment	Simulation task	**11L+4T Sessions**
Topics: DC motor – principle of operation – torque equation – types –starting – speed control – various testing – braking, Testing of dc machines, Applications				
Module 1	**Switched Reluctance Motor and Stepper Motor**	**Assignment**	**Applications of Stepper motors**	**11L+4T Sessions**
Switched Reluctance Motor Construction, Principle of operation, design of stator and rotor pole arc, power converter for switched reluctance motor. **Stepper Motors** Construction, principle of operation-theory of torque production, Types of stepping motor.				
Module 2	**Permanent Magnet Brushless D.C. Motors and Permanent Magnet Synchronous Motors**	**Mini project**	**Simulation task/ Prototype development**	**11L+4T Sessions**
Permanent Magnet Brushless D.C. Motors Construction, principle of operation, EMF and Torque equations, Torque speed characteristics, Sensor less motors, Motion control **Permanent Magnet Synchronous Motors** Construction, Principle of operation, EMF and torque equations, Starting, Rotor configurations, Dynamic model				
Targeted Application & Tools that can be used: · The course subject finds it application in many major areas of technologies like **Locomotives, Elevators, Excavators, Steel Mills, robotic applications, Rolling Mills and many more.**				
Text Book 1. Dr. P.S. Bhimbra, 'Electrical Machinery', Khanna Publications, 7th Edition, 2007. 2. VenkataRatnam K, Special Electrical Machines, CRC Press, 2009.				
References 1. Arthur Eugene Fitzgerald and Charles Kingsley, 'Electric Machinery', Tata McGraw Hill Education Publications, 6 th Edition, 2002. 2. Vincent Del Toro, 'Electrical Engineering Fundamentals', 2nd Edition, Prentice hall Publications, 2003. 3. Parkar Smith, N.N., 'Problems in Electrical Engineering', 9th Edition, CBS Publishers and Distributers, 1984. 4. Kenjo, T., and Sugawara, A., Stepping Motors and their Microprocessor Controls, Oxford Science Publications, 1984. 5. Miller, T. J. E., Brushless Permanent Magnet and Reluctance Motor Drives, Oxford Science Publications, 1989 **Online learning resources:**				

1. Case study: chrome extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.ijarcce.com/upload/2016/may-16/IJARCCE%20246.pdf 2. Ebook: https://puniversity.informaticsglobal.com:2069/search/searchresult.jsp 3. newsearch=true&queryText=Digital%20signal%20processing%20applications. 4. https://nptel.ac.in/courses/108/102/108102156/ 5. https://www.youtube.com/watch?v=DMDTkXeFkb8 6. Case study: https://www.researchgate.net/publication/342360681_Economic_Benefits_of_Energy-Efficient_Electrical_Machines_A_Case_Study
Topics relevant to "SKILL DEVELOPMENT" : DC Motor control and Operation of PMSM at various load conditions for **Skill Development through Problem Solving methodologies.** This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Dr Joshi Manohar V
Recommended by the Board of Studies on	21st BoS, Held on 09/06/2025
Date of Approval by the Academic Council	26th Academic Council meeting held on 25th July 2025

Course Code: EEE2503	**Course Title: AC Machines** **Type of Course:** Professional Core Theory only	**L-T- P-C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	EEE1200 Basic Electrical and Electronics Engineering EEE2500 Network Theory EEE2501 Electromagnetic Field Theory					
Anti-requisites	**Nil**					
Course Description	This course provides the basics of AC machinery fundamentals and machine parts and helps to gain the skills for controlling AC machines. It highlights the use of mathematical tools for analyzing the performance of machines. The course also inculcates the ability to analyze the performance of Induction and Synchronous Machines in industrial and domestic applications. Mini project and Assignments enhance the ability to visualize the real-world applications using tools like MATLAB/Simulink, Caspoc software, etc.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of AC machines and attain **Skill Development** through **Problem Solving methodologies**.					
Course Out Comes	On successful completion of the course, the students shall be able to: 1. **Analyze** single & three-phase transformers and their performance through testing. 2. **Analyze** the performance of the single & three-phase induction motors using the phasor diagrams and equivalent circuits. 3. **Examine** the operation of the synchronous generator & its					

	performance characteristics. 4. **Explain** the principle of operation of synchronous motors.			
Course Content:				
Module 1	Transformers	Assignment	Study of transformers used in substations	**13 Sessions**
Topics: **Single-phase transformers:** working principle, types, constructional details, EMF equation, operation on no load and on load, phasor diagrams, and applications, equivalent circuit, losses and efficiency, tests on transformer, All day efficiency. **Poly-phase transformers:** Poly-phase connections - Y/Y, Y/Δ, Δ/Y, Δ/Δ and open Δ, Scott connection and Applications.				
Module 2	Induction motors	Industrial Visit	Study of motors used in various sections of the industry	**13 Sessions**
Topics: **Poly-phase induction motors:** construction, principle and types, no-load and load characteristics, no-load and blocked rotor test, equivalent circuit, circle diagram, starting and speed control methods. **Single-phase induction motors:** construction, principle and types, double-revolving field theory, equivalent circuit.				
Module 3	Synchronous generators	Industrial visit	Study of alternators used in various power generation plants	**10 Sessions**
Topics: construction, principle and types, armature reaction, load characteristics, voltage regulation, two-reaction theory, parallel operation.				
Module 4	**S**ynchronous motors	Assignment	Industrial applications of synchronous motor	**09 Sessions**
Topics: principle of operation, synchronous machines on infinite bus bars, phasor diagram, V and inverted-V curves, hunting and its suppression, starting methods.				
Targeted Application & Tools that can be used: The course subject finds its application in many major areas of technologies like power generation, transmission and distribution sectors, motion control equipment, medical instruments, automobiles, and many more.				
Text Book 1. Dr. P.S. Bhimbra, 'Electrical Machinery', Khanna Publications, 7th Edition, 2007. 2. Nagrath, I.J. and Kothari, D.P., 'Electrical Machines', Tata McGraw Hill Education Private Limited Publishing Company Ltd., 4th Edition, 2010.				
References 1. J. B. Gupta, 'Theory & Performance of Electrical Machines', S.K. Kataria & Sons, 15th 2015 edition, 2024. 2. Arthur Eugene Fitzgerald and Charles Kingsley, 'Electric Machinery', Tata McGraw Hill Education Publications, 6th Edition, 2002. 3. Miller, T.J.E., 'Brushless Permanent Magnet and Reluctance Motor Drives', Clarendon Press, Oxford, 1989. 4. Parkar Smith, N.N., 'Problems in Electrical Engineering', CBS Publishers and Distributers, 9th Edition, 1984 5. M. G. Say, 'Performance and Design of Alternating Current Machines', CBS Publishers & Distributors Pvt. Ltd., New Delhi, 3rd Edition, 2002. **Online learning resources** 1. https://presiuniv.knimbus.com/user#/home 2. https://onlinecourses.nptel.ac.in/noc25_ee27/preview				

3. https://z-lib.gs/book/3496322/3715c3/electrical-machines-fundamentals-of-electromechanical-energy-conversion.html?dsource=recommend 4. https://www.youtube.com/playlist?list=PLp6ek2hDcoNCANsWM2mw3qi0387BhfLyV
Topics relevant to development of "SKILL DEVELOPMENT": Performing the testing on AC machines and analyzing their performance for **Skill Development** through **Problem Solving methodologies**. This is attained through the assessment component mentioned in the course hand-out. **Topics relevant to "ENVIRONMENT & SUSTAINABILITY":**Operation of the transformer, induction motor, and synchronous machines.

Catalogue prepared by	**Dr. Markala Karthik**
Recommended by the Board of Studies on	21st BoS, Held on 09/06/2025
Date of Approval by the Academic Council	26th Academic Council meeting held on 25th July 2025

Code: **ECE2501**	**Course Title: Linear Integrated Circuits** **Type of Course: Professional Core and Theory**	**L-T-P-C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	Knowledge of passive and active elements, basics of diode – forward and reverse biasing, diode current equation, Transistors - BJT, Rectifiers. Network theorems- KCL, KVL, Voltage divider rule, super position theorem etc.					
Anti-requisites	**NIL**					
Course Description	The purpose of this course is to enable the students to appreciate the behaviour of operational amplifier based electronic circuits. This course introduces the fundamentals of analog computers. This course emphasizes on the use of operational amplifiers, their characteristics to design various analog circuits. The course also gives a brief idea about operational amplifier based integrated circuits. The associated laboratory provides an opportunity to validate the concepts taught in theory. It also enhances the ability to visualize the real-world problems in order to provide a solution using various simulation tools.					
Course Objective	**The objective of the course is to familiarize the learners with the concepts of Linear Integrated Circuits and attain the SKILL DEVELOPMENT through EXPERIENTIAL LEARNING.**					
Course Outcomes	On successful completion of the course the students shall be able to: i. Describe the block diagram and characteristics of op-amp. ii. Demonstrate linear applications of op-amp. iii. Employ op-amp for various nonlinear applications. iv. Implement various applications of op-amp using IC 741. v. Illustrate Astable and Monostable Multivibrator using Timer IC 555.					
Course Content:						
Module 1	Introduction to op-amp	Quiz	Memory Recall based Quiz			**10 Sessions**
Topics:						

Introduction to op-amp, block diagram, op-amp IC, op-amp symbol, equivalent circuit, transfer characteristics and ideal characteristics of op-amp, op-amp parameters, open loop op-amp configurations - inverting, non-inverting and differential mode, concept of virtual ground.

Module 2	Linear Applications of op-amp	Assignment	Simulation tasks		**15 Sessions**

Topics:
Non-inverting amplifier, Inverting amplifier, Voltage follower circuit, Summing amplifiers, Average circuit, Difference amplifiers, op-amp as ideal and practical Differentiator circuit, op-amp as ideal and practical Integrator Circuit, V to I Converter, I to V Converter, Instrumentation amplifier Circuit, AC amplifier, Operational transconductance amplifier (OTA),Sample and hold circuit,Multiplier and Divider using op-amp.

Module 3	Non Linear Applications of op-amp	Quiz & Assignment	Quiz based on Numerical solving. Assignment based on Simulation		**15 Sessions**

Topics:
Comparators, Zero crossing detector,Schmitt trigger circuit. Square and Triangular waveform generators, IC 555 timer - Monostable Multivibrator, Astable Multivibrator. Filters – Low pass filter and high pass filter.Voltage regulators- Introduction, Series op-amp regulator, 723 general purpose regulator.
Converters- Introduction to ADC and DAC, Analysis of 3-bit binary weighted DAC, Analysis of 3-bit R-2R DAC, successive approximation ADC.

Targeted Application & Tools that can be used:
Targeted Applications: Automotive technologies, personal electronics, consumer appliances etc. This course is useful for placement in core companies, research & development work.
Professionally Used Software: NI Multisim, LabVIEW, PSpice etc., device setup in laboratory.

Text Books:
1. David A Bell, "Operational Amplifiers and Linear ICs", 3rd edition, Oxford University Press

Reference Books:
1. Gayakwad Ramakant A. "Op-Amps and Linear Integrated Circuits", Pearson , Fourth Edition, Pearson.
2. Maheshwari L. K. and Anand M. M. S., "Analog Electronics", PHI, 2009

Online Resources (e-books, notes, ppts, video lectures etc.):
1. Document on Integrated Circuit. https://www.sciencedirect.com/topics/earth-and-planetary-sciences/integrated-circuit
2. NPTEL Video lectures on Integrated circuits, MOSFETs, OPAMPs and their applications by Prof. Hardik Jeetendra Pandya, IISC Bangalore, https://nptel.ac.in/courses/108/108/108108111/
3. Presidency University Library Link https://presiuniv.knimbus.com/user#/home

E-content:
1. Q. He and D. Jiao, "Fast Electromagnetics-Based Co-Simulation of Linear Network and Nonlinear Circuits for the Analysis of High-Speed Integrated Circuits," in IEEE Transactions on Microwave Theory and Techniques, vol. 58, no. 12, pp. 3677-3687, Dec. 2010, doi: 10.1109/TMTT.2010.2086590.

2. Chen Tian, Jianyong Lu, Liu Jun, Huaguo Liang, Yingchun Lu, Maoxiang Yi, A reconfigurable test method based on LFSR for 3D stacking integrated circuits, Integration, Volume 87, 2022, Pages 82-89, ISSN 0167-9260, https://doi.org/10.1016/j.vlsi.2022.06.011.

3. Abdelaziz Lberni, Amin Sallem, Malika Alami Marktani, Nouri Masmoudi, Abdelaziz Ahaitouf, Ali Ahaitouf, Influence of the operating regimes of MOS transistors on the sizing and optimization of CMOS analog integrated Circuits, AEU - International Journal of Electronics and Communications, Volume 143, 2022, 154023, ISSN 1434-8411, https://doi.org/10.1016/j.aeue.2021.154023.

4. Di Li, Chun Wang, Xinhui Cui, Dongdong Chen, Chunlong Fei, Yintang Yang, Recent progress and development of interface integrated circuits for piezoelectric energy harvesting, Nano Energy, Volume 94, 2022, 106938, ISSN 2211-2855, https://doi.org/10.1016/j.nanoen.2022.106938.	
Topics relevant to "SKILL DEVELOPMENT": Amplifiers, comparators, multivibrators and converters for **Skill Development** through **Experiential Learning** techniques. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Mrs. Samreen Fiza
Recommended by the Board of Studies on	12th BOS held on 10/08/2021
Date of Approval by the Academic Council	Meeting No. 16th , Dated 23/10/2021

Course Code: ECE2521	**Course Title: Embedded System Design Using Microcontroller** **Type of Course: Theory**	**L-T-P-C**	4	0	0	4
Version No.	1.0					
Course Pre-requisites	Basics of Electronics Devises, Logic Design, 8 bit/16 bit Microprocessor Architecture and Assembly Language Programing, Basics of C-Language, Memory types.					
Anti-requisites	**NIL**					
Course Description	The course provides insights into the fundamentals of microprocessor, microcontroller architecture and instruction set; knowledge for Embedded Systems Design. The course develops programming skills in both assembly language and middle level languages. Peripherals and their programming; Hardware and Software synchronization. Finally, embedded system design applications and some advanced topics will be covered. The comprehensive nature of the course covers assembly language programming using simulation tools.					
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:** **CO1:** Distinguish architecture of various processors and microcontrollers **CO2:** Summarize assembly language programming of Microcontroller. **CO3:** Discuss the TIMER, PWM and UART unit **CO4:** Apply interfacing of various peripherals to develop embedded applications.					
Course Content:						
Module 1	Fundamentals of Embedded Systems	Quiz	Memory Recall based Quizzes			**08 sessions**
Topics:						

Embedded Systems: Introduction to Embedded Systems. RISC Design Philosophy. Design Philosophy, Embedded System Hardware, Embedded System Software

Processor Fundamentals: Registers, Current Program Status Register, Pipeline, Exemptions, Interrupts and Vector Table. Architecture Revisions, ARM Processor families, RISC-V.

Module 2	**Architecture and Programming**	Assignment	Programming and Simulation task / Memory Recall based Quizzes	**11 sessions**

Topics:
Introduction to Architecture. Addressing Modes, Data Transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Bit manipulation instructions. Simple Assembly language program examples (without loops) to use these instructions.
Stack, I/O Port Interfacing and Programming: Stack and Subroutine instructions. Assembly language program examples on subroutine and involving loops - Delay subroutine with simple ALP programs.

Module 3	Peripherals Interfacing	Assignment using Keil and Proteus	Programming Assignment	**10 sessions**

Topics:
Concepts of Input and Output Ports. Introduction to Embedded C: Conditional statements, loop statements. LPC 2148 Timer Unit, PWM Unit, UART, DAC, ADC

Module 4	Embedded system designing and applications	Assignment using Keil and Proteus	Interfacing and Programming Assignment	**10 sessions**

Topics:
Interfacing peripherals: Basics of Interfacing Switches, LEDs, Seven segment displays. Interfacing Stepper motors and DC motors. Embedded system applications examples and case studies.

Targeted Application & Tools that can be used:
Targeted Applications: Industry 4.0, Biomedical and Agricultural automation
Professionally Used Software: Keil Version 04/ Proteus

Project Work/Assignment:

1. Case Study: At the end of the course students will be given a 'real-world' application-based on real world embedded system case study. Students will be submitting a report which will include Application Design, sensors used, middleware protocols used and working mechanism etc. in appropriate format

2 Book/Article review: At the end of the course a literature review of any 05 recent articles from the reputed national and international journal/ conferences will be given by students. They need to refer to tools like Scopus/ Google-Scholar and submit a report on their understanding of the assigned article in appropriate format.

3. Presentation: There will be a group presentation, where the students will be given a topic. They will have to present their review work.

Text Book(s):

1. Alexander G. Dean, "Embedded Systems Fundamentals with Arm Cortex M Based Microcontrollers: A Practical Approach", ARM Education Media, 2nd Edition
2. Andrew N. Sloss, Dominic Symes, Chris Wright, "ARM System Developer's Guide, Designing and Optimizing System Software", Morgan Kaufmann Publishers, 2nd Edition.

Reference(s):

Reference Book(s):

1. Jonathan W. Valvano, "Embedded Systems: Introduction to Arm® Cortex™-M Microcontroller- Vol 01", CreateSpace Independent Publishing Platform, 1st Edition
2. Jonathan W. Valvano, "Embedded Systems: Real-Time Operating Systems for Arm® Cortex™-M Microcontrollers", CreateSpace Independent Publishing Platform, 1st Edition.
3. ARM Cortex Datasheet available on (https://www.arm.com/)

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

4. Free online self-paced course :- https://bcourses.berkeley.edu.
5. Online notes :- https://mitpress.mit.edu/books/internet-things
6. NPTEL online video content:- http://www.digimat.in/nptel/courses/video/106105160/L22.html
7. Online ppts :- https://www.upf.edu/pra/en/3376/22580
8. Online ppts:- https://www.macs.hw.ac.uk/~dwcorne/Teaching/introdl.ppt
9. Presidency University Library Link

   https://presiuniv.knimbus.com/user#/home

E-content:

1. Joseph Sifakis, " Embedded systems design - Scientific challenges and work directions 2009 Design, Automation & Test in Europe Conference & Exhibition https://ieeexplore.ieee.org/document/5090623
2. Gabor Karsai; Fabio Massacci; Leon Osterweil; Ina Schieferdecker," Evolving Embedded Systems", Computer , VOL. 43, issue.5 https://ieeexplore.ieee.org/document/5472888
3. Sachin P. Kamat," An eye on design: Effective embedded system software", IEEE Potentials, VOL. 29, issue.5 https://ieeexplore.ieee.org/document/5568178
4. Ahmed Abdallah; Eric M. Feron; Graham Hellestrand; Philip Koopman; Marilyn Wolf, " Hardware/Software Codesign of Aerospace and Automotive Systems", Proceedings of the IEEE , VOL. 98, issue.4 https://ieeexplore.ieee.org/document/5440056

Topics relevant to the: "FOUNDATION SKILLS", ARM Embedded Systems: Introduction to Embedded Systems. RISC Design Philosophy.

Topics related to development of "EMPLOYABILITY": Interfacing peripherals: Basics of Interfacing Switches, LEDs, Seven segment displays. Interfacing Stepper motors and DC motors.

Catalogue prepared by	Dr Anilloy Frank
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	

<table>
<tr><td>Course Code: EEE2504</td><td colspan="4">Course Title: Control Systems Engineering
Type of Course: Professional Core 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="9">3.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="9">ECE2500: Signals and Systems</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 explore the importance of control system engineering and to develop the basic abilities of modelling and analyzing the control system. The course is both conceptual and analytical in nature and needs fair knowledge of Mathematical and computing. The course develops the critical thinking and analytical skills. The course also enhances the programming and simulation abilities through assignments</td></tr>
<tr><td>Course Objective</td><td colspan="9">The objective of the course is to familiarize the learners with the concepts of Control Systems Engineering 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:
1] Develop the transfer function for various Electrical and Mechanical systems.
2] Examine the time response of second order system for unit step input.
3] Apply different stability analysis techniques in time domain and frequency domain.
4] Choose the suitable compensation network for the given system
5] Identify the controllability and observability of the given state model</td></tr>
<tr><td>Course Content:</td><td colspan="9"></td></tr>
<tr><td>Module 1</td><td colspan="2">System Components and their representation</td><td>Assignment</td><td colspan="2">Numerical</td><td colspan="4">10 Sessions</td></tr>
<tr><td colspan="10">Topics:
Introduction to control systems, mathematical models of physical systems-differential equations of physical systems, Mechanical systems, Electrical systems, Block diagrams and signal flow graphs.</td></tr>
<tr><td>Module 2</td><td colspan="2">Time Response Analysis, Controllers</td><td>Assignment, Quiz</td><td colspan="2">Programming / Simulation</td><td colspan="4">10 Sessions</td></tr>
<tr><td colspan="10">Topics:
Unit step response of first and second order system, time response specifications, time response specifications of second order systems, steady state errors and error constants. P.PI and PID controllers</td></tr>
<tr><td>Module 3</td><td colspan="2">Stability Analysis and compensation techniques</td><td>Simulation</td><td colspan="2">Programming</td><td colspan="4">15 Sessions</td></tr>
<tr><td colspan="10">Topics:
Concept of stability, Routh stability criterion, Root locus concept-rules for sketching root locus, Introduction, Frequency domain specifications -Bode diagrams, Stability Analysis from Bode Plots, Concept of relative stability. Introduction to Nyquist stability criteria. Lead, Lag, lead-lag compensating networks</td></tr>
<tr><td>Module 4</td><td colspan="2">State space model</td><td>Case study</td><td colspan="2">Simulation</td><td colspan="4">10 Sessions</td></tr>
<tr><td colspan="10">Topics:</td></tr>
</table>

Concept of State, State variables & State model, Concepts of controllability and observability. Introduction to Nonlinear systems
Targeted Application & Tools that can be used: Control Systems are used in domestic applications, traffic light control, general industry, military and virtually every modern vehicle in the world, robotics. Modern industrial plants utilized robots for manufacturing temperature controls, pressure controls, speed controls, position controls, etc. In chemical process, control field is an area where automations play an important role. Professionally used tools: MATLAB/Simulink, Scilab, Octave.
Text Book [1]. Nagrath I. J. and M. Gopal, Control Systems Engineering, New Age International (P) Ltd, 5th ed, 2007. [2]. K. Ogata, 'Modern Control Engineering', Pearson Education Asia / PHI, 4th Edition.
References [1] Benjamin Kuo, 'Automatic Control Systems', PHI, 7th Edition. [2] Hasan Saeed, automatic control Systems with MATLAB programs, S K Kataria and sons, Latest ed. **Online Learning Resources:** 1. Ebook:https://presiuniv.knimbus.com/user#/home 2. Case study: https://people.disim.univaq.it/~costanzo.manes/Didattica_Teoria_dei_Sistemi/System_Theory_Web_Resources.html 3. https://nptel.ac.in/courses/107/106/107106081/
Topics relevant to "SKILL DEVELOPMENT": Mathematical modelling, Stability analysis, Compensators **Skill Development** through **Problem Solving methodologies.** This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Dr Jisha L K
Recommended by the Board of Studies on	21st BoS, Held on 09/06/2025
Date of Approval by the Academic Council	26th Academic Council meeting held on 25th July 2025

Course Code: EEE2505	**Course Title: Electrical and Electronics Measurements and Instrumentation** **Type of Course: Professional Core - Theory only**	**L- T- P- C**	3	0	0	3
Version No.	**2.0**					
Course Pre-requisites	ECE2021-Digital Electronics					
Anti-requisites	**Nil**					
Course Description	This course provides an introduction to the principles, tools, and techniques used in electrical and electronics measurements. The course focuses on the measurement of electrical and electronic quantities, as well as the instrumentation used to acquire and process these measurements. Students					

	will learn how to effectively use a variety of measuring instruments and understand their limitations, accuracy, and precision in practical applications.			
Course Objective	The objective of the course is to familiarize the learners with the concepts of Electrical and Electronics Measurements and Instrumentation laboratory and attain **Skill Development** through **Participative Learning techniques**			
Course Out Comes	**On successful completion of the course the students shall be able to:** 1.Apply the methods for measurement of different types of errors in instruments. 2.Compare the construction and operation of various electromechanical instruments for measurement of different parameters. . 3.Compare the construction and working principles of analog, digital voltmeters and ammeters. 4.Employ electrical and electronic instruments such as CRO, DSO, DMM, CT, PT, and energy meters for electrical measurements. 5.Classify suitable transducers based on the nature of measurement and application requirements. 6. Employ data acquisition systems, smart sensors, and signal analyzers in modern instrumentation and telemetry systems.			
Course Content:				
Module 1	Concepts of measuring physical quantities	Assignment	Data Analysis task	1 Sessions
Methods of Measurement, Direct and Indirect Methods, Errors in Measurements. True Value, Static Error, Static Correction, Error Calibration Curve, Accuracy and Precision. , Static Sensitivity, Linearity. Hysteresis, Dead Time, Dead Zone, Resolution or Discrimination.				
Module 2	Functional concepts of various Electromechanical Instruments & Characteristics	Assignment	Comparison of Instruments	10 Sessions
Galvanometers, DC Ammeter and DC voltmeter -Permanent Magnet moving Coil Instrument-Moving iron instrument, EMMC instrument-Multi range ammeter and voltmeter-Calibration -Bridges for computation of R,L and C, Q factor.				
Module 3	Electrical and Electronic Instruments	Assignment	Mini Project	4 Sessions
Cathode Ray oscilloscope (CRO)-Digital Storage oscilloscope(DSO)-Digital Voltmeter (DVM)-Digital Multimeter (DMM)-Construction and characteristics of Current Transformers and Potential Transformers. Construction and working of energy meters, Trivector meters, Bi-directional Energy meters.				
Module 4	Transducers and Data Acquisition systems	Assignment	Presentation	0 Sessions
Classification of transducers – Selection of transducers – Resistive, capacitive & inductive Transducers – Piezoelectric, Hall effect, optical and digital transducers – Elements of data acquisition system – Function Generators, Spectral and Harmonic Distortion analyzers, Smart sensors and Telemetry.				
Targeted Application & Tools that can be used: Power System Load flow studies, protection and stability for real time test systems. Professionally Used Software: LabVIEW, MATLAB & Simulink				
Text Book 1. A. K. Sawhney, "Electronics and Electrical Measurements", Dhanpat Rai& Sons.				
References 1. H. S. Kalsi, "Electronic Instrumentation", McGraw Hill. 2. David A. Bell, "Electronic Instrumentation & Measurements", Oxford University Press / PHI. **online learning resources** https://nptel.ac.in/courses/108/105/108105153/ https://www.youtube.com/watch?v=xLjk5DrScEU&list=PLt5syl71JKf0IacRzLI-02Q_udP4nJiJg				

https://www.researchgate.net/figure/Results-of-1-kHz-electrical-measurements-on-case-study-core-plugs-using-reservoir-brine_tbl2_264898895 4.https://puniversity.informaticsglobal.com/login?qurl=https://search.ebscohost.com%2flogin.aspx%3fdirect%3dtrue%26db%3dnlebk%26AN%3d2706929%26site%3dehost-live	
Topics relevant to development of "SKILL DEVELOPMENT": Construction and working of energy meters, Trivector meters, Bi-directional Energy meters **Skill Development** through **Participative Learning techniques**. This is attained through assessment component mentioned in course plan.	
Catalogue prepared by	**Mr. Bishakh Paul**
Recommended by the Board of Studies on	21st BoS, Held on 09/06/2025
Date of Approval by the Academic Council	26th Academic Council meeting held on 25th July 2025

Course Code: EEE2506	Course Title: Transmission and Distribution Type of Course: Professional Core& Theory only	L-T-P- C	3	1	0	4
Version No.	3.0					
Course Pre-requisites	EEE1200 (Basics of Electrical and Electronics Engineering), EEE2500 (Network Theory)					
Anti-requisites	Nil					
Course Description	This course covers power transmission and distribution. This course covers common transmission and distribution systems; line parameters including inductances and capacitances; overhead line performance studies; and regulation and efficiency calculations using comparable models. The course also teaches modelling and evaluating transmission and distribution systems; mechanical transmission line design; and sag/tension calculations and stringing charts. The course improves analysis. Assignments employing Mi Power/ETAP/MATLAB/PSCADA/Power World Simulator/PSSE improve programming skills.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of power transmission and distribution and attain **Skill Development** through **Problem Solving methodologies.**					
Course Out Comes	**On successful completion of the course the students shall be able to:** 1. Describe the structure of the power system, including generation, transmission, and distribution. 2. Calculate the transmission line parameters for a given transmission line system. 3. Analyze the performance of transmission lines using different modeling methods. 4. Solve numerical problems involving sag-tension analysis, insulator string efficiency, and corona loss in overhead lines. 5. Compute the voltage drop and power loss in different distribution system configurations.					
Course Content:						

Module 1	Introduction to Power System	Assignment	Data Collection	5L+1T Sessions
Topics: Structure of the power system- generation, transmission and distribution, Types of AC and DC distributors, Basic Aspects of AC Power Transmission, Concepts of Power in AC Transmission Systems. Advantages of higher voltage transmission.				
Module 2	Transmission Line Parameters	Assignment	Programming	10L+4T Sessions
Topics: Introduction to line parameters- resistance, inductance and capacitance. Basic Concepts of Computation of Line Inductances and various types of line configurations, Concepts of Computation of Line Capacitance and various types of line configurations. Skin effect, Conductor Types, bundled Conductors.				
Module 3	Transmission Line Performance Analysis	Assignment	Simulation	9L+3T Sessions
Topics: Introduction, Classification of lines, Short Transmission lines Modeling, Medium Transmission Line Modeling, ABCD constants of transmission lines and Numerical Examples on Performance of Transmission Lines.				
Module 4	Overhead Transmission Lines	Assignment/Case Study	Programming/Simulation/Data Collection/	10L+4T Sessions
Topics: Overhead Transmission Lines: Introduction, Types of supporting structures and line conductors used. Sag calculation- supports at same level and at different levels. Effect of wind and ice, Sag at erection, Stringing chart. Over Head Insulator: Introduction, Insulator Materials, Types of Insulators, Potential Distribution over a string of suspension insulator, String Efficiency and methods of Increasing string efficiency, Corona: Phenomena of Corona, Disruptive and visual critical voltages, Power Loss due to Corona, Factors affecting Corona Loss & Aspects of Corona on Real Life AC Transmission.				
Module 5	Introduction to Distribution System	Assignment/Case Study	Data Collection	10L+4T Sessions
Introduction, Classifications of distribution system- A.C and D. C Systems, Connection Schemes of Distribution System, Requirements of a Distribution System and Design Considerations in Distribution System. Computation of voltage drop and power loss in the feeder line for different configurations and numerical examples.				
Targeted Application & Tools that can be used: Application Area is Power System Data collection, Electricity Transmission and Distributed companies, Power Grid and State Electricity Boards. Professionally Used Software: Mi Power/ ETAP/ MATLAB/PSCADA/Power World Simulator/PSSE.				
Text Book 1. A. Chakrabarti, M.L. Soni and P.V. Gupta, "Power System Engineering", Dhanpat Rai and Co. New Delhi.				
References 1. S. N. Singh, "Electrical Power Generation, Transmission and Distribution", PHI 2. D.P. Kothari, I.J. Nagrath, "Modern Power System Analysis", TMH 3. V.K.Mehta, Rohit Mehta "Principles of Power System", S. Chand Publishers. 4. IEEE 1863-2019 - IEEE Guide for Overhead AC Transmission Line Design				
Online Resources: 1. EBook: https://puniversity.informaticsglobal.com/ 2. Seminar: https://nptel.ac.in/courses/108/102/108102047/ 3. Case Study: http://www.digimat.in/nptel/courses/video/108102047/L01.html 4. https://www.youtube.com/watch?v=Od0k9nqtoCM (Underground Cable Laying-by Power Sector Skill Council) 5. https://www.youtube.com/watch?v=Z2cELqtxysA (Overhead Line erection- by Power Sector Skill Council)				

6. https://www.youtube.com/watch?v=LPN1NZBz810 (Conductor Sag Demonstration- by Power Sector Skill Council))	
Topics relevant to "SKILL DEVELOPMENT": Various types Transmission line Modelling and applications of various transmission lines for Skill Development through Problem Solving methodologies. This is attained through assessment component mentioned in Course Plan. Topics related to development of "HUMAN VALUES and PROFESSIONAL ETHICS" : Concepts of Economical Conductor Size in a Cable &Permissible Current Loading of cable as an assignment.	
Catalogue prepared by	Dr. Ravi V Angadi.
Recommended by the Board of Studies on	21st BoS, Held on 09/06/2025
Date of Approval by the Academic Council	26th Academic Council meeting held on 25th July 2025

Course Code: EEE2507	**Course Title: Electrical Power Generation and Economics.** **Type of Course: Professional Core - Theory only**	**L- T- P- C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	EEE1200 (Basics of Electrical and Electronics Engineering),					
Anti-requisites	**Nil**					
Course Description	This course covers the principles of electrical power generation concepts and phenomenon of different sources of Power Generation. Elaborate discussion on Site Selection factors, Working, Plant layout, Power equations, etc. of various power plants like Hydroelectric, Thermal, Nuclear, Renewable energy sources etc. and the power generation economic factors, different tariff methods and consumption of electrical energy. It aims to equip students with the knowledge required to understand the technical and economic aspects of power systems, aligning with current industrial requirements. The course improves analysis. Assignments employing Mi Power/ ETAP/ MATLAB/ PSCADA/Power World Simulator/PSSE improve programming skills.						
Course Objective	The objective of the course is to familiarize the learners with the concepts of Electrical Power Generation and Economics and attain Skill Development through **PARTICIPATIVE LEARNING** methodologies.					
Course Out Comes	**On successful completion of the course the students shall be able to:** 1. **Review** the different types of electric power generation. 2. **Describe** the operational mechanisms and benefits of thermal and nuclear power plant. 3. **Describe** the operational mechanisms and benefits of solar and wind power plant. 4. **Determine** the cost of generating stations and tariff for different types of consumers.					
Course Content:						
Module 1	Introduction & Sources of Electric Power generation	Assignment	Data Collection		**10 Sessions**	

Topics:(a). Introduction & Sources of Electric Power generation: Introduction to electrical energy generation and sources like Hydel, Thermal, Nuclear, Solar, Wind, Fuel Cell, Tidal, Gas and etc.
(b). Hydro Power Generation: Selection of Site, Classification of Hydro Electric Power Plant, Arrangement of Hydro Electric Power Plant, Operation of Hydro Electric Power Plant, Hydro Electric Power Plant Structure & Control.

Module 2	Thermal Power Generation	Assignment/ Case Study	Analysis of real-world power generation projects	**10 Sessions**

Topics: (a). Thermal Power Generation: Introduction, Selection of Site, Main parts of a thermal plant, working, Plant Layout.
(b) Nuclear Power Station: Introduction, Pros & Cons of Nuclear Power Generation, Selection of Site & Cost, Main parts of a nuclear power plant working, Plant Layout.

Module 3	Solar and Wind Power Generation	Assignment	Programming/Simulation	**10 Sessions**

Topics: (a). Solar Power plant: Introduction, Selection of Site, Main parts of a solar plant, working, Plant Layout. Advantages and disadvantages.
(b). Wind Power Plant: Introduction, Selection of Site, Main parts of a wind power plant, working, Plant Layout. Different types, Advantages and disadvantages. .

Module 4	Economic Aspects and Electric Power Tariff	Assignment/Case Study	Programming/Simulation/Data Collection/	**15 Sessions**

Topics: (a). Economic Aspects: Introduction, Terms commonly used in System Operation, Diversity factor, Load factor, Plant Capacity factor, Definition & Problems, Plant use factor, Plant Utilization factor, Loss factor & Load duration curve, Numerical examples.
Topics: (b). Electric Power Tariff: Cost of Generating Station, factors influencing the rate of tariff designing. Tariff, Types of Tariff, Numerical Examples.

Targeted Application & Tools that can be used:
Application Area is Power System Data collection, Electricity Power Generation companies, Power Grid and State Electricity Boards. Professionally Used Software: Mi Power/ ETAP/ MATLAB/PSCADA/Power World Simulator/PSSE.

Text Book
1. A. Chakrabarti, M.L. Soni and P.V. Gupta, "Power System Engineering", Dhanpat Rai and Co. New Delhi.

References
1. Geoffrey S. Rothwell and Tomas Gomez, "Electricity Economics: Production Functions with Electricity", Wiley Publisher.
2. Allen J. Wood and Bruce F. Wollenberg, "Power Generation, Operation, and Control", Wiley Publisher.
3. Godfrey Boyle, "Renewable Energy: Power for a Sustainable Future", Oxford University Press.
4. S. N. Singh, "Electrical Power Generation, Transmission and Distribution", PHI
5. D.P. Kothari, I.J. Nagrath, "Modern Power System Analysis", TMH
6. V.K.Mehta, Rohit Mehta "Principles of Power System", S. Chand Publishers.

Online Resources:
1. Book: https://presiuniv.knimbus.com/user#/home
2. Seminar: https://nptel.ac.in/courses/108/102/108102047/
3. Case Study: http://www.digimat.in/nptel/courses/video/108102047/L01.html
4. http://www.eols.net/sample-chapters/c05/6-39a-06-02.pdf
5. https://www.youtube.com/watch?v=Od0k9nqtoCM

Topics relevant to "SKILL DEVELOPMENT": Various types of power generating station working and constructional features, Load curve and load duration curve for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course plan.

Topics relevant to "HUMAN VALUES & PROFESSIONAL ETHICS": Concepts of economics of power generation as an assignment.	
Catalogue prepared by	Dr. Ravi V Angadi.
Recommended by the Board of Studies on	21st BoS, Held on 09/06/2025
Date of Approval by the Academic Council	26th Academic Council meeting held on 25th July 2025

Course Code: EEE2508	Course Title: Power Electronics Type of Course: Professional Core Theory only	L-T- P-C	3	1	0	4
Version No.	3.0					
Course Pre-requisites	EEE2500- Network Theory					
Anti-requisites	NIL					
Course Description	This course is a very important and fundamental course for the conversion, control and monitoring of electric energy using power converters. The course uses the fundamentals of mathematics, modelling and software tools and enhance the process of learning. The course is both conceptual and analytical in nature and imparts the basic skills of developing the Simulink models, Programming and hardware interfacing through assignments and mini projects.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Power Electronics and attain Skill Development through Problem Solving methodologies.					
Course Outcomes	On successful completion of this course the students shall be able to: 1) Select suitable power semiconductor switching devices for power converters. 2) Compute the performance of single and three-phase controlled rectifiers for different loading conditions. 3) Select suitable control strategies to obtain the performance of chopper circuits for step-up and step-down operations 4) Compare the behavior of AC voltage controller for different types of loads. 5) Classify the various applications of cycloconverters based on industry sectors and functional requirements. 6) Compare different pulse width modulation (PWM) techniques for inverters.					

Course Content:				
Module 1	Power Semiconductor Switching Devices	Assignment	Data sheet collection and Analysis task	10L+4T Sessions
Topics: Silicon Controlled Rectifiers (SCR's) - BJT - Power MOSFET - Power IGBTs - Basic theory of operation of SCR – Static and Dynamic characteristics of SCR -Salient points. Two transistor analogy of SCR –Firing circuits of SCR –Numerical problems				
Module 2	Phase Controlled Rectifiers (AC-DC controllers)	Hands on Task	Simulation and Arduino based controller for 12V dc motor	10L+4T Sessions
Topics: Phase control technique - Single phase and three phase Line commutated converters - Half wave and fully controlled converters with different loads. Average load voltage and current-Numerical Problems.				
Module 3	Choppers and AC Voltage Regulators	Assignment	Development of Simulink model and Analysis	15L+4T Sessions
Choppers: Time ratio control and Current limit control strategies – Step up and step down choppers- Load voltage and currents different loads-Numerical problems Switch Mode Power Converters: Basics of switch mode converters- Buck converter, Boost converter -Buck-Boost converters AC Voltage Controllers: AC voltage controllers – Single phase two SCR's in anti-parallel with R and RL loads - RMS load voltage, current and power factor- wave forms , Numerical problems, Cycloconverters: Introduction to Cycloconverters- Types of cycloconverters-working-Applications of Cycloconverters				
Module 4	Inverters(DC-AC converters)	Assignment	Simulation using Scilab and Analysis	10L+3T Sessions
Inverters – Single phase inverter – bridge inverter, 3 phase inverter – Waveforms, Voltage control techniques for inverters- Pulse width modulation techniques – Numerical problems.				
Targeted Application & Tools that can be used: The application of power electronic converters in the fields of sustainable energy technologies such as wind energy, solar power, wave energy, and fuel cells are described. Furthermore, industrial applications like electric drives, Electric Vehicles and induction heating as well as application of power electronics for power transmission, harmonics control and voltage stability issues. Professionally Used Software: MATLAB/PSIM/Scilab				
Text Books 1. M.H.Rashid, "Power Electronics Power Electronics Devices, Circuits and Applications ,Fourth Edition , Pearson,2017 2. Dr P S Bimbhra , "Power Electronics" ,Khanna Publishers, Fifth Edition,1990 References 1. M.D. Singh and Khanchandani K.B, "Power Electronics", T.M.H. Second edition, 2017 Online resources 1. Lecture Series on Power Electronics by Prof. B.G. Fernandes, Department of Electrical Engineering,IIT Bombay. For more details on NPTEL visithttp://nptel.ac.in 2. https://www.pdfdrive.com/fundamentals-of-power-electronics-e5904858.html 3. https://ieeexplore.ieee.org/document/9545403 (case study) 4. https://springerplus.springeropen.com/articles/10.1186/2193-1801-2-370 5. https://presiuniv.knimbus.com/user#/home				
Topics relevant to "SKILL DEVELOPMENT": Fundamentals of switching devices, Control parameters to vary average and RMS value of output voltage of power converters for **Skill Development** through **Problem Solving methodologies.** This is attained through **assessment** component mentioned in Course Plan. **Topics relevant to "ENVIRONMENT and SUSTAINABILITY":** Power converters and semiconductor devices.				

Catalogue prepared by	Dr Joshi Manohar V & Ms. Ragasudha C P
Recommended by the Board of Studies on	21st BoS, Held on 09/06/2025
Date of Approval by the Academic Council	26th Academic Council meeting held on 25th July 2025

Course Code: EEE3057	**Course Title: Power System Analysis** **Type of Course: Professional Core and Theory only**	**L- T- P- C**	3	1	0	4
Version No.	3.0					
Course Pre-requisites	EEE2509: Transmission and Distribution.					
Anti-requisites	**Nil**					
Course Description	This course introduces Representation of Power System Components, discusses Symmetrical Components, analysis of Symmetrical & Unsymmetrical Faults in the Power System. It deals with various methods to solve the power flow. It also discusses stability concept and contingency analysis. The course develops critical thinking and analytical skills. The course also enhances the programming and simulation skills through modern tools such as MATLAB, MiPower and etc.,					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Power System Analysis and attain **Skill Development** through **Problem Solving methodologies**.					
Course Out Comes	**On successful completion of the course the students shall be able to:** 1. Model the network of power system components. 2. Apply GS and NR methods to compute the load flow for given power system netbook. 3. Analyze the fault current in power system for different types of faults.					

	4. Illustrate the concept of stability of power system. 5. Analyse the concept of contingency of power system.			
Course Content:				
Module 1	Representation of Power System Components:	Assignment	Programming/Simulation	**10L+4T Sessions**
Topics: Basic Concepts of Network Modelling of power system- Equivalent circuit of Transmission line, Transformer, Synchronous Generators, Concepts of per Unit Systems, Formation of Network Matrices.				
Module 2	Load Flow Studies	Assignment	Programming/Simulation	**10L+4T Sessions**
Topics: Concepts of Load Flow Model, Development of Load Flow Model, and Solution of Load flow Equations, Numerical Examples, Practical Applications of Load Flow Solutions.				
Module 3	Fault Analysis	Case Study	Programming/Simulation	**10L+4T Sessions**
Topics: Basic Concepts of Fault Analysis in power systems, Types of Faults, Symmetrical Fault Analysis Method, Asymmetrical Fault Analysis Method, and Numerical Examples.				
Module 4	Power system Stability	Case Study	Programming/Simulation	**10L+3T Sessions**
Topics: Basic Concepts of Power System Stability, Angle In stability, Voltage Instability, Development of Mathematical models for static and transient stability analysis and solutions. Voltage stability analysis methods.				
Module 5	Introduction to Contingency Analysis	Case Study	Simulation	**5 Sessions**
Topics: Concept of contingency analysis, types of contingency analysis, importance of contingency analysis power system, Case Studies.				
Targeted Application & Tools that can be used: Power System Load flow studies, protection and stability for real time test systems. Professionally Used Software: Mi Power/ ETAP/ MATLAB/PSCADA/Power World Simulator/PSSE.				
Text Book 3. A Modern Power system Analysis – by I.J.Nagrath&D.P.Kothari: Tata McGraw–Hill Publishing Company, 2nd edition. 4. Power System Analysis by Hadi Saadat – TMH Edition.				
References 1. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill. 2. Power System Analysis – by A.R.Bergen, Prentice Hall, Inc. 3. Power System Analysis and Design by J.Duncan Glover, M.S.Sarma, T.J.Overbye – CengageLearning publications. **online learning resources** 5. EBook:https://puniversity.informaticsglobal.com 6. Seminar: https://onlinecourses.nptel.ac.in/noc19_ee62/ 7. Case Study: http://www.eolss.net/sample-chapters/c05/e6-39a-06-02.pdf. 8. https://www.ebookmela.co.in/download/power-system-analysis-operation-and-control-by-abhijit-chakrabarti				
Topics relevant to development of "SKILL DEVELOPMENT": Performing the load flow analysis for**Skill Development**through **Problem Solving methodologies**. This is attained through assessment component mentioned in course hand-out. **Topics related to development of "HUMAN VALUES and PROFESSIONAL ETHICS":** Performing the load flow analysis as per the IEEE standards by giving case study.				

Catalogue prepared by	**Dr. Ravi V Angadi**
Recommended by the Board of Studies on	21st BoS, Held on 09/06/2025
Date of Approval by the Academic Council	26th Academic Council meeting held on 25th July 2025

Course Code: EEE EEE3058	**Course Title: Electrical Drives** **Type of Course: Professional Core and Theory Only**	**L- T-P-C**	3	1	0	4
Version No.	**3.0**					
Course Pre-requisites	EEE2503 DC Machines and Special Machines EEE2504 AC Machines EEE2511 Power Electronics					
Anti-requisites	**NIL**					
Course Description	The course intends to provide a basic understanding of various power converters fed electrical motor drives. It gives insight into electric drive systems to analyze the steady-state and dynamic characteristics of speed and torque characteristics of ac & dc drives used in the modern industry. The course also develops the critical thinking abilities to apply in the area of variable-speed drives and energy conservation which are used in various industrial, domestic, and traction applications. Mini projects and Assignments enhance the ability to visualize real-world applications using tools like MATLAB, caspoc software etc.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Electrical Drives 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 dynamics of Electric Drives and multi-quadrant operation 2. **Select** the power converter in control of d.c drive systems. 3. **Apply** suitable control method in induction motor drives 4. **Choose** the proper Electric Drive system for energy conservation and industrial applications					
Course Content:						

Module 1	Introduction to Electrical Drives and its dynamics	Assignment	Data collection and Data analysis task	11L + 4T Sessions
Topics: Fundamentals of Electrical Drives-Power converters used in modern electrical motor drives; analyze the steady-state and dynamic characteristics of commonly used drives in the modern industry–Multi-quadrant operation. Numerical problems.				
Module 2	Operation & Analysis of D.C Drives	Assignment	Handson& Programming task. [Arduino based four quadrant operation of converter/chopper fed24Vdcmotordriveforfood Processing industry]	11L + 4T Sessions
Topics: Single phase and three phase rectifier fed dc motor drives. Analysis of chopper fed dc motor drives-Numerical Problems.				
Module 3	Operation and Analysis of	Assignment	Simulation task	11L + 4T Sessions

	Induction Motor Drives			
Topics: Control of Induction motor drives, Stator voltage control: Variable voltage and variable frequency control, rotor resistance control, slip power recovery-Numerical Problems				
Module 4	Operation of Synchronous motor drives and Industrial Drives	Assignment	Simulation task [using Caspoc software and Analysis]	12L +3T Sessions
Topics: Synchronous motor drives, Energy efficient drives, losses in electrical drive system, Energy conservation in electric drives. Traction Drives, industrial drives – paper mills, rolling mills, textile mills, and cement mills				

Targeted Application & Tools that can be used: The applications are as of Electrical Drives are: Industrial operations such as in rolling mills, textile mills, cement mills, processing plants.
Professionally Used Software: MATLAB/Caspoc

Text Books

1. G.K DUBEY, "Fundamentals of Electrical Drives", Second edition, Narosa publishing house,2001
2. W. Shepherd, L. N. Hulley and D. T. Liang, "Power Electronics and motor control", Second Edition, Cambridge University Press, 1995.

References

1. N.K De and P.K. Sen, "Electrical Drives", PHI.
2. S.K Pillai, "A First Course on Electric Drives", Wiley Eastern Ltd.
3. Bimal K Bose, "Modern Power Electronics and AC Drives" Pearson, 2015

Online learning resources:

1. noc19-ee65-lec01 - YouTube(NPTEL Video Lectures)
2. Dynamic Simulation of Electrical Machines and Drive Systems Using MATLAB GUI | IntechOpen
3. PDF⋙ Advanced Electric Drive Vehicles (Energy, Power Electronics, and Machines) –DonnamiraTTookMrs
4. www.sciencedirect.com/science/article/abs/pii/S1364032111004308
5. https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2706929&site=ehost-live

Topics relevant to "SKILL DEVELOPMENT":

1. Rectifier fed DC Motor control at various torque conditions
2. Inverter fed AC Motors control at various torque conditions

For **Skill Development** through **Problem Solving methodologies**. This is attained through assessment component mentioned in Course Plan.

Topics relevant to "ENVIRONMENT AND SUSTAINABILITY":

Energy conservation and saving in Electrical Drives

Catalogue prepared by	Dr Joshi Manohar V
Recommended by the Board of Studies on	21st BoS, Held on 09/06/2025
Date of Approval by the Academic Council	26th Academic Council meeting held on 25th July 2025

Course Code: ECE2051	Course Title: Digital Electronics Laboratory Type of Course: Program Core	L-T-P-C	0	0	2	1
Version No.	1.0					
Course Pre-requisites	**[1] Elements of Electronics/Electrical Engineering, 2] Basic concepts of number representation, Boolean Algebra**					
Anti-requisites	**NIL**					
Course Description	Digital Electronics: Learning of basics in digital electronic circuits that are used to process the digital signals. The course is designed to be one of the core course in electronics/ electrical engineering.Successful completion will provide the necessary foundation for more specialist learning in digital microelectronics, computer and communication engineering.The purpose of this course is to support the students to exhibit the Boolean Logic. The course is analytical in nature and needs fair knowledge of Boolean Theorems. The course shields theory and laboratory for Digital Electronics including basic principles, analysis and design. Further it covers the different methods of Boolean function simplification- Study and classification of Digital circuits- Design and Implementations of Digital Logic circuits-Programmable logic circuit The course also enhances the Design, Implementation and Programming abilities through laboratory assignments. The associated laboratory provides an opportunity to certify the theoreticknowledge**.**					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Digital Electronics and attain **SKILL DEVELOPMENT** through **EXPERIENTIAL LEARNING .**					
Course Outcomes	**On successful completion of this course the students shall be able to:** 1 **Implement** various combinational logic circuits using gates. 2 **Verify** the performance of various sequential logic circuits using gates.					
Course Content:						

List of LaboratoryTasks:

Experiment N0 1: Verify the Logic Gates truth table
Level 1: By using Digital Logic Trainer kit
Level 2: By using Analog devices like RPS, Volt meter, Resistors and ICs

Experiment No. 2: Verify the Boolean Function and Rules
Level 1: By using Digital Logic Trainer kit
Level 2: By using Analog devices like RPS, Volt meter, Resistors and ICs

Experiment No. 3: Design and Implementations of HA/FA
Level 1: By using basic logic gates and Trainer Kit
Level 2: By using Universal logic gates and Trainer Kit

Experiment No. 4: Design and Implementations of HS/FS
Level 1: By using basic logic gates and Trainer Kit
Level 2: By using Universal logic gates and Trainer Kit

Experiment No. 5: Design and Implementations of combinational logic circuit for specifications
Level 1: Specifications given in the form of Truth table
Level 2: Specification should be extracted from the given scenario

Experiment No. 6: Study of Flip flops

Experiment No. 7: Design and Implementations of synchronous counter using JK flipflop
Level 1: TWO bit up counter/Down counter
Level 2: FOUR bit up counter/Down counter

Experiment No.8: HDL coding for basic combinational logic circuits
Level 1: Gate level Modeling
Level 2: Behavioral Modeling

Experiment No.9: HDL coding for basic sequential logic circuit
Level 1: Gate level Modeling
Level 2: Behavioral Modeling

Text Book(s):

2. Mano, M. Morris and Ciletti Michael D., *"Digital Design"*, Pearson Education, 6th edition
3. Thomas L. Floyd "DIGITAL LOGIC DESIGN" , Pearson Education, fourth edition.

Reference(s):
Reference Book(s):

R1. Jain, R. P., *"Modern Digital Electronics",* McGraw Hill Education (India), 4th Edition

R2. Roth, Charles H., Jr and Kinney Larry L., *"Fundamentals of logic Design"*, Cengage Learning, 7th Edition

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

2. **eBook1**: Mano, M. Morris and Ciletti Michael D., *"Digital Design"*, Pearson Education.
3. {[PDF] Digital Design By M. Morris Mano, Michael D Ciletti Book Free Download
4. **eBook2:**Floyd "DIGITAL LOGIC DESIGN" fourth edition- ePub, eBook- [PDF] DIGITAL

E-content:

1 Z. Xin-Li and W. Hong-Ying, "The Application of Digital Electronics in Networking Communication," 2016 Eighth International Conference on Measuring Technology and Mechatronics Automation (ICMTMA), 2016, pp. 684-687, doi: 10.1109/ICMTMA.2016.168.

2 An encoding technique for design and optimization of combinational logic circuit DipayanBhadra;Tanvir Ahmed Tarique;Sultan Uddin Ahmed;Md. Shahjahan;KazuyukiMurase2010 13th International Conference on Computer and Information Technology (ICCIT)

3 Matrosova and V. Provkin, "Applying Incompletely Specified Boolean Functions for Patch Circuit Generation," 2021 IEEE East-West Design & Test Symposium (EWDTS), 2021, pp. 1-4, doi: 10.1109/EWDTS52692.2021.9581029.

4 Matrosova, V. Provkin and E. Nikolaeva, "Masking Internal Node Faults and Trojan Circuits in Logical Circuits," *2019 IEEE East-West Design & Test Symposium (EWDTS)*, 2019, pp. 1-4, doi: 10.1109/EWDTS.2019.8884434.

Topics relevant to "SKILL DEVELOPMENT": Adders, Multiplexers, Decoders / Encoders; Flip-Flops, Counters and Registers for **Skill Development** through **Experiential Learning techniques.** This is attained through **assessment component** mentioned in course handout.

Catalogue prepared by	Dr.G.Muthupandi
Recommended by the Board of Studies on	BOS Meeting NO: 12th BOS held on 10/08/2021
Date of Approval by the Academic Council	Academic Council Meeting No. 16th , Dated 23/10/2021

Course Code: ECE2550	Course Title: Signals and Systems Lab Type of Course: Program Core	L-T-P-C	0	0	2	1
Version No.	2.0					
Course Pre-requisites	Basic knowledge of MATLAB. An understanding of basic concepts of linear circuits as examples of linear systems and a familiarity with complex numbers and calculus, including power series are desirable.					
Anti-requisites	NIL					
Course Description	This is an undergraduate level course that gives an understanding and practical knowledge on signal/system properties, sampling, frequency transforms and responses as well as computer analysis using MATLAB. The course feeds into several applications, including Data Science, Machine Learning, Communications and Signal processing domain					
Course Objective	The objective of the course is SKILL DEVELOPMENT of student by using EXPERIENTIAL LEARNING techniques					
Course Outcomes	*On successful completion of the course the students shall be able to* 1. **Recognize** appropriate MATLAB statements to carry out different arithmetic and logical operations 2. **Sketch** the Frequency response of fundamental signals and sequences using Fourier transform 3. **Apply** the properties of Fourier Transform and Laplace transform to study fundamental signals 4. **Apply** the properties of DTFT to study fundamental signals. 5. **Demonstrate** the convolution operation in time domain using MATLAB 6. **Analyze** the corelation operation between two signals and sequences in time domain					

List of Experiments

1.Basic operations on matrices
2. Generation of various signals and sequences
3. Fourier transforms and inverse Fourier transform
4. Properties of Fourier transforms
5. Laplace transforms
6. Z transforms
7.Convolution between signals
8. Convolution between two sequences
9. Auto correlation
10. Cross correlation

Text Books:

1. Alan V Oppenheim, Alan S Willsky and S.Hamid Nawab, "Signals and systems", Pearson Education, 2nd edition, 2003

Reference Books:

1. B P Lathi, "Linear Systems and Signals" (The Oxford Series in Electrical and Computer Engineering) 2004

2. Signals and systems, second edition - Simon Haykin, Barry VanVeen, Wiley, Wiley India,2007 Online Resources (e-books, notes, ppts, video lectures etc.): 1. Signals and Systems | MIT OpenCourseWare 2. Signals and Systems | Electrical Engineering and Computer Science | MIT OpenCourseWare 3. https://presiuniv.knimbus.com/user#/home E-content: 1. L. Santhosh and A. Thomas, "Implementation of radix 2 and radix 22 FFT algorithms on Spartan6 FPGA," 2013 Fourth International Conference on Computing, Communications and Networking Technologies (ICCCNT), 2013, pp. 1-4, doi: 10.1109/ICCCNT.2013.6726840. 2. Saeed, Ahmed, et al. "Efficient fpga implementation of fft/ifft processor." International Journal of circuits, systems and signal processing 3.3 (2009): 103-110. 3. S. Bouguezel, M. O. Ahmad and M. N. S. Swamy, "An Alternate Approach for Developing Higher Radix FFT Algorithms," APCCAS 2006 - 2006 IEEE Asia Pacific Conference on Circuits and Systems, 2006, pp. 227-230, doi: 10.1109/APCCAS.2006.342373.
Topics related to development of "EMPLOYABILITY": CTFT, CTFS, DTFT, DTFS, Laplace Transform and Z Transform

Catalogue prepared by	Dr. Veena C S
Recommended by the Board of Studies on	21st BOS held on 9-June_2025
Date of Approval by the Academic Council	26th Academic Council meeting held on 25-July-2025

Course Code: EEE2560	**Course Title: Dc machines and Special Electrical Machines laboratory** **Type of Course: Professional Core - Laboratory Only**	**L-T P- C**	**0**	0	2	1
Version No.	**1.0**					
Course Pre-requisites	EEE2502 DC Machines and Special Machines					
Anti-requisites	**NIL**					
Course Description	This laboratory course enhances the ability of validating the methods of controlling various DC Machines and special electrical machines. The laboratory sessions will likely achieve the goals of visualizing and analyzing the working of widely used rotating machines at various loading conditions, improving teamwork abilities and practical skills. The course is intended to develop critical and analytical thinking abilities to control and analyze the fundamentals of DC Machines and special electrical machines.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Dc machines and Special Electrical Machines laboratory 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 Outcomes	On successful completion of this course the students shall be able to: 1. **Demonstrate** the performance characteristics of DC machines by conducting various tests. 2. **Identify** the parameters to control the speed the of DC motor. 3. **Analyse** the performance of Special Electrical machines 4. **Interpret** the results to obtain meaningful conclusions
Course Content:	

List of Laboratory Tasks:

Experiment No.1.Magnetization characteristics of a d.c. shunt generator.
Experiment No.2. Load test on a DC shunt generator
Experiment No.3. Load test on DC shunt motor
Experiment No.4. Speed Control of DC Shunt Motor
Experiment No. 5: Hopkinson's test on
Experiment No. 6: Swinburne's Test
Experiment No. 7: Simulation of the Output Characteristics of a Switched Reluctance Motor (SRM) Using MATLAB/Simulink

Experiment No. 8: Simulation of Performance Characteristics of a Stepper Motor Using MATLAB/Simulink

Experiment No. 9: Simulation of the dynamic characteristics of Permanent Magnet Synchronous Motor using MATLAB
Experiment No. 10: Simulation of the dynamic characteristics of BLDC Motor using MATLAB

Targeted Application & Tools that can be used:
The application of electrical machines has been extensively employed in industrial applications such as electric vehicles and battery-powered devices such as wheelchairs, power tools, guided vehicles, welding equipment, X-ray and tomographic systems, and computer numerical control (CNC) machines, robotic applications
Professionally Used Software: MATLAB/PSIM

Textbooks:

1. Electric Machinery", Fitzgerald, Kingslay, Umans, Tata McGraw-Hill.
2. Venkata Ratnam K, Special Electrical Machines, CRC Press, 2009.
3. DC Machines & Special Electrical Machines Laboratory Manual by Presidency University

References:

1. Electric Machinery, P.S.Bimbhra, Khanna Publishers.
2. Basic Electric Machines, Vincent Deltoro, Prentice Hall
3. Kenjo, T., and Sugawara, A., Stepping Motors and their Microprocessor Controls, Oxford Science Publications, 1984.
4. Miller, T. J. E., Brushless Permanent Magnet and Reluctance Motor Drives, Oxford Science Publications, 1989

Online learning resources

1. https://youtu.be/D4RFFnzRdkk?si=SgnaT9GfSpatfqM3http
2. https://youtu.be/Nn1V9KLrtX4?si=ifcW2s5FQ3HFQLB6
3. https://www.mdpi.com/journal/machines/special_issues/388U663WBR(case study)

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

Catalogue prepared by **Updated by**	Dr V Joshi Manohar
Recommended by the Board of Studies on	21st BoS, Held on 09/06/2025
Date of Approval by the Academic Council	26th Academic Council meeting held on 25th July 2025

Course Code: **EEE2561**	**Course Title:** **AC Machines Laboratory** **Type of Course:** **Professional Core - Laboratory**	**L-T-P-C**	0	0	2	1
Version No.	2.0					
Course Pre-requisites	EEE2503 AC Machines					
Anti-requisites	NIL					
Course Description	This laboratory course enhances the ability to perform various experiments and analyses on AC machines, thereby predicting their expected performance correctly through different methods and calculations, which also enhances teamwork, and hands-on practical and analytical skills.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of experiments on AC and DC machines 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 the team.** 5. **Assess errors and eliminate them.** 6. Observe and measure physical phenomenon. 7. **Write Reports.** 8. The ability to follow standard test procedures. 9. An awareness of the need to observe safety precautions. 10. To judge magnitudes without actual measurement.					

Course Outcomes	**On successful completion of the course, the students shall be able to:** 1. **Determine** the parameters of the transformer by suitable tests. 2. **Analyze** the performance of the transformer by conducting suitable tests. 3. **Analyze** the performance of the Induction motors by conducting suitable tests 4. **Determine** the performance of the synchronous machines by conducting suitable tests
Course Content:	

List of Laboratory Tasks:

Experiment No 1: Open circuit and short circuit test of single-phase transformer
Experiment No 2: Load test on single-phase transformer
Experiment No 3: Sumpner's test on a pair of single-phase transformers
Experiment No 4: Parallel operation of two single-phase transformers
Experiment No 5: Scott connection
Experiment No 6: No load and blocked rotor test on three-phase induction motor
Experiment No 7: Load test on three-phase induction motor
Experiment No 8: No load and blocked rotor test on single-phase induction motor
Experiment No 9: Load test on single-phase induction motor
Experiment No 10: Regulation of a three-phase alternator by synchronous impedance & m.m.f. methods
Experiment No 11: 'V' and 'Inverted V' curves of a three-phase synchronous motor

Targeted Application & Tools that can be used:

The application of electrical machines has been extensively employed in industrial applications such as electric vehicles and battery-powered devices such as wheelchairs, power tools, guided vehicles, welding equipment, X-ray and tomographic systems, and computer numerical control (CNC) machines.
Professionally used tools: MATLAB/PSIM

Course Material

1.Electrical Machines-II Lab Manual, Presidency University, Bengaluru.

Textbooks

1. "Electric Machinery", Fitzgerald, Kingslay, Umans, Tata McGraw-Hill.
2. "Electric Machinery Fundamentals", Chapman, McGraw-Hill Higher Education.
3. "Electric Machines", Nagrath and Kothari, Tata McGraw-Hill.

Reference Books:

1. Electric Machinery and Transformer, Guru, Hiziroglu, Oxford University press.
2. Electric Machinery, P.S.Bimbhra, Khanna Publishers.
3. Basic Electric Machines, Vincent Deltoro, Prentice Hall.

Online resources

1. https://www.youtube.com/playlist?list=PL5TKV1tzb09lx62sPBmho6WJZX5WWFzUr
2. https://www.youtube.com/playlist?list=PLp6ek2hDcoNCANsWM2mw3qi0387BhfLyV
3. https://www.youtube.com/playlist?list=PLMYtBmvT7X7Sjw9T4Z3oef_grv8GFUHE6
4. https://www.youtube.com/playlist?list=PLs5_Rtf2P2r5YY5b23uDGrtpo42ezMmGp
5. https://ieeexplore.ieee.org/abstract/document/8820546
6. https://ieeexplore.ieee.org/document/6436061 (case study)

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

Catalogue prepared by	Dr. Markala Karthik

Recommended by the Board of Studies on	21st BoS, Held on 09/06/2025
Date of Approval by the Academic Council	26th Academic Council meeting held on 25th July 2025

Code: ECE2551	Course Title: Linear Integrated Circuits Lab Type of Course: Lab	L-T-P-C	0	0	2	1
Version No.	1.0					
Course Pre-requisites	Knowledge of passive and active elements, basics of diode – forward and reverse biasing, diode current equation, Transistors - BJT, Rectifiers. Network theorems- KCL, KVL, Voltage divider rule, super position theorem etc.					
Anti-requisites	NIL					
Course Description	The purpose of this course is to enable the students to appreciate the behaviour of operational amplifier based electronic circuits. This course introduces the fundamentals of analog computers. This course emphasizes on the use of operational amplifiers, their characteristics to design various analog circuits. The course also gives a brief idea about operational amplifier based integrated circuits. The associated laboratory provides an opportunity to validate the concepts taught in theory. It also enhances the ability to visualize the real-world problems in order to provide a solution using various simulation tools.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Linear Integrated Circuits and attain the SKILL DEVELOPMENT through EXPERIENTIAL LEARNING.					
Course Outcomes	On successful completion of the course the students shall be able to: 1 Implement various applications of op-amp using IC 741. 2 Illustrate Astable and Monostable Multivibrator using Timer IC 555.					
Course Content:						

List of Laboratory Tasks:

Experiment No 1:To setup an Inverting amplifier circuit using OP-AMP 741 IC and observe the waveforms.
Level 1: Build the circuit of Inverting amplifier for the gain of 10 and input resistance of 1kΩ.
Level 2:Build the circuit of an inverting amplifier for a gain of 5 and input resistance of 1kΩ to avoid op-amp going into saturation.

Experiment No. 2:To setup a Non-Inverting amplifier circuit using OP-AMP 741 IC and observe the waveforms.
Level 1: Build the circuit of Non-Inverting amplifier for the gain of 10 and input resistance of 1kΩ.
Level 2:Build the circuit of open loop Non-Inverting amplifier, compare with closed loop circuit and comment on the observations.

Experiment No. 3:To setup an Inverting Summing amplifier circuit using OP-AMP 741 IC and observe the waveforms.
Level 1: Build the circuit of an Inverting Summing amplifier for the gain of 2 with dc voltage of 1.5v.

Level 2: Build the circuit to mix a sinusoidal signal and a dc signal without saturation for an amplification factor of 10.

To setup a zero-crossing detector circuit using OP-AMP 741 IC and observe the waveforms.
Level 1: Build the circuit of a zero-crossing detector for the gain of 2 with input voltage of 2Vp-p.
Level 2: NA

Experiment No. 4:To setup a Difference amplifier circuit using OP-AMP 741 IC and observe the waveforms.
Level 1:Build the circuit of a Difference amplifier for the gain of 2 with the input signal of DC value of 1.5 V and the sinusoidal voltage of 1V p-p.
Level 2:Built the circuit to mix a sinusoidal signal and a dc signal without saturation for an amplification factor of 2.

Experiment No. 5:Build the circuit of Differentiator and Integrator and observe the waveforms.
Level 1:Build an integrator and a differentiator circuit using op-amp for a square wave input. Plot the output you obtained.
Level 2:In continuation with Level 1, determine the relation between the time period of the waveform and RC time constant of the circuit you have used. Plot the output obtained for different input frequencies.

Experiment No. 6:To obtain the frequency response of active low pass and high pass filters and determine 3dB frequencies of both filters.
Level 1: Plot the frequency response for the first order low-pass and high-pass filter with a cut-off frequency of 10kHz with a pass band gain of 1.5.
Level 2: In continuation with Level 1, analyze the circuit to achieve frequency scaling.

Experiment No. 7:Generation of sine, square and triangular waveform using op-amp.
Level 1: Construct a Wien bridge oscillator using op-amp 741 and (i) Plot the output waveform (ii) Measure the frequency of oscillation.
Level 2: Set up the frequency range in order to obtain triangular wave from square wave using Op-Amp 741 and plot the output waveform.

Experiment No. 8:To set up Astable and Monostable Multivibrator using IC 555.
Level 1:Setup Astable and Monostable Multivibrator using IC 555, plot the output waveform.
Level 2:Setup Astable Multivibrator using IC 555 for t1 = 0.7ms.

Targeted Application & Tools that can be used:
Targeted Applications: Automotive technologies, personal electronics, consumer appliances etc. This course is useful for placement in core companies, research & development work.
Professionally Used Software: NI Multisim, LabVIEW, PSpice etc., device setup in laboratory.

Text Books:
1. David A Bell, "Operational Amplifiers and Linear ICs", 3rd edition, Oxford University Press

Reference Books:
1. Gayakwad Ramakant A. "Op-Amps and Linear Integrated Circuits", Pearson , Fourth Edition, Pearson.
2. Maheshwari L. K. and Anand M. M. S., "Analog Electronics", PHI, 2009
Online Resources (e-books, notes, ppts, video lectures etc.):
1. Document on Integrated Circuit. https://www.sciencedirect.com/topics/earth-and-planetary-sciences/integrated-circuit
2. NPTEL Video lectures on Integrated circuits, MOSFETs, OPAMPs and their applications by Prof. Hardik Jeetendra Pandya, IISC Bangalore, https://nptel.ac.in/courses/108/108/108108111/
3. Presidency University Library Link https://presiuniv.knimbus.com/user#/home

E-content:
1. Q. He and D. Jiao, "Fast Electromagnetics-Based Co-Simulation of Linear Network and Nonlinear Circuits for the Analysis of High-Speed Integrated Circuits," in IEEE Transactions on

Microwave Theory and Techniques, vol. 58, no. 12, pp. 3677-3687, Dec. 2010, doi: 10.1109/TMTT.2010.2086590.

2. Chen Tian, Jianyong Lu, Liu Jun, Huaguo Liang, Yingchun Lu, Maoxiang Yi, A reconfigurable test method based on LFSR for 3D stacking integrated circuits, Integration, Volume 87, 2022, Pages 82-89, ISSN 0167-9260, https://doi.org/10.1016/j.vlsi.2022.06.011.

3. Abdelaziz Lberni, Amin Sallem, Malika Alami Marktani, Nouri Masmoudi, Abdelaziz Ahaitouf, Ali Ahaitouf, Influence of the operating regimes of MOS transistors on the sizing and optimization of CMOS analog integrated Circuits, AEU - International Journal of Electronics and Communications, Volume 143, 2022, 154023, ISSN 1434-8411, https://doi.org/10.1016/j.aeue.2021.154023.

4. Di Li, Chun Wang, Xinhui Cui, Dongdong Chen, Chunlong Fei, Yintang Yang, Recent progress and development of interface integrated circuits for piezoelectric energy harvesting, Nano Energy, Volume 94, 2022, 106938, ISSN 2211-2855, https://doi.org/10.1016/j.nanoen.2022.106938.

Topics relevant to "SKILL DEVELOPMENT": Amplifiers, comparators, multivibrators and converters for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mrs. Samreen Fiza
Recommended by the Board of Studies on	12th BOS held on 10/08/2021
Date of Approval by the Academic Council	Meeting No. 16th , Dated 23/10/2021

Course Code: ECE2571	Course Title: Embedded System Design Using Microcontroller Lab Type of Course: Lab	L-T-P-C	0	0	2	1
Version No.	1.0					
Course Pre-requisites	Basics of Electronics Devises, Logic Design, 8 bit/16 bit Microprocessor Architecture and Assembly Language Programing, Basics of C-Language, Memory types.					
Anti-requisites	NIL					
Course Description	The course provides insights into the architecture of Embedded Systems Design. The associated laboratory provides an opportunity to validate the concepts taught and enhances the ability to visualize the real-world problems in order to provide a solution using various simulation tools and hardware interfacing techniques. The course develops programming skills in both assembly language and middle level languages. Peripherals and their					

	programming; Hardware and Software synchronization. The comprehensive nature of the course covers assembly language programming using simulation tools.
Course Objective	This course is designed to improve the learner's EMPLOYABILITY SKILLS by using EXPERIENTIAL LEARNING Methodologies
Course Outcomes	On successful completion of this course the students shall be able to: CO1: Demonstrate ALP and C programs of various processors and microcontrollers, the TIMER, PWM and UART unit CO2: Apply interfacing of various peripherals to develop embedded applications.
Course Content:	

List of Laboratory Task:

Exp 01:- Level 01-WAP to find addition/Subtraction of two 32-bit numbers.
Level 02 -WAP to find average of 'n' 32-bit numbers.
Exp 02:- Level 01-WAP to find multiplication and Divison of two 32-bit numbers.
Level 02-WAP to transfer a block of word from Source to destination memory
Exp 03:- Level 01-WAP to find multiplication and Divison of two 32-bit numbers.
Level 02-WAP to transfer a block of word from Source to destination memory
Exp 04:- Level 01- WAP to implement hexadecimal addition/ subtraction.
Level 02- WAP to implement hexadecimal multiplication
Exp 05:- Level 01-CCS IDE with C-Programming
Level 02- Interfacing with basic Input / Output Devices LEDs
Exp 06:- Interfacing with basic Input / Output Devices switches
Exp 07:-Interfacing with basic Input / Output Devices PUSH Button
Exp 08:- Pulse Width Modulation (PWM) based Waveform Generation and Timing
Exp 09:- Interfacing of Analog-to-Digital (ADC) and Digital-to-Analog (DAC) Converters
Exp 10:- Interfacing of Sensors (Temperature Sensors / Ultrasonic Sensors etc.) • Integrating multiple devices in a small project
Exp 11:- Interfacing of Displays (LCDs / seven-segment LEDs etc.)

Targeted Application & Tools that can be used:
Targeted Applications: Industry 4.0, Biomedical and Agricultural automation
Professionally Used Software: Keil Version 04/ Proteus

Project Work/Assignment:

1. Case Study: At the end of the course students will be given a 'real-world' application-based on real world embedded system case study. Students will be submitting a report which will include Application Design, sensors used, middleware protocols used and working mechanism etc. in appropriate format

2 Book/Article review: At the end of the course a literature review of any 05 recent articles from the reputed national and international journal/ conferences will be given by students. They need to refer to tools like Scopus/ Google-Scholar and submit a report on their understanding of the assigned article in appropriate format.

3. Presentation: There will be a group presentation, where the students will be given a topic. They will have to present their review work.

Text Book(s):

3. Alexander G. Dean, "Embedded Systems Fundamentals with Arm Cortex M Based Microcontrollers: A Practical Approach", ARM Education Media, 2nd Edition
4. Andrew N. Sloss, Dominic Symes, Chris Wright, "ARM System Developer's Guide, Designing and Optimizing System Software", Morgan Kaufmann Publishers, 2nd Edition.

Reference(s):

Reference Book(s):

10. Jonathan W. Valvano, "Embedded Systems: Introduction to Arm® Cortex™-M Microcontroller- Vol 01", CreateSpace Independent Publishing Platform, 1st Edition
11. Jonathan W. Valvano, "Embedded Systems: Real-Time Operating Systems for Arm® Cortex™-M Microcontrollers", CreateSpace Independent Publishing Platform, 1st Edition.
12. ARM Cortex Datasheet available on (https://www.arm.com/)

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

13. Free online self-paced course :- https://bcourses.berkeley.edu.
14. Online notes :- https://mitpress.mit.edu/books/internet-things
15. NPTEL online video content:- http://www.digimat.in/nptel/courses/video/106105160/L22.html
16. Online ppts :- https://www.upf.edu/pra/en/3376/22580
17. Online ppts:- https://www.macs.hw.ac.uk/~dwcorne/Teaching/introdl.ppt
18. Presidency University Library Link

    https://presiuniv.knimbus.com/user#/home

E-content:

5. Joseph Sifakis, " Embedded systems design - Scientific challenges and work directions 2009 Design, Automation & Test in Europe Conference & Exhibition https://ieeexplore.ieee.org/document/5090623
6. Gabor Karsai; Fabio Massacci; Leon Osterweil; Ina Schieferdecker," Evolving Embedded Systems", Computer , VOL. 43, issue.5 https://ieeexplore.ieee.org/document/5472888
7. Sachin P. Kamat," An eye on design: Effective embedded system software", IEEE Potentials, VOL. 29, issue.5 https://ieeexplore.ieee.org/document/5568178
8. Ahmed Abdallah; Eric M. Feron; Graham Hellestrand; Philip Koopman; Marilyn Wolf, " Hardware/Software Codesign of Aerospace and Automotive Systems", Proceedings of the IEEE , VOL. 98, issue.4 https://ieeexplore.ieee.org/document/5440056

Topics relevant to the: "FOUNDATION SKILLS", ARM Embedded Systems: Introduction to Embedded Systems. RISC Design Philosophy.

Topics related to development of "EMPLOYABILITY": Interfacing peripherals: Basics of Interfacing Switches, LEDs, Seven segment displays. Interfacing Stepper motors and DC motors.

Catalogue prepared by	Dr Anilloy Frank
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	

<table>
<tr><td>Course Code:
EEE2562</td><td>Course Title: Measurement and Instrumentation Laboratory
Type of Course: Professional Core
& Laboratory</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">2.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="6">EEE2505: Electrical and Electronics Measurements and Instrumentation</td></tr>
<tr><td>Anti-requisites</td><td colspan="6">NIL</td></tr>
<tr><td>Course Description</td><td colspan="6">The Measurement and Instrumentation Laboratory is a hands-on course designed to provide students with practical experience in the use of a variety of electrical and electronic measurement tools and instruments. Through a series of experiments, students will learn to measure, record, and analyze electrical parameters such as voltage, current, resistance, power, and frequency. The course focuses on the application of the theoretical concepts introduced in Measurement and Instrumentation by allowing students to perform real-world measurements and data analysis using industry-standard equipment.</td></tr>
<tr><td>Course Objective</td><td colspan="6">The objective of the course is to familiarize the learners with the concepts of experiments on Power Electronics and attain Skill Development through Experiential Learning techniques.</td></tr>
<tr><td>Basic skill sets required for the laboratory:</td><td colspan="6">The students shall be able to develop:
➢ An attitude of enquiry.
➢ Confidence and ability to tackle new problems.
➢ Ability to interpret events and results.
➢ Ability to work as a leader and as a member of team.
➢ Assess errors and eliminate them.
➢ Observe and measure physical phenomenon.
➢ Write Reports.
➢ Select suitable equipment, instrument and materials.
➢ Locate faults in systems.
➢ Manipulative skills for setting and handling equipment.
➢ The ability to follow standard test procedures.
➢ An awareness of the need to observe safety precautions.
➢ To judge magnitudes without actual measurement.</td></tr>
<tr><td>Course Outcomes</td><td colspan="6">On successful completion of this course the students shall be able to:
1. Differentiate time and frequency domain characteristics of electrical signals using data acquired through LabVIEW software and NI my-DAQ.
2. Validate the performance characteristics of bridge circuits and wattmeters through experimental data.
3. Analyze the relationships between component values and voltage drops across series-connected resistors using NI ELVIS II+ workstation.
4. Assess the capability of NI ELVIS II+ in determining phase difference and power factor in R-L and R-C circuits.
5. Distinguish key components of power quality issues using data from a power quality analyzer</td></tr>
<tr><td>Course Content:</td><td colspan="6"></td></tr>
<tr><td colspan="7">Experiment No 1: Familiarization with virtual instrumentation using Lab-VIEW Software

Experiment No 2: Calibration and Measurement of unknown resistance using</td></tr>
</table>

Wheatstone Bridge

Experiment No 3: Measurement of unknown inductance using Maxwell's inductance bridge.

Experiment No 4: Measurement of component values and voltage drop across the series combination of given resistors using NI ELVIS II+ workstation.

Experiment No 5: Measurement of phase difference and power factor of a series R-L and R-C circuit using NI ELVIS II+ workstation

Experiment No 6: Measurement of 3 phase active power and reactive power using 2 wattmeter method.

Experiment No 7: Measurement of Voltage sag, swell and THD of supply from electricity board using Power Quality Analyzer.

Experiment No 8: Measurement of amplitude, frequency, THD of an external signal using NI myDAQ and Lab-VIEW.

Targeted Application & Tools that can be used:
In a Measurement and Instrumentation Laboratory, various instruments, tools, and software are used to perform precise measurements, data acquisition, signal analysis, and error analysis across a wide range of electrical and electronic systems.
Professionally Used Software: LabVIEW and MATLAB

Textbooks

1. Measurements and Instrumentation Laboratory Manual by Presidency University

References

6. H. S. Kalsi, "Electronic Instrumentation", McGraw Hill.
7. David A. Bell, "Electronic Instrumentation & Measurements", Oxford University Press / PHI

Online resources

8. https://nptel.ac.in/courses/108/105/108105153/
9. 2.https://www.youtube.com/watch?v=xLjk5DrScEU&list=PLt5syl71JKf0IacRzLI-02Q_udP4nJiJg
10. 3. https://www.researchgate.net/figure/Results-of-1-kHz-electrical-measurements-on-case-study-core-plugs-using-reservoir-brine_tbl2_264898895
11. 4.https://puniversity.informaticsglobal.com/login?qurl=https://search.ebscohost.com%2flogin.aspx%3fdirect%3dtrue%26db%3dnlebk%26AN%3d2706929%26site%3dehost-live

Topics relevant to "SKILL DEVELOPMENT": Laboratory experiments for analyzing various signals **Skill Development** through **Experiential Learning techniques**. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mr Bishakh Paul
Recommended by the Board of Studies on	21st BoS, Held on 09/06/2025
Date of Approval by the Academic Council	26th Academic Council meeting held on 25th July 2025

<table>
<tr><td>Course Code:
EEE2563</td><td>Course Title: Control Systems Engineering Laboratory
Type of Course: Professional Core and Laboratory</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">EEE2504 - Control systems Engineering</td></tr>
<tr><td>Anti-requisites</td><td colspan="6">Nil</td></tr>
<tr><td>Course Description</td><td colspan="6">The purpose of this course is to provide an opportunity to validate the concepts taught in the course control system engineering and enhances the ability to visualize the real system performance by conducting the experiments through hardware and software The course develops critical thinking and analytical skills of the student. The course also enhances the student’s programming and simulation abilities</td></tr>
<tr><td>Course Objective</td><td colspan="6">The objective of the course is to familiarize the learners with the concepts of Control Systems Engineering Laboratory experiments and attain Skill Development through Experiential Learning techniques.</td></tr>
<tr><td>Basic skill sets required for the laboratory:</td><td colspan="6"></td></tr>
<tr><td></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 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.</td></tr>
<tr><td>Course Out Comes</td><td colspan="6">On successful completion of the course the students shall be able to:
1. Analyse the time domain specifications for second order system.
2. Examine the behaviour of lag, lead and lag - lead compensating networks
3. Compare the performance of P, PI, and PID controllers.
4. Examine the Characteristics of Servo Motor
5. Analyze the stability of LTI system using Root locus and Bode plots</td></tr>
<tr><td>Course Content:</td><td colspan="6"></td></tr>
<tr><td colspan="7">List of Laboratory Tasks:
Experiment N0 1: Obtain the Time Response of Second Order System
Experiment N0 2: Study the Step Response Using MATLAB
Experiment N0 3: Frequency Response of RC lead Compensation Network
Experiment N0 4: Frequency Response of RC Lag Compensation Network.
Experiment N0 5: Frequency Response of RC Lag-Lead Compensation
Experiment N0 6: Study the Effect of P, PI and PID on a Second Order System using Hardware components
Experiment N0 7: Study the Effect of P, PI and PID on a Second Order System using MATLAB.
Experiment N0 8: Characteristics of AC Servo Motor
Experiment N0 9: Stability Analysis (Bode, Root Locus) of LTI System using MATLAB
Experiment N0 10: Simulation of DC Position control System using MATLAB.</td></tr>
</table>

Targeted Application & Tools that can be used:
Control Systems are used in domestic applications, traffic light control, general industry, military and virtually every modern vehicle in the world, robotics. Modern industrial plants utilized robots for manufacturing temperature controls, pressure controls, speed controls, position controls, etc. In chemical process, control field is an area where automations play an important role.
Professionally used tools: MATLAB/Simulink, Scilab, Octave.

Course Material

1. Control Systems Lab Manual, Presidency University, Bengaluru.

Text Book:

1. Nagrath I. J. and M. Gopal, Control Systems Engineering, New Age International (P) Ltd, 5th ed, 2007.

Reference Books:

1. K. Ogata, 'Modern Control Engineering', Pearson Education Asia / PHI, 4th Edition.
2. Benjamin Kuo, 'Automatic Control Systems', PHI, 7th Edition.
3. Hasan Saeed, automatic control Systems with MATLAB programs, S K Kataria and sons, Latest ed.

Online Resources:

1. https://puniversity.informaticsglobal.com
2. Ebook: https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-01sc-introduction-to-electrical-engineering-and-computer-science-i-spring-2011/unit-2-signals-and-systems/designing-control-systems/
3. Case study: https://nptel.ac.in/courses/107/106/107106081/

Topics relevant to "SKILL DEVELOPMENT": Analysing the performance and the stability of the given system by using theoretical and practical methods for **Skill Development** through **Experiential Learning** techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Ms. Jisha L K
Recommended by the Board of Studies on	BoS No: 12thBoS held on 27/7/2021
Date of Approval by the Academic Council	16th Academic Council Meeting held on 23/10/2021

Course Code: EEE2564	**Course Title: Electrical CAD Laboratory** **Type of Course: Professional core & Laboratory**	**L-T- P-C**	0	0	2	1
Version No.	1.0					
Course Pre-requisites	EEE2502 DC Machines and Special Machines EEE2503 AC Machines EEE2506 Transmission and Distribution					
Anti-requisites	**Nil**					
Course Description	This course introduces computer applications in electrical engineering and practical expertise in The course develops an understanding of DC and AC machine windings; single line diagrams of generating stations and substations' covering; incoming circuits; electrical machine assembly drawings (Transformer, DC Machine, and Alternator) using design data, sketches, or both; and simple domestic and commercial wiring drawings/sketches as per					

	standards using AUTO CAD Software. Critical thinking and analysis are also taught. Modern tool training improves drawing skills (AUTOCAD).
Course Objective	The objective of the course is to familiarize the learners with the concepts of Electrical Cad Laboratory experiments and attain **Skill Development** through **Experiential Learning** techniques.
Basic skill sets required for the laboratory:	
	The students shall be able to develop: ➢ **An attitude of enquiry.** ➢ **Confidence and ability to tackle new problems.** ➢ Ability to interpret events and results. ➢ **Ability to work as a leader and as a member of team.** ➢ **Assess errors and eliminate them.** ➢ Observe and measure physical phenomenon. ➢ **Write Reports.** ➢ **Select suitable equipment, instrument and materials.** ➢ Locate faults in systems. ➢ **Manipulative skills for setting and handling equipment.** ➢ The ability to follow standard test procedures. ➢ An awareness of the need to observe safety precautions. ➢ To judge magnitudes without actual measurement.
Course Out Comes	**On successful completion of the course the students shall be able to:** 1) **Develop** the armature winding of both DC and AC Machine. 2) **Develop** the layout of Generating Stations and Substations Covering, Incoming Circuits. 3) **Develop** the sectional views of transformers, DC machine and alternator. 4) **Develop** the plan/layout of domestic/commercial wiring.
Course Content:	

List of Laboratory Tasks:

Experiment No 1: Develop a DC Armature winding diagram for the given data;

Level 1: Winding Diagrams of D.C. Machines Simplex/ Double Layer Lap Windings (By using Auto CAD Software).

Level 2: Winding Diagrams of D.C. Machines Simplex/ Double Layer Wave Windings (By using Auto CAD Software).

Experiment No 2: Develop a single line diagram of Substation.

Level 1: Single Line Diagrams of Generating Stations and Substations Covering Incoming Circuits, Outgoing Circuits, Busbar Arrangements (Single bus bar) Power Transformers, Circuit Breakers, Isolators, Earthing Switches, Instrument Transformers, Surge or Lightning Arresters, Communication Devices (Power Line Carrier) and Line Trap.

Level 2: Single Line Diagrams of Generating Stations and Substations Covering Incoming Circuits, Outgoing Circuits, Busbar Arrangements (Double bus bar), Power Transformers, Circuit Breakers, Isolators, Earthing Switches, Instrument Transformers, Surge or Lightning Arresters, Communication Devices (Power Line Carrier) and Line Trap

Experiment No 3: Develop a AC Armature winding diagram for the given data;

Level 1: Winding Diagrams of A. C. Machines Simplex/ Double Layer Lap Windings (By using Auto CAD Software).

Level 2: Winding Diagrams of A. C. Machines Simplex/ Double Layer Wave Windings (By using Auto CAD Software).

Experiment No 4: Develop a Transformers Assembly Drawings Using Design Data, Sketches or Both.

Level 1: Transformers - Sectional Views of Single and Three Phase Core Transformers.

Level 2: Transformers - Sectional Views of Single and Three Phase Shell Type Transformers.

Experiment No 5: Develop a DC Machines Assembly Drawings Using Design Data, Sketches or Both.
Level 1: DC Machine- Sectional Views of Yoke with Poles, Armature.
Level 2: DC Machine- Sectional Views of Yoke with Poles, Armature and Commutator.
Experiment No 6: Develop an Alternator Assembly Drawings Using Design Data, Sketches or Both.
Level 1: Alternator- Sectional Views of star connected Stator and Rotor.
Level 2: Alternator- Sectional Views of Delta connected Stator and Rotor.
Experiment No 7: Develop an Alternator Assembly Drawings Using Design Data, Sketches or Both.
Level 1: Alternator- Sectional Views of star connected Stator and Rotor.
Level 2: Alternator- Sectional Views of Delta connected Stator and Rotor.
Experiment No 8: Develop a domestic and commercial wiring.
Level 1: Domestic wiring- Sketch the domestic wiring layout plan.
Level 2: Commercial wiring- Sketch the commercial wiring layout plan.

Targeted Application & Tools that can be used:
Application Area is design and development of electrical machines for various applications. Professionally Used Software: AUTOCAD/ Suitable CAD software can be used for drawings.

Course Material
1. Electrical Cad Laboratory Manual, Presidency University, Bengaluru.

Text Book:
1. A. K. Sawhney, " A course in Electrical Machine design", DhanpatRai, 6th, Edition, 2013
2. V. N. Mittle, "Design of Electrical Machines", N.C. Jain Publishers.
3. D M. Yogesh, B.S Nagaraja, N. Nandan, "Computer Aided Electrical Drawing", PHI

Reference Books:
1. K. L. Narang , "Electrical Engineering Drawing", SatyaPrakashan, 2014.
2. K.M. Vishnu Murthy, "Computer-Aided Design of Electrical Machines", B S Publications.

Online resources:
1. https://puniversity.informaticsglobal.com/
2. https://www.autodesk.in/solutions/electrical-design
3. https://elecdes.com/electrical-cad-software/elecdes-electrical-cad-software
4. https://ieeexplore.ieee.org/document/9782226/

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 Plan.

Catalogue prepared by	Mr. Ravi V Angadi
Recommended by the Board of Studies on	21st BoS, Held on 09/06/2025
Date of Approval by the Academic Council	26th Academic Council meeting held on 25th July 2025

Course Code: EEE2565	**Course Title: Power Electronics Laboratory** **Type of Course: Professional Core Laboratory**	**L- T-P-C**	0	0	2	1
Version No.	2.0					
Course Pre-requisites	EEE2508 Power Electronics.					
Anti-requisites	NIL					
Course Description	This laboratory course gives an opportunity in validating the methods of controlling various power converters and analysing the characteristics of power semiconductor devices. The laboratory sessions will likely achieve the goals of visualizing and analysing the working of power converters at various conditions, improving teamwork abilities and practical skills. The					

	course intents to develop critical and analytical thinking abilities to control the power converters.
Course Objective	The objective of the course is to familiarize the learners with the concepts of experiments on Power Electronics 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 Outcomes	**On successful completion of this course the students shall be able to:** 1.**Demonstrate** the characteristics of SCR, MOSFET, and IGBT by experimentation. 2.**Illustrate** the operation of power converters for various loads. 3.**Analyse** the firing circuits for converters. 4.**Demonstrate** the speed control of machines using converters
Course Content:	

List of Laboratory Tasks:

Experiment No 1: To plot the static characteristics of the SCR.

Level 1: To obtain the V-I characteristics of SCR and determine holding current and forward break over voltage.

Level 2: For a given SCR, comment on how the magnitude of forward break over voltage changes with increasing of gate current.

Experiment No. 2: To plot the static characteristics of Power MOSFET/ Power IGBT

Level 1: To plot the drain and trans conductance characteristics of power MOSFET

Level 2: To study V-I characteristics of IGBT and hence determine the output resistance and trans-conductance.

Experiment No. 3: To study SCR RC triggering circuit for a single-phase rectifier.

Level 1: To turn on the SCR using RC triggering circuit for single phase half wave rectifier and to observe the waveforms across R load by varying the width of firing pulses

Level 2: To study the performance and waveforms of full wave rectifier using RC triggering circuit.

Experiment No. 4: To study the operation of single phase semi converter (half controlled bridge rectifier) with different loads

Level 1: To study the performance and waveforms of single-phase half-controlled rectifier with R load

Level 2: To use single phase semi converter for controlling the speed of a separately excited DC motor

Experiment No. 5: To study the triggering of SCR using digital triggering

Level 1: To study SCR digital triggering circuit for a single-phase controlled rectifier

Level 2: To Simulate and validate the relationship between load voltage and firing angle for single phase-controlled rectifier using MATLAB/PSIM

Experiment No. 6: To control the speed of universal motor by AC voltage controller

Level 1: To control speed of universal motor using AC Voltage Controller and to plot the speed V/S firing angle graphically
Level 2: To Simulate and validate the above results using MATLAB/PSIM

Experiment No. 7:To study the AC voltage control by using TRIAC – DIAC combination

Level 1: To study AC voltage controller using TRIAC – DIAC combination connected to lamp load and to plot load voltage (rms) Vs firing angle.
Level 2: To study AC voltage controller using TRIAC – DIAC combination connected to R-L load and compare the results with that of resistive load.

Experiment No. 8: To obtain speed control of a separately excited d.c motor using Type A chopper.

Level 1: To obtain speed control of a separately excited d.c motor using an IGBT/ MOSFET Type A chopper and to plot output voltage & speed vs duty cycle
Level 2: verify the relationship between output voltage and firing angle for the above chopper theoretically

Experiment No. 9: To study single phase fully controlled rectifier with RL load

Level 1: To identify the difference between the conduction angles In case of single phase fully controlled rectifier with R and R-L loads.
Level 2: To understand the effect of freewheeling diode in case of fully controlled rectifier with R-L load.

Experiment No. 10: To obtain speed control of stepper motor using motor logic controller circuit

Level 1: To obtain speed control of stepper motor using motor logic controller circuit and at the same time verify the truth table for full step mode
Level 2: To obtain speed control of stepper motor and verify the truth table for half step mode

Targeted Application & Tools that can be used:

The application of power electronic converters in the fields of sustainable energy technologies such as wind energy, solar power, wave energy, and fuel cells are described. Furthermore, industrial applications like electric drives, Electric Vehicles and induction heating as well as application of power electronics for power transmission, harmonics control and voltage stability issues.
Professionally Used Software: MATLAB/PSIM/Scilab

Textbooks

1 M.H.Rashid, "Power Electronics Power Electronics Devices, Circuits and Applications,vFourth Edition , Pearson,2017
2. Power Electronics Lab Manual by Presidency University

References

1. M.D. Singh and Khanchandani K.B, "Power Electronics", T.M.H. Second edition, 2017
2. Dr P S Bimbhra , "Power Electronics" ,Khanna Publishers, Fifth Edition,1990

Online resources

12. Lecture Series on Power Electronics by Prof. B.G. Fernandes, Department of Electrical Engineering, IIT Bombay. For more details on NPTEL visit http://nptel.ac.in
13. https://www.pdfdrive.com/fundamentals-of-power-electronics-e5904858.html
14. https://ieeexplore.ieee.org/document/9545403 (case study)
15. https://springerplus.springeropen.com/articles/10.1186/2193-1801-2-370
16. https://puniversity.informaticsglobal.com

Topics relevant to "SKILL DEVELOPMENT": Laboratory experiments for controlling various power converters and analysing the characteristics of power semiconductor devices for **Skill Development** through **Experiential Learning techniques**. This is attained through assessment component mentioned in Course Plan.

Catalogue prepared by	Dr Joshi Manohar V & Ms. Ragasudha C P
Recommended by the Board of Studies on	21st BoS, Held on 09/06/2025

Date of Approval by the Academic Council	26th Academic Council meeting held on 25th July 2025

Course Code: EEE3566	**Course Title: Power System Simulation Laboratory** **Type of Course: Professional Core & Laboratory**	**L-T-P-C**	0	0	2	1
Version No.	2.0					
Course Pre-requisites	EEE3057 Power System Analysis					
Anti-requisites	**Nil**					
Course Description	This course introduces computer applications in power system engineering and provides practical knowledge. MATLAB/Mipower fundamentals, power system analysis like load flow, short circuit, and D analysis, economic load dispatch, and contingency analysis will be simulated and studied in this lab. The course improves critical thinking and analysis. Through current tools, the course improves programming and Simulink modelling.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Power System Simulation laboratory experiments 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:** CO. 1. **Develop** a program in MATLAB/ Mi-Power to assess the YBus, and ZBus of the given power system network. CO. 2. **Inference** the power flow solution of the given power system network by using the Mi-Power software package. CO. 3. **Inference** the fault analysis of the given power system network by using Mi-Power software package. CO. 4. **Demonstrate** the stability analysis for the given power system network by using Mi-Power software package. CO. 5. **Illustrate** the economic load dispatch for the given power system. CO. 6. **Examine** the severity of the system by conducting contingency study for a given power system network.					

Course Content:	

List of Laboratory Tasks:

Experiment No 1: Develop a MTALAB Code to compute Ybus.

Level 1: Formation of Y Bus without mutual coupling by using MATLAB

Level 2: Formation of Y Bus without mutual coupling by using Mi Power

Experiment No 2: Develop a MTALAB Code to compute Ybus.

Level 1: Formation of Y Bus with mutual coupling.

Level 2: Formation of Y Bus with mutual coupling by using Mi Power

Experiment No 3: Develop a MTALAB Code to compute Zbus. .

Formation of Z Bus .

Experiment No 4: Develop a MTALAB Code to compute system parameters

Determination of bus currents and bus for specified power system network.

Experiment No 5: Load flow analysis by Gauss-Siedel method.

Perform a load flow analysis without any acceleration factor by using Mipower software package.

Experiment No 6: Load flow analysis by newton raphson method.

Perform a load flow analysis by using Mipower software package.

Experiment No 7: Fault Analysis of given power system network.

Perform a symmetrical fault analysis for the given power system network.

Experiment No 8: Transient Stability Studies

Analyze the transient stability of a single line diagram of a 5 bus system with three generating units, four lines and two transformer and two loads, comment on the stability of the machine.

Experiment No 9: Optimal Generator scheduling.

Determine the cost equations and loss co-efficients of different units in the plant are given. Determine economic generation for total load demand of 240MW.

Experiment No 10: Contingency Analysis

Preform the contingency analysis for the given 5 bus system network and interpret the results.

Targeted Application & Tools that can be used:

Power System Load flow studies, protection and stability for real time test systems.

Professionally Used Software: Mi Power/ ETAP/ MATLAB/PSCADA/Power World Simulator/PSSE.

Course Material

1. Power System Simulation Lab Manual , Presidency University, Bengaluru.

Text Book:

4. A Modern Power system Analysis – by I.J.Nagrath&D.P.Kothari: Tata McGraw–Hill Publishing Company, 2nd edition.
5. Power System Analysis by Hadi Saadat – TMH Edition.

Reference Books:

1. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
2. Power System Analysis – by A.R.Bergen, Prentice Hall, Inc.
3. Power System Analysis and Design by J.Duncan Glover, M.S.Sarma, T.J.Overbye – CengageLearning publications.

Online resources:

1. https://puniversity.informaticsglobal.com/
2. https://onlinecourses.nptel.ac.in/noc19_ee62/
3. http://www.eolss.net/sample-chapters/c05/e6-39a-06-02.pdf.
4. https://www.ebookmela.co.in/download/power-system-analysis-operation-and-control-by-abhijit-chakrabarti

Topics relevant to "SKILL DEVELOPMENT": Performing suitable experiments to compute the load flow analysis using the modern tools like MATLAB, Mi Power for **Skill Development** through **Experiential Learning techniques.** This is attained through assessment component mentioned in Course Plan

Catalogue prepared by	Dr. Ravi V Angadi
Recommended by the Board of Studies on	BoS No: 12th BoS held on 27/7/21
Date of Approval by the Academic Council	16th Academic Council Meeting held on 23/10/21

Professional Elective Courses Catalogues;
Track 1: General Basket

Course Code: EEE3003	**Course Title: Switchgear and Protection** **Type of Course: Professional Core and Theory only**	**L-T-P-C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	EEE2506 Transmission and Distribution EEE2507 Electrical Power Generation and Economics					
Anti-requisites	**NIL**					
Course Description	This course provides the basic knowledge with regards to the need for protection of electric power systems. The course aims to understand the requirement of switchgear used in power system networks and conceptually visualize the basic aspects of protection involved in power systems. It develops an insight into the protection schemes followed in power system.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Switchgear, Protection and attain **Skill Development** through **Participative Learning** techniques.					
Course Out Comes	After the completion of the course students shall be able to: 1. **Summarize** the importance of protection in power system. 2. **Explain** the operation of fuses and switches in power system protection. 3. **Identify** various types of circuit breakers and their mechanism of operation. 4. **Choose** protective relaying schemes in conventional and modern relays					
Course Content:						
Module 1	Introduction to protection, switches and fuses	Assignment	Data Analysis	**10 Sessions**		
Topics: Introduction to Protection-Need for protective systems, Components of a protection system, Introduction to switches-switches, isolators, Fuse characteristics and types- open type, semi enclosed re-wirable type, D type cartridge fuse, HRC fuse and their applications.						
Module 2	Circuit breakers	Assignment	Problem Solving	**12 Sessions**		
Topics: Circuit Breakers and operational characteristics -Circuit breakers, Arc interruption theories, RRRV Classification of circuit breakers-oil circuit breakers, Air circuit breakers, SF6 circuit breakers, Vacuum circuit breaker						
Module 3	Protective relays	Assignment	Problem Solving	**13 Sessions**		

Topics: Introduction to relays, theory of protection and classification -zones of protection, primary and backup protection, Essential qualities of protection, Classification of relays based on technology and functionality Protective relaying characteristics and parameters-Over current relays- instantaneous, time current relays, Numerical Overcurrent Relays, IDMT characteristics and parameters and operation with required formulas, Time and current settings of overcurrent relays, PSM and TSM calculations Directional relay, Differential relay, Effect of Line Length and Source Impedance on Performance of Distance Relays, Electromechanical distance protection relays-Operating principle of Distance protection relays, Balanced (Opposed) Voltage Differential Protection, Wire Pilot Protection, Carrier Current Protection, Electromechanical Impedance relay, Pilot Relaying Scheme, Electromechanical Reactance relay, Electromechanical MHO relay, Static relays-microprocessor based relays				
Module 4	Unit protection schemes	Assignment	Problem Solving	**10 Sessions**
Topics: Protection scheme for alternator, induction motor and transformer, Buszone Protection, Frame Leakage Protection.				
Targeted Application & Tools that can be used: The protection finds its application in whole of the power system network as an integral part of it. Specifically finds its application in protection of electrical devices and equipment of the power systems such as generators, transformers, transmission lines, buses and motors. The Commercially available simulation software tools like MiPower /MATLAB are utilized as professional tool.				
TextBooks 1. Badri Ram and D.N. Vishwakharma, "Power System Protection and Switchgear", Second Edition, McGraw Hill Education , 2011 2. Sunil S.Rao, "Switchgear Protection and power systems", 13th edition, Khanna Publishers,2014.				
References 1. Badriram and ViswaKharma, "Power System Protection and Switchgear",TMH 2. Y. G. Paithankar and S.R. Bhide, "Fundamentals of Power Systems Protection", PHI, 2nd Edition, 2013. 3. Ravindarnath and Chandra,"Power System Protection and Switchgear", New Age Publications. **Online resources** 1. Case study: https://puniversity.informaticsglobal.com/openFullText.html?DP=https://ieeexplore.ieee.org/document/7967241/ 2. https://ieeexplore.ieee.org/document/712612 3. https://ieeexplore.ieee.org/document/5060940 4. Ebook:https://puniversity.informaticsglobal.com/user#/home				
Topics relevant to the "SKILL DEVELOPMENT": Arc interruption in circuit breaker, Rate of rise of restriking voltage, Protection schemes in alternator for **Skill Development** through **Participative Learning techniques**. This is attained through assessment component mentioned in the Course Plan.				

Catalogue prepared by	Ms. Ramya N
Recommended by the Board of Studies on	BoS No: 12th BoS held on 27/7/21
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Course Code: EEE3008	**Course Title: Materials in Electrical Systems** **Type of Course: Professional Elective & Theory only**		**L-T- P-C**	3	0	0	3
Version No.	2.0						
Course Pre-requisites	PHY1202 Advanced Materials and Quantum Physics for Engineers						
Anti-requisites	**NIL**						
Course Description	This course provides a fundamental knowledge of the materials used in electrical systems. The course needs basic concepts of semiconductor physics and chemistry to understand the concepts of properties of electrical materials, PV cells and in batteries. The course is conceptual in nature and develops the ability to identify exact material suitable for specific application.						
Course Objective	The objective of the course is to familiarize the learners with the concepts of Materials in Electrical System**s** and attain **Employability Skills** through **Participative Learning** techniques.						
Course Outcomes	**On successful completion of this course the students shall be able to:** 1. **Explain** the importance of Electrical properties 2. **Summarize** the Power Generation and Light generation concepts. 3. **Identify** the materials used in Energy storage devices. 4. **Illustrate** the materials used in various engineering applications.						
Course Content:							
Module 1	Introduction	Quiz	Data Analysis task	**09 Session**			
Topics: Economic relevance of the materials sector for electrical applications in the world, Physical basis of electrical conduction, Electrical conductivity in metals, Semiconductors, Intrinsic conduction properties, Extrinsic conduction by doping, Conjugated semiconductors (organic semiconductors), Superconductivity, Ionic conductivity. Introduction Properties and Application of Piezoelectric materials, Eletro strictive materials, Ferromagnetic materials, Magneto strictive materials, Shape memory alloys, Electro archaeological fluids, Magneto archaeological fluids, Smart hydrogels.							
Module 2	Power generation and light generation	Assignment		**09 Session**			
Topics: Power generation by photovoltaic cells, Working principle of solar cells, Materials for solar cells, Potential for power generation, Material trends in photovoltaic cells. Light Generation by LEDs inorganic LEDs: IR, red, green, blue, UV; Organic LEDs (small molecules and polymer).							
Module 3	Electric energy storage	Assignment	Presentations	**09 Session**			
Topics: Basics electrochemical reactions, Batteries, Battery structure and function, Traditional materials, Materials development for increased energy density, Fuel cells/electrolysis.							
Module 4	Materials for power electronics for power control	Quiz	Data Collection and Analysis	**09 Session**			

Topics: Basic Requirements, Power diodes, Types of power devices- Bipolar power devices, Unipolar power devices, Material Trends in power electronics: Si, SiC, GaN, ZnO, C (diamond, etc.)
Targeted Application & Tools that can be used: Application Area include all Electrical and Electronics material Manufacturing companies Intel Corporation, Samsung Semiconductor, Texas Instruments Inc. Micron Technology Inc.etc., Professionally Used Software: LabVIEW/MATLAB
TextBooks 1. Electrical Engineering Materials Adrianus J Dekker, Phi Learning Publishers 2. Electrical Properties of Materials, 8th Edition by Solymar, L, Oxford University Press New Delhi. 3. Power Semiconductor Devices by Vitezslav Benda, John Gowar and D.A. Grant
References 1. Introduction to Electrical Engineering Materials 4th Edn. 2004 Edition by Indulkar C, S. Chand & Company Ltd-New Delhi. 2. Electrical and Electronic Engineering Materials by SK Bhattacharya, Khanna Publishers, New Delhi. 3. Electronic properties of engineering materials by J. D. Livingston **Online Resources** 1. https://www.youtube.com/watch?v=3W-rOtTc3ek 2. https://www.youtube.com/watch?v=XaId7WR0mGo 3. Ebook:https://puniversity.informaticsglobal.com/search/searchresult.jsp?newsearch=true&qu eryText=Digital%20signal%20processing%20applications 4. Seminar topic: Case study: https://my.eng.utah.edu/~ma5090/topic.htm
Topics relevant to "EMPLOYABLITY SKILLS": Materials for solar cells, Power diodes, Types of power devices Bipolar power devices, Unipolar power devices are for developing **Employability Skills t**hrough **Participative Learning techniques.** This is attained through assessment component mentioned in Course Plan. **Topics relevant to "ENVIRONMENT AND SUSTAINABLITY":** Battery structure and function, Traditional materials, Materials development for increased energy density.

Catalogue prepared by	Ms. Sarin M V
Recommended by the Board of Studies on	BoS No: 12th. BoS held on 27/7/2021
Date of Approval by the Academic Council	16th Academic Council Meeting, held on 23/10/2021

Course Code: EEE3006	**Course Title: High voltage Engineering** **Type of Course: Professional Elective Theory only**	**L-T-P-C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	EEE2506 Transmission and Distribution					
Anti-requisites						
Course Description	This course introduces the fundamental aspects of insulation breakdown in materials. The course provides adequate content about the design, measurement, and assessment of high voltage electrical equipment, test techniques, and over-voltage phenomena. The course gives an opportunity to understand the concepts by simulation through any open-source software packages available for the simulation and analysis of high voltage circuits.					

Course Objective	The objective of the course is to familiarize the learners with the concepts of High voltage 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 conduction and breakdown mechanism of solid, liquid, gas dielectric materials 2**) Explain** generation of high voltage and current in electrical systems 3) **Summarize** the different methods of measurement of high voltage and current 4) **Identify** the overvoltage phenomenon and the testing methodologies for different high voltage equipment			
Course Content:				
Module 1	**Conduction and Breakdown**	Assignment	Data Collection	**6 Sessions**
Topics: Dielectric breakdown in Gaseous, Liquid and Solid Insulators Mechanism of breakdown of gases –Townsend's criteria, Streamer theory; Paschen's Law, Penning effect, Corona discharges,				
Module 2	**Generation of High Voltage and current**	Assignment	Simulation	**12 Sessions**
Topics: High DC voltage – Rectifier circuit, Voltage doubler circuit, Cockroft-Walton Voltage Multiplier Circuit. High AC voltage – Cascaded Transformer, Series Resonant circuit. High Impulse voltage and current – Impulse generator circuit, Marx circuit, Impulse current generator.				
Module 3	**Measurements of High Voltages and Currents**	Assignment	Simulation	**12 Sessions**
Topics: Peak voltage, impulse voltage and high direct current measurement method, cathode ray oscillographs for impulse voltage and current measurement, measurement of dielectric constant and loss factor, partial discharge measurements.				
Module 4	**Overvoltage Phenomenon and Testing of High Voltage**	Case Study	Data Collection	**15 Sessions**
Topics: Apparatus Overvoltage due to lightning, Overvoltage due to switching surge, faults or other abnormalities, Methods of Protection against HV surge, Insulation coordination in HV apparatus. Standard test procedures, Laboratory test procedures, Testing of – Insulators, Bushings, Circuit breakers, Isolators, Transformer, Cables, surge diverters.				
Targeted Application & Tools that can be used: The high voltage engineering specifically finds its application in every other critical manufacturing and processing industries as an integral part of it. Its generation circuit, its test benches and standard test procedures on are topics of higher priority. The Commercially available simulation software tools like MATLAB are utilized as professional tool in the course and students are encouraged to use any open-source software available.				
Text Book 1. M. S. Naidu & V. Kamaraju, "High Voltage Engineering", Tata McGraw Hill Education, 5 th Edition, 2013 2. C.L. Wadhwa, "High Voltage Engineering", New Age International Publishers, 3 rd Edition, 2012				
Online learning resources 1. https://nptel.ac.in/courses/108/104/108104048/ 2. https://electrical-engineering-portal.com/download-center/books-and-guides/electricity-generation- t-d/lecture-notes-hv-engineering				

3. Ebook: https://puniversity.informaticsglobal.com 4. Seminar topic: https://ieeexplore.ieee.org/search/searchresult.jsp?newsearch=true&queryText=high%20voltage%20en gineering 5. Case study: https://www.highvoltageservices.co.uk/category/high-voltage-electrical-case-studies/
Topics relevant to "EMPLOYIBILITY SKILLS": Statistical evaluation of measurement data, Principle and types of analog and digital voltmeters, ammeters. for Developing **"Employability Skills"** through **Participative Learning Techniques.** This is attained through assessment components mentioned in course handout.

Catalogue prepared by	Ms. Ragasudha C P
Recommended by the Board of Studies on	12th. BoS held on 27/7/2021
Date of Approval by the Academic Council	16th Academic Council Meeting, dated 23 /10/2021

Course Code: EEE3009	**Course Title: AI applications for Electrical Engineering** **Type of Course: 1]. Professional Elective &** **2]. Theory only**	**L- T-P-C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	**Data Structures and Algorithms** Basic Data Structures: Arrays, Strings, Stacks, Queues, Basic math operations (addition, subtraction, multiplication, division, exponentiation), Basic Recursion, Basic Dynamic Programming.					
Anti-requisites	**NIL**					
Course Description	This course enables to locate soft commanding methodologies, such as artificial neural networks, Fuzzy logic and genetic Algorithms and to observe the concepts of feed forward neural networks and about feedback neural networks. This course is logical and conceptual in nature which enhances the critical thinking and reasoning skills. The course develops the programming skills through regular assignments and concepts.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of AI applications for Electrical Engineering and attain **Employability Skills** through **Participative Learning** techniques.					
Course Outcomes	**On successful completion of this course the students shall be able to** 1. State the importance of feed forward neural networks, feedback neural networks and learning techniques 2. Select the suitable learning techniques for Electrical Engineering applications. 3. Analyse fuzziness involved in various systems and fuzzy set theory. 4. Develop fuzzy logic control for applications in electrical engineering					
Course Content:						
Module 1	**Artificial Neural Networks**	Assignment	Problem solving		**10 Session**	
Topics: Introduction-Models of Neural Network – Architectures – Knowledge representation – Artificial Intelligence and Neural networks – Learning process – Error correction learning –						

Hebbian learning – Competitive learning – Boltzman learning – Supervised learning – Unsupervised learning – Reinforcement learning – learning tasks				
Module 2	**ANN Paradigms**	Assignment	Problem solving	**10 Session**
Topics: Multi – layer perceptron using Back propagation Algorithm-Self – organizing Map – Radial Basis Function Network – Functional link, network – Hopfield Network.Characteristics of NN, Learning Methods, LMS and Back Propagation Algorithm, training Examples of models, Advances in Neural networks				
Module 3	**Fuzzy Logic**	Assignment	Algorithm Development	**10 Session**
Topics: Introduction – Fuzzy versus crisp – Fuzzy sets – Membership function – Basic Fuzzy set operations – Properties of Fuzzy sets – Fuzzy cartesian Product – Operations on Fuzzy relations – Fuzzy logic – Fuzzy Quantifiers – Fuzzy Inference –Principal component analysis, Autoencoder: Architecture, Sparsity. Long short term memory units in RNN.				
Module 4	**Genetic Algorithm**	Assignment	Algorithm development	**10 Session**
Topics:Introduction-Encoding – Fitness Function-Reproduction operators – Genetic Modeling – Genetic operators – Crossover – Single–site crossover – Two-point crossover – Multi point crossover-Uniform crossover – Matrix crossover – Crossover Rate – Inversion & Deletion – Mutation operator –Mutation – Mutation Rate-Bit-wise operators – Generational cycle-convergence of Genetic Algorithm. ANN in space vector PWM wave synthesis for 2-level and multi-level converters				
Targeted Application & Tools that can be used: Application Area is Computer Science Applications, Electric Drives, Electric Vehicles, Control Systems Professionally Used Software: MATLAB/Simulink				
Textbook 1. S. Rajasekaran and G. A. V. Pai, "Neural Networks, Fuzzy Logic & Genetic Algorithms"- PHI, New Delhi, 2003 **2.** Saifullah Khalid**.,"Applications of Artificial Intelligence in Electrical Engineering " March 2020**				
References 1. P. D. Wasserman, Van Nostrand Reinhold," Neural Computing Theory & Practice" – New York, 1989. 2. Bart Kosko," Neural Network & Fuzzy System" Prentice Hall, 1992. 3. G. J. Klir and T. A. Folger," Fuzzy sets, Uncertainty and Information"-PHI, Pvt.Ltd,1994. 4. D. E. Goldberg," Genetic Algorithms"- Addison Wesley 1999 **Online Resources** 1. https://online.egr.msu.edu/articles/ai-machine-learning-electrical-computer-engineering-applications/ 2. https://iopscience.iop.org/article/10.1088/1742-6596/1087/6/062 3. https://www.youtube.com/watch?v=y4cAHVLGTIE 4. S. Rajasekaran and G. A. V. Pai, "Neural Networks, Fuzzy Logic & Genetic Algorithms"-PHI, New Delhi, 2003 5. https://puniversity.informaticsglobal.com:2229/login.aspx?_direct=true&db=nlebk&AN=2706929&site=ehost-live				
Topics relevant to "EMPLYOBILITY SKILLS": Multi – layer perceptron using Back propagation Algorithm-Self – organizing Map – Radial Basis Function Network for developing **Employability Skills** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout				
Catalogue prepared by	Mr. Sarin MV			
Recommended by the Board of Studies on	14th BoS held on 22/2/2022			

Date of Approval by the Academic Council	18th Academic Council Meeting held on 03/08/2022

Course Code: EEE3010	**Course Title: Electrical Estimation and Costing** **Type of Course: Professional Elective & Theory only**	**L- T-P-C**	3	0	0	3
Version No.	**2.0**					
Course Pre-requisites	EEE2506 Transmission and Distribution					
Anti-requisites	**NIL**					
Course Description	The purpose of this course is to provide an understanding of the basic concepts, design, and estimation of distribution systems and substations. This course develops and ability to design earthing systems for residential and commercial buildings and discuss practical aspects of condition monitoring and maintenance of various electrical equipment. It enhances learning the testing of various electrical equipment. This course also enhances the analytical abilities through assignments.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of **E**lectrical Estimation and Costing and attain **Employability Skills** through **Problem Solving** methodologies.					
Course Outcomes	**On successful completion of this course the students shall be able to:** 1. **Interpret** electrical drawings and understand estimation fundamentals. 2. **Estimate** and costing of the wiring installation of residential and commercial buildings. 3. **Estimate** the material requirements and cost for overhead transmission and distribution lines. 4. **Estimate** the material requirements and cost for substation setup.					
Course Content:						
Module 1	Standards for estimation	Assignment	Data collection			**10 Session**
Topics: Role of National Electric code and IE rules- types of wires and cables – selection of ratings of copper and aluminium wires and underground cables as per IS code– protective devices such as fuses, relays, MCB's and ELCB's - Selection of fuses for motors. Types of fuses. General rules for wiring – determination of number of sub circuits. Determination of ratings of main switch/isolator – DB – Distribution Board –single line diagram using standard electrical signs and symbols of single phase/three phase circuits.						
Module 2	Wiring installation	Assignment	Data collection and estimation			**12 Session**
Topics: Wiring estimation for single phase/three phase residential consumers – schematic layout and diagram – single phase /three phase wiring estimation for small scale industries/offices/commercial building – Electrical Design and Estimation for High rise building. Design of lightning protection of residential buildings.						
Module 3	Estimation in Transmission and Distribution (T&D) Systems	Assignment	Data collection and estimation			**13 Session**

Topics: Overview of T&D Systems- Components: transformers, poles, conductors, insulators., Transmission line configurations and their cost implications., Estimation Techniques- Load calculation and voltage drop considerations, Designing overhead and underground distribution networks. Costing of T&D Projects- Labor and material cost estimation for poles, cables, and transformers, Environmental and regulatory compliance costs. Case Studies- Real-world T&D project estimation (e.g., rural electrification).				
Module 4	Substation Estimation	Assignment	Data collection and estimation	**10 Session**
Topics: Substation equipments – outdoor – indoor substations – layouts – components – selection of HV and EHV power and distribution transformers and switchgears – layout & schematic diagram for (a) 16MVA, 110/11KV outdoor substation (b) 11KV/415V, 63KVA outdoor / indoor substations. Earthing – Pipe earthing, Plate earthing, earthmat design - test procedure.				
Targeted Application & Tools that can be used: Application Area is Power System Data collection, Electricity Transmission and Distributed companies, Power Grid and State Electricity Boards				
Textbooks 1. Gupta J.B Kataria& Sons -Electrical installation, Estimation & Costing 2. Raina & Battacharys, Electrical System Design, Estimation & Costing, Wiley Eastern				
References 1. Estimating and Costing by S.K Bhattacharya, Tata McGraw Hill, 3 rd edition, 2006 2. National Electric Code, Bureau of Indian Standard Publications 3. S.L Uppal & Garg - Khanna publishers. Electrical wiring estimating and costing 4. Estimating and Costing by Surjeet Singh, Dhan pat Rai & Co., 2 nd edition, 2003. 5. Electrical Estimating and Costing by N Alagappan and B Ekambaram, TMH, 2 nd edition, 2006. 6. ISI, National Electric Code, Bureau of Indian Standard Publications **Online Resources** 1. https://nptel.ac.in/courses/108101167 2. https://www.scribd.com/document/360113853/ELECTRICAL-ESTIMATION-COSTING-pdf 3. https://www.youtube.com/watch?v=D04uxZpgp6M 4. https://presiuniv.knimbus.com/user#/home				
Topics relevant to "EMPLOYABILITY SKILLS": Wiring estimation for single phase/three phase residential consumers – schematic layout and diagram – single phase /three phase wiring estimation for small scale industries/offices/commercial building for developing **Employability Skills** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course handout.				
Catalogue prepared by	Mr Bishakh Paul			
Recommended by the Board of Studies on	BoS No: 14th, held on 22/02/2022			
Date of Approval by the Academic Council	18th Academic Council meeting held on 03/08/22			

Course Code: EEE3011	**Course Title: Testing and Commissioning of Electrical Equipment's.** **Type of Course: 1]. Professional Elective & 2]. Theory only**	**L-T-P-C**	3	0	0	3
Version No.	2.0					

Course Pre-requisites	EEE2505 Electrical and Electronics Measurements and Instrumentation EEE2506 Transmission and Distribution EEE2507 Electrical Power Generation and Economics			
Anti-requisites	**NIL**			
Course Description	Power systems and industrial plants are made up of a variety of electrical drives, transformers, circuit breakers, and other equipment that must be installed, commissioned, and maintained on a regular basis to avoid permanent breakdown. It is required to carry out or supervise the installation, commissioning, and maintenance of various electrical equipment in power stations, substations, and industry. This course will enable to understand the concepts, and principles behind the installation, commissioning, and maintenance of electrical equipment in power stations, substations, and industry.			
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Electrical Equipment Testing and Commissioning and attain **Entrepreneurial Skills** through **Participative Learning** techniques.			
Course Outcomes	**On successful completion of this course the students shall be able to** 1. **Prepare** the maintenance schedule of different equipment and machines 2. **Interpret** various electrical equipment, machines and domestic appliances. 3. **Selec**t procedure of different types of earthing for different types of electrical installations. 4. **Apply** the electrical safety regulations and rules during maintenance			
Course Content:				
Module 1	Safety Management	**Assignment**	**Case study**	**10 sessions**
Topics: Objectives, Safety Management during Operation and Maintenance, Clearance and Creepages, Electric Shock, need of Earthing, different methods of Earthing, factors affecting the Earth Resistance, methods of measuring the Earth Resistance, Equipment Earthing and System Grounding, Earthing Procedure - Building installation, Domestic appliances, Industrial premises, earthing of substation, generating station and overhead line.				
Module 2	Installation of Electrical Equipment	**Assignment**	**Data collection**	**9 sessions**
Topics: Inspection of Electrical Equipment at site, Storage Electrical Equipment at site, Foundation of Electrical Equipment at site, Alignment of Electrical Machines, Tools/Instruments necessary for installation, technical report, Inspection, storage and handling of transformer, switchgear and motors				
Module 3	Testing of Transformer, Plant and Equipment	**Assignment**	**Presentation**	**9 sessions**
Topics: General Requirements for Type, Routine and Special Tests, Measurement of winding resistance; Measurement of voltage ratio and check of voltage vector relationship; Measurement of impedance voltage/short-circuit impedance and load loss; Measurement of no-load loss and current; Measurement of insulation 13 28 resistance; Dielectric tests; Temperature-rise, insulation and HV test, dielectric absorption, switching impulse test. Testing of Current Transformer and Voltage Transformer, power transformer, distribution transformer				
Module 4	Installation and Commissioning of Rotating Electrical Machines	**Assignment**	**Presentation**	**9 sessions**
Topics: Degree of protection, cooling system, installation, commissioning and protection of induction motor and rotating electric machine, insulation resistance measurement, site testing and checking, care, services and maintenance of motors, commissioning of synchronous generator, protection and automation				
Targeted Application & Tools that can be used: Application Area is Power System Data collection, Electricity Transmission and Distributed companies, Power Grid and State Electricity Board**s.**				

Textbooks

1. Rao, S., "Testing, commissioning, operation and maintenance of electrical equipment", 6/E., Khanna Publishers, New Delhi

References

1. Paul Gill, "Electrical power equipment maintenance and testing", CRC Press, 2008.
2. Singh Tarlok, "Installation, commissioning and maintenance of Electrical equipment", S.K. Kataria and Sons, New Delhi,
3. Philip Kiameh, "Electrical Equipment Handbook: Troubleshooting and Maintenance", McGrawHill, 2003.
4. Relevant Indian Standards (IS Code) and IEEE Standards for-Installation, maintenance and commissioning of electrical equipments /machines.

Online resources:

5. https://www.iimu.ac.in/upload_data/Tender/SpecialConditionsWSequipment1.pdf
6. https://www.sciencedirect.com/topics/engineering/commissioning-process
7. Rao, S., "Testing, commissioning, operation and maintenance of electrical equipment", 6/E., Khanna Publishers, New Delhi
8. https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2706929&site=ehost-live
5. https://puniversity.informaticsglobal.com

Topics relevant to "ENTREPRENEURIAL SKILLS": Inspection of Electrical Equipment, Earthing Procedure - Building installation inspection of Electrical Equipment, Earthing Procedure - Building installation for developing **Entrepreneurial Skills** through **Participative Learning techniques**. This is attained through the assessment component mentioned in course handout.

Topics relevant to "HUMAN VALUES & PROFESSIONAL ETHICS": Safety Management during Operation and Maintenance, electric tests, insulation and HV test.

Catalogue prepared by	**Mr. K Sreekanth Reddy**
Recommended by the Board of Studies on	BoS No: 15th held on 27/7/2022
Date of Approval by the Academic Council	18th Academic Council Meeting held on 3/08/2022

Course Code: EEE3013	**Course Title: VLSI Systems** **Type of Course: Professional Elective, Theory Only**	**L-T- P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	ECE2021 Digital Electronics					
Anti-requisites	**Nil**					
Course Description	The course introduces the fabrication and layout techniques necessary to design large scale systems. It improves the knowledge on understanding electrical properties of MOS transistor and analysis of CMOS, CMOS inverters. It also develops the ability to identify the steps which are required for VLSI system design. The course is analytical in nature. The course develops programming skills through Assignments.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of VLSI 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. **Summarize** the methodologies for fabricating the ICs.					

	2. **Illustrate** logic circuits using CMOS and its equivalent layout for fabrication. 3. **Analyze** the delay and power dissipation in logic circuits by analyzing the characteristics of CMOS. 4. **Apply** arithmetic circuits for various applications.

Course Content:

Module 1	Overview of VLSI and VHDL	Assignment	Quiz	**No. of Sessions:10**

The VLSI design process, Architectural design, logical design, Physical design, layout styles, Full custom, Semi-custom approaches, Introduction Verilog HDL, Gate level, data flow, behavioral modelling

Module 2	Introduction to MOS Devices	Assignment	Case study	**No. of Sessions: 12**

Introduction to MOS Transistor Theory: nMOS, pMOS Enhancement Transistor, MOSFET as a Switch, Threshold voltage, MOS Device Design Equations, Body effect, Second order effects. MOS Transistor Circuit Model. Stick Diagram, Layout Design Rules.

Module 3	Combinational logic Circuits	Mini project	CMOS Design/Programming task	**No. of Sessions: 12**

Introduction, Static CMOS Design- Complex Logic Gates, Ratioed Logic, Pass-Transistor Logic, Transmission gate Logic, Dynamic CMOS Logic Design: Dynamic Logic Design Considerations. Speed and Power Dissipation of Dynamic logic, Signal integrity issues, Cascading Dynamic gates.

Module 4	Designing arithmetic circuits	Mini project continued	seminar	**No. of Sessions: 11**

Adders-Ripple carry, Carry-Look ahead, Multiplier using Array based-Ripple carry adder, Carry- Save adder, Multiplier using Tree based-Wallace Tree, Dadda Tree, Booth Multiplier, Squarer.
Modelling of arithmetic circuits using HDL

Targeted Application & Tools that can be used:

Application: VLSI circuits are used everywhere, including microprocessors in a personal computer, chips in a graphic card, digital camera or camcorder, chips in a cell phone, embedded processors, and safety systems like anti-lock braking systems in an automobile, personal entertainment systems, medical electronic systems etc

List of Open Source Software/learning website: HDL

Text Book

1. Jan Rabaey, Anantha Chandrakasan, B.Nikolic, "Digital Integrated circuits: A design perspective". Second Edition, Prentice Hall of India, 2013.
2. Neil H.E.Weste, David Money Harris, "CMOS VLSI DESIGN: a circuits and systems perspective", Fourth edition, Pearson 2015.

References

1. Samir Palnitkar, "Verilog HDL", Prentice Hall, 2010.
2. Sung-Ma Kong, Yusuf Leblebici and Chulwoo Kim, "CMOS digital integrated circuits: analysis and design", 4th edition, McGraw-Hill Education, 2015.

Online resources:

1. https://nptel.ac.in/courses/117102060
2. https://www.tutorialspoint.com/vlsi_design/vlsi_design_digital_system.htm
3. Ebook: Analog and Digital VLSI Circuit Design by Panda, Saradindu First edition. New Delhi : Laxmi Publications Pvt Ltd. 2015, https://presiuniv.knimbus.com/user#/home
4. Seminar topic: https://puniversity.informaticsglobal.com:2069/search/searchresult.jsp?newsearch=true&queryText=Digital%20signal%20processing%20applications
5. Case study: http://users.ece.utexas.edu/~adnan/ecd-summer-05.pdf
6. https://presiuniv.knimbus.com/user#/home

Topics relevant to "EMPLOYABILITY SKILLS": Verilog HDL, Signal integrity issues, Modelling of arithmetic circuits using HDL for developing **Employability Skills** through **Participative Learning techniques**. This is attained through assessment component mentioned in Course Plan.	
Catalogue prepared by	Mr. K Sreekanth Reddy
Recommended by the Board of Studies on	BoS No: 15th BoS held on 27/7/2022
Date of Approval by the Academic Council	18th Academic Council Meeting held on 03/08/2022

Course Code: EEE3014	**Course Title: Digital Signal Processing System** **Type of Course: Professional Elective, Theory only**	**L- T-P-C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	ECE2500 Signals and Systems					
Anti-requisites	**Nil**					
Course Description	The course emphasis is on theory and methods for digital signal processing including basic principles governing the analysis and design of discrete-time systems as signal processing devices. It also develops knowledge in selection of suitable sensor based on requirement and application. The course is analytical in nature and needs basic knowledge of mathematical and computing. The course develops programming skills through assignments.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Digital Signal Processing 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 discrete-time signals 2. **Apply** DFT for digital signal analysis. 3. **Discover** IIR filter for a given specification 4. **Compute** FIR filter coefficients for a given specification					
Course Content:						
Module 1	**Basics of DSP, Fourier Transforms, and Convolution**	Assignment	Quiz	**No. of Sessions:10**		
Linear convolution of sequences using DFT, Introduction to Circular convolution, Circular convolution-Concentric circle method and Matrix multiplication method, Calculation of linear convolution from circular convolution.						
Module 2	**FFT Algorithms**	Assignment	Case study	**No. of Sessions: 13**		
Introduction to FFT, Comparison of FFT with Direct evaluation of the DFT, DIT-algorithm: Radix-2 DIT-FFT algorithm and its problems. DIF-algorithm: Radix-2 DIF-FFT algorithm and its problems, Comparison. IDFT using FFT algorithm.						
Module 3	**IIR Filter Design and Realizations**	Mini project	Design of a filter/Programming task	**No. of Sessions:** 13		

IIR filters –Introduction- characteristics of analog filters - Butterworth filters, Chebyshev filters. Design of IIR filters from analog filters (LPF, HPF, BPF, BRF) - Frequency transformation in the analog domain. Structure of IIR filter - direct form I, direct form II, Cascade, parallel realizations.				
Module 4	**FIR Filter Design and Realizations**	Mini project continued	seminar	**No. of Sessions: 10**
Sampling method, direct form realizations - Bartlett and Blackmann window functions, Parallel and Lattice structures, General-purpose digital signal processors				
Targeted Application & Tools that can be used: **Application:** DSP is used primarily in areas of the audio signal, speech processing, RADAR, seismology, audio, SONAR, voice recognition, secure communications, electro-optics, intelligence an array of military applications can benefit from the digital signal processing (DSP) capabilities of programmable logic. **List of Open Source Software/learning website:** NPTEL, MATLAB				
Text Book 1. John G. Proakis, D.G. Manolakis and D.Sharma, "Digital Signal Processing Principles, Algorithms and Applications", 4th edition, Pearson Education. 2. Sanjit K. Mitra, Digital Signal Processing, 4th edition. 3. (L1) : Lecture notes /PPT				
References 1. Sophocles J. Orfanidis, "Introduction to Signal Processing" 2nd edition, Prentice Hall, Inc, 2010 2. Oppenhiem V.A.V and Schaffer R.W, "Discrete – time Signal Processing", 3rd edition, Pearson new international edition, 2014. 3. G. K. Ananthasuresh, K. J. Vinoy, S. Gopalakrishnan, K. N. Bhat, V. K. Aatre, Micro and Smart Systems: Technology and modeling, Willey Publications,2012. 4. Lawrence R Rabiner and Bernard Gold, "Theory andData Acquisition and Signal Processing Pearson India Education Services, 2016. **Online resources:** 1. https://nptel.ac.in/courses/117102060 2. https://www.tutorialspoint.com/digital_signal_processing/index.htm 3. Ebook: Digital Signal Processing, Regis, Carlos Danilo Miranda, New York : Momentum Press. https://presiuniv.knimbus.com/user#/home 4. Seminar topic: https://puniversity.informaticsglobal.com:2069/search/searchresult.jsp?newsearch=true&queryText= Digital%20signal%20processing%20applications 5. Case study: https://www.slideshare.net/VaibhavTayal8/dsp-case-study 6. https://presiuniv.knimbus.com/user#/home.				
Topics relevant to "EMPLOYABILITY SKILLS": Design of IIR filters from analog filters, DIF-algorithm for developing **Employability Skills** through **Problem Solving methodologies**. This is attained through assessment component mentioned in course handout.				
Catalogue prepared by	Mr. K Sreekanth Reddy			
Recommended by the Board of Studies on	15th held on 27/7/2022			
Date of Approval by the Academic Council	8th Academic Council Meeting held on 3/8/2022			

Course Code: EEE3015	**Course Title: Industrial Automation with PLC and SCADA** **Type of Course: Professional Elective Course**	**L-T-P- C**	**3**	**0**	**0**	**3**
Version No.	2.0					

Course Pre-requisite	EEE1200 - Basics of Electrical and Electronics Engineering			
Anti-requisites	**NIL**			
Course Description	This course deals with PLC hardware/software and their importance in automation. SCADA deals with communication protocols and real-time control of power systems using EMS. The course is both conceptual and analytical in nature. It develops programming and simulation skills.			
Course Objective	The objective of the course is to familiarize the learners with the concepts of Industrial Automation with PLC and SCADA and attain **Employability Skills** through **Problem Solving** methodologies			
Course Outcomes	**On successful completion of this course the students shall be able to:** 1. Describe the Internal organization, operation of PLC and I/O Devices. 2. Compute the various ladder diagram and instruction set programming language. 3. Explain the concept of SCADA, DCS and its features. 4. Develop the system by interfacing peripheral devices with PLC, SCADA and DCS applications.			
Course Content:				
Module 1	Introduction to Programmable Logic Controllers:	Assignment	List all the PLC applications in industries like Siemens, ABB, Schneider Electric	**10 Sessions**
Topics: Introduction to industrial Automation, Advantages & disadvantages of PLC with respect to relay logic, PLC architecture, Input Output modules, PLC interfacing with plant, memory structure of PLC.				
Module 2	PLC Programming Methodologies:	Assignment	Programming	**10 Sessions**
Topics: Ladder diagram, STL, functional block diagram, SFC, Instruction List. Creating ladder diagram from process control descriptions, Introduction to IEC61131 international standard for PLC.				
Module 3	Introduction to SCADA and DCS	Assignment	Simulation	**10 Sessions**
Topics: Introduction, Types, features, Data acquisition, Manufacturers system, Evolution of SCADA, Communication Technologies, Monitoring and Supervisory Functions. DCS Specifications, Configuration and Programming.				
Module 4	Industrial Applications of PLC and SCADA	Case study	Simulation	**10 Sessions**
Topics: SCADA Applications in Power System, Water Utilities and Sewage, Building facilities, Oil and Gas Industries, Communication Network, Industrial Plants and Process Control, Railway Traction and Traffic signals.				
Targeted Application is Siemens, ABB, Power-grid, Yokogawa Electric **Tools that can be used: NI Lab-VIEW , Siemens Step 7-Micro/Win 32, S7-200 PLC**				
Text Books 1. W.Boldon, 'Programmable logic controllers', 5th Edition, Elsevier India Pvt. Ltd., New Delhi, 2011. 2. Stuart A.Boyer, "SCADA: 'Supervisory control and Data Acquisition', 4th Edition, ISA, 2010.				
References				

1. Robert Radvanovsky, Jacob Brodsky, "Handbook of SCADA/Control Systems Security", 2nd edition, CRC press, 2016. 2. G. K. McMillan, Douglas Considine, "Process/Industrial Instruments Hand book", 5th edition, McGraw Hill, New York, 2009. **Online learning resources** 1. Case study https://presiuniv.knimbus.com/user#/home 2. Seminar https://presiuniv.knimbus.com/user#/home 3. https://electrical-engineering-portal.com/resources/plc-programming-training 4. https://www.plcacademy.com/ 5. Ebook:https://electrical-engineering-portal.com/download-center/books-and-guides/electrical-engineering/plc-book
Topics relevant to development of "EMPLOYABILITY SKILL": PLC programming, SCADA for developing **Employability Skills** through **Problem Solving** methodologies . This is attained through assessment component mentioned in course Plan.

Catalogue prepared by	Dr. Sunil Kumar A V
Recommended by the Board of Studies on	21st BoS, Held on 09/06/2025
Date of Approval by the Academic Council	26th Academic Council meeting held on 25th July 2025

Course Code: **ECE3205**	**Course Title: Object-Oriented Programming Essentials using JAVA** **Type of Course:** Theory & Lab Integrated	**L- T-P-C**	2	**0**	2	**3**
Version No.	1.0					
Course Prerequisites	NIL					
Anti-requisites	**NIL**					
Course Description	This course provides a comprehensive introduction to Object-Oriented Programming (OOP) principles using Java, covering core concepts such as classes, objects, encapsulation, inheritance, polymorphism, and abstraction. Through hands-on exercises and practical applications, students will learn to design, implement, and debug robust and reusable software solutions, gaining essential skills for modern software development.					
Course Objective	The primary objective of this course is to equip students with a solid understanding of Object-Oriented Programming (OOP) concepts and their practical application using the Java programming language. Students will learn to leverage OOP principles such as encapsulation, inheritance, and polymorphism to design, develop, and maintain efficient, modular, and scalable software solutions. By the end of the course, students will be capable of writing robust Java programs that adhere to OOP best practices and solve real-world problems.					

Course Outcomes	On successful completion of the course the students shall be able to: C.O. 1: Demonstrate a foundational understanding of core Object-Oriented Programming (OOP) concepts, including classes, objects, encapsulation, inheritance, polymorphism, and abstraction, and explain how these concepts contribute to modular and reusable code.. [Understanding] C.O. 2: Design and implement Java programs using OOP principles, effectively creating and manipulating objects, defining class relationships, and utilizing inheritance and interfaces to build structured and efficient applications [Application] C.O. 3: Apply problem-solving skills to analyze real-world scenarios and develop appropriate object-oriented solutions in Java, correctly identifying objects, their attributes, and behaviors, and designing class hierarchies.. [Application] C.O. 4: Write, debug, and test Java code that adheres to OOP best practices and standard coding conventions, resulting in readable, maintainable, and robust software solutions.. [Application]			
Course Content:				
Module 1	Introduction to Java	Assignment		10 Sessions
Topics: What is Java? History and features.JVM, JRE, JDK explained.Setting up the development environment (JDK installation, IDE introduction - e.g., IntelliJ IDEA, Eclipse).First Java program: "Hello World!" structure, main method,Variables, data types (primitive and non-primitive).Operators (arithmetic, relational, logical, assignment).Control flow statements: if-else, switch, for, while, do-while.Arrays (one-dimensional).Methods: defining, calling, parameters, return types.Procedural vs. Object-Oriented paradigms.The concept of objects and classes.Defining a class (blueprint).Creating objects (instantiation) using new keyword.State (attributes/fields) and Behavior (methods).Meaning and benefits of encapsulation.Access modifiers: public, private, protected, default.Getters and Setters methods.Constructors: default, parameterized.this keyword.				
Module 2	Classes and Relationship	Assignment		12 Sessions
Topics: **Static Members** static variables (class variables) and static methods (class methods).static initialization blocks.Difference between static and instance members.**Object Relationships (Association) -**Introduction to object relationships.**Aggregation:** "has-a" relationship (e.g., Car has an Engine).**Composition:** Stronger "has-a" relationship (e.g., House has Rooms).Implementing these relationships in Java. T**he final Keyword-** final variables (constants).final methods (cannot be overridden).final classes (cannot be subclassed).**Packages-** Purpose and benefits of packages.Creating and using packages. import statement.Package naming conventions.**Working with Strings-**String class basics.String literals vs. new String().Common String methods (e.g., length(), charAt(), substring(), equals(), equalsIgnoreCase(), concat()).StringBuffer and StringBuilder (brief introduction to mutability).				

Module 3	Inheritance and Polymorphism	Term paper/Assignment		12 Sessions

Topics:

Inheritance Fundamentals- What is inheritance? "is-a" relationship.Superclass (parent) and Subclass (child).Benefits: code reusability, extensibility.extends keyword.Constructor chaining in inheritance. **Method Overriding-** Rules for method overriding.@Override annotation.Using the super keyword to call superclass methods/constructors. **Polymorphism-** Definition and types of polymorphism (compile-time vs. runtime).Method Overloading (revisit as compile-time polymorphism).Runtime Polymorphism: object upcasting and downcasting.Dynamic Method Dispatch. **Abstract Classes and Methods -**Purpose of abstract classes and methods.Defining abstract classes and methods.Rules for abstract classes and their subclasses.When to use abstract classes vs. regular classes.

Module 4	Interfaces, Exception Handling, and Introduction to Collections	Term paper/Assignment		12 Sessions

Topics:

Interfaces: What are interfaces? Purpose and characteristics.Abstract methods, default methods, static methods in interfaces.Implementing multiple interfaces.Interfaces vs. Abstract classes.Functional interfaces (brief introduction). **Exception Handling-**Understanding errors vs. exceptions.Types of exceptions: checked vs. unchecked.try-catch-finally block.throw and throws keywords. Creating custom exceptions. **Introduction to Collections Framework -**Why use collections?Overview of the Collections hierarchy (Collection, List, Set, Map).Basic usage of ArrayList and HashSet.Iterating over collections (enhanced for loop). **Object Class and Object Equality -** The Object class as the root of all classes.toString() method.equals() method: default behavior and overriding for custom equality. hashCode() method: overriding and its relation to equals().

List of Laboratory Tasks:

Module 1: Introduction to Java and Core OOP Concepts

1: Getting Started with Java and Basic Programs

- **Objective:** Familiarize with the Java environment, basic syntax, and I/O.
- **Tasks:**
    1. Install JDK and configure your chosen IDE (IntelliJ IDEA Community Edition recommended).
    2. Write a Java program that prints "Hello, Java OOP World!" to the console.
    3. Write a program that takes two integer inputs from the user, calculates their sum, difference, product, and quotient, and prints the results.
    4. Write a program to calculate the area and perimeter of a rectangle given its length and width.

2: Control Flow Statements

- **Objective:** Practice using conditional and looping constructs.
- **Tasks:**
    1. Write a program that takes a student's score (0-100) as input and prints their grade (A, B, C, D, F) using if-else if.
    2. Write a program that prints all even numbers from 1 to 50 using a for loop.

3. Write a program that calculates the factorial of a number using a while loop.
4. Implement a simple calculator that performs addition, subtraction, multiplication, or division based on user choice using a switch statement.

3: Introduction to Classes and Objects

- **Objective:** Understand how to define a class and create objects.
- **Tasks:**
  1. Create a class named Dog with attributes: name (String), breed (String), and age (int).
  2. Add a method bark() that prints "[Dog's Name] barks!".
  3. In a main method, create two Dog objects, assign values to their attributes, and call their bark() method.

4: Encapsulation and Constructors

- **Objective:** Implement encapsulation using getters/setters and various constructors.
- **Tasks:**
  1. Modify the Dog class from Lab 3. Make all attributes private.
  2. Add public getter and setter methods for each attribute.
  3. Implement a default constructor that initializes attributes to default values (e.g., name = "Unknown").
  4. Implement a parameterized constructor that takes name, breed, and age as arguments.
  5. In the main method, create Dog objects using both constructors and demonstrate calling getters and setters.

5: Advanced Class Features - this keyword and Methods

- **Objective:** Master the this keyword and define more complex methods.
- **Tasks:**
  1. Create a class Book with private attributes: title (String), author (String), isbn (String), and isBorrowed (boolean).
  2. Implement a parameterized constructor Book(String title, String author, String isbn) using the this keyword to resolve ambiguity.
  3. Add methods:
     - borrowBook(): Sets isBorrowed to true and prints a confirmation. If already borrowed, print an error.
     - returnBook(): Sets isBorrowed to false and prints a confirmation. If not borrowed, print an error.
     - displayBookInfo(): Prints all book details.
  4. In main, create Book objects and test all methods.

Module 2: Object Relationships and Advanced Class Features (Labs 6-10)

6: Static Members

- **Objective:** Understand and apply static variables and methods.
- **Tasks:**
  1. Create a class BankAccount with private instance attributes: accountNumber (String), accountHolderName (String), balance (double).
  2. Add a private static int nextAccountNumber = 1001; to generate unique account numbers.
  3. Implement a static method generateAccountNumber() that returns nextAccountNumber and increments it.
  4. Implement a constructor that takes accountHolderName and an initial balance. This constructor should call generateAccountNumber() to set accountNumber.
  5. Add a static method getNumberOfAccountsCreated() that returns the total count of bank accounts created (using another static variable).

6. In main, create several BankAccount objects and print the total number of accounts created.

7: Association (Composition)

- **Objective:** Implement a strong "has-a" relationship using composition.
- **Tasks:**
  1. Create a class Engine with attributes type (String) and horsepower (int). Include a constructor and a displayEngineInfo() method.
  2. Create a class Car with attributes make (String), model (String), and an Engine object.
  3. The Car's constructor should take make, model, engineType, and engineHorsepower as arguments and *create* a new Engine object internally.
  4. Add a startCar() method to Car that prints "Starting [Car Model] with a [Engine Type] engine."
  5. In main, create Car objects and call their methods.

8: Association (Aggregation)

- **Objective:** Implement a weaker "has-a" relationship using aggregation.
- **Tasks:**
  1. Create a class Address with attributes: street (String), city (String), zipCode (String). Include a constructor and a displayAddress() method.
  2. Create a class Student with attributes: studentId (String), name (String), and an Address object.
  3. The Student's constructor should take studentId, name, and an *existing* Address object as arguments (i.e., the Address object is passed in, not created inside Student).
  4. Add a displayStudentInfo() method that also displays the student's address.
  5. In main, create an Address object, then create multiple Student objects that share the same Address object to demonstrate aggregation.

9: The final Keyword and Packages

- **Objective:** Understand final keyword and organize code using packages.
- **Tasks:**
  1. Create a final class MathConstants with a public static final variable PI = 3.14159;. Try to extend this class or change PI (observe compile errors).
  2. Create a package named com.mycompany.utility and move MathConstants into it.
  3. Create another package com.mycompany.geometry and a class Circle inside it.
  4. The Circle class should have a radius (double) attribute and a calculateArea() method that uses MathConstants.PI (requires import statement).
  5. In a main method (in a separate class, potentially in another package), create Circle objects and calculate their areas, demonstrating package import.

10: Working with Strings

- **Objective:** Practice common String class methods.
- **Tasks:**
  1. Write a program that takes a sentence as input.
  2. Print the length of the sentence.
  3. Print the sentence in uppercase and lowercase.
  4. Check if the sentence contains the word "Java" (case-insensitive).
  5. Replace all occurrences of a specific word (e.g., "old") with another word (e.g., "new").
  6. Extract the first five characters and the last five characters of the sentence.

Module 3: Inheritance and Polymorphism (Labs 11-15)

11: Single Inheritance

- **Objective:** Implement single inheritance and understand super keyword for constructors.

- **Tasks:**
    1. Create a Shape class with attributes color (String) and isFilled (boolean). Include a constructor and a displayInfo() method.
    2. Create a Circle class that extends Shape.
    3. Circle should have an additional attribute radius (double).
    4. Circle's constructor should call the Shape class constructor using super().
    5. Add a method calculateArea() to Circle.
    6. In main, create Shape and Circle objects and call their methods to demonstrate inheritance.

12: Method Overriding

- **Objective:** Implement method overriding and understand its implications.
- **Tasks:**
    1. Create a Vehicle class with attributes make (String), model (String) and a method start() that prints "Vehicle starting."
    2. Create a Car class that extends Vehicle. Override the start() method to print "Car starting with key."
    3. Create a Motorcycle class that extends Vehicle. Override the start() method to print "Motorcycle starting with kickstart."
    4. In main, create objects of Vehicle, Car, and Motorcycle and call their start() methods to observe different behaviors. Use the @Override annotation.

13: Polymorphism (Method Overloading and Dynamic Dispatch)

- **Objective:** Understand compile-time and runtime polymorphism.
- **Tasks:**
    1. Revisit the Shape (Circle) hierarchy from Lab 11.
    2. In the Shape class, add an overloaded method draw():
        - draw(): prints "Drawing a generic shape."
        - draw(String style): prints "Drawing a shape with style: [style]."
    3. In Circle, override the draw() method (no parameters) to print "Drawing a Circle with radius [radius]."
    4. In main, create a Circle object and demonstrate:
        - Calling Circle's draw() method.
        - Calling Shape's overloaded draw(String style) method on the Circle object.
        - Create a Shape reference pointing to a Circle object (polymorphism): Shape myShape = new Circle(...); and call myShape.draw(). Observe dynamic dispatch.

14: Abstract Classes and Methods

- **Objective:** Implement abstract classes and understand their role in defining common interfaces for subclasses.
- **Tasks:**
    1. Create an abstract class Employee with attributes name (String), id (String).
    2. Declare an abstract method calculateSalary() that returns a double.
    3. Implement a concrete method displayDetails() that prints name and ID.
    4. Create two concrete subclasses: FullTimeEmployee and PartTimeEmployee.
    5. FullTimeEmployee should have an additional attribute monthlySalary and implement calculateSalary() to return monthlySalary.
    6. PartTimeEmployee should have hourlyRate and hoursWorked and implement calculateSalary() to return hourlyRate * hoursWorked.
    7. In main, create objects of FullTimeEmployee and PartTimeEmployee, call displayDetails(), and calculateSalary(). Demonstrate that you cannot instantiate Employee.

15: Polymorphic Arrays and Collections (Basic)

- **Objective:** Use polymorphic arrays to store objects of different types from a hierarchy.

- **Tasks:**
    1. Using the Employee (FullTimeEmployee, PartTimeEmployee) hierarchy from Lab 14.
    2. Create an array of type Employee (e.g., Employee[] employees = new Employee[3];).
    3. Store a FullTimeEmployee object, a PartTimeEmployee object, and another FullTimeEmployee object in this array.
    4. Loop through the employees array and for each Employee object, call displayDetails() and calculateSalary(). Observe how polymorphism ensures the correct calculateSalary() method is called for each specific employee type.

Module 4: Interfaces, Exception Handling, and Introduction to Collections (Labs 16-20)

16: Interfaces

- **Objective:** Understand and implement interfaces for defining contracts.
- **Tasks:**
    1. Create an interface Playable with an abstract method play().
    2. Create two classes: AudioPlayer and VideoPlayer.
    3. Both AudioPlayer and VideoPlayer should implement Playable and provide their own implementation of the play() method (e.g., "Playing audio..." or "Playing video...").
    4. In main, create objects of both players, store them in an array of Playable type, and loop through the array calling the play() method on each.

17: Exception Handling (try-catch)

- **Objective:** Learn to handle common runtime exceptions gracefully.
- **Tasks:**
    1. Write a program that attempts to divide two numbers taken from user input. Use a try-catch block to handle ArithmeticException (for division by zero).
    2. Write a program that tries to access an element beyond the bounds of an array. Use a try-catch block to handle ArrayIndexOutOfBoundsException.
    3. Modify the previous input program to handle InputMismatchException if the user enters non-integer input.

18: Exception Handling (finally, throw, throws)

- **Objective:** Deepen understanding of finally, throw, and throws.
- **Tasks:**
    1. Create a method readFile(String fileName) that attempts to open a file. Use try-catch-finally to ensure the file is closed regardless of whether an exception occurs.
    2. Create a custom exception class InvalidAgeException (unchecked exception).
    3. Write a method validateAge(int age) that throws InvalidAgeException if the age is less than 0 or greater than 150.
    4. In main, call validateAge() within a try-catch block to demonstrate handling the custom exception.

19: Introduction to Collections - ArrayList

- **Objective:** Use ArrayList to store and manage collections of objects.
- **Tasks:**
    1. Create an ArrayList of String to store a list of your favorite movies.
    2. Add at least 5 movies to the list.
    3. Print all movies in the list.
    4. Remove one movie by name and one by index.
    5. Check if a specific movie is in the list.
    6. Iterate through the list using an enhanced for loop and print each movie.

20: Object Equality (equals() and hashCode())

- **Objective:** Understand object equality and correctly override equals() and hashCode().
- **Tasks:**
  1. Create a class Point with private attributes x (int) and y (int).
  2. Implement a constructor for Point.
  3. Override the toString() method to return a string representation like "Point(x, y)".
  4. Override the equals(Object obj) method so that two Point objects are considered equal if their x and y values are the same.
  5. Override the hashCode() method consistent with equals().
  6. In main, create several Point objects, including some with identical x and y values.
  7. Demonstrate the use of equals() to compare points.
  8. (Optional/Bonus) Add Point objects to a HashSet and observe how hashCode() impacts uniqueness (if hashCode() isn't overridden correctly, duplicate points might be added).

Targeted Application & Tools that can be used:

- Java Development Kit (JDK):
- Integrated Development Environments (IDEs) - IntelliJ IDEA Community Edition,Eclipse IDE for Java Developers,Apache NetBeans
- Version Control System (VCS) - Git, GitHub/GitLab/Bitbucket

Text Book(s):

T1. **Head First Java** by Kathy Sierra and Bert Bates

T2. **Java: A Beginner's Guide** by Herbert Schildt

T3. **Core Java, Volume I—Fundamentals** by Cay S. Horstmann:

Reference(s):

1. **The Object-OrientOriented Thought Process** by Matt Weisfeld
2. **Java: The Complete Reference** by Herbert Schildt:

Professional Elective Courses Catalogues;
Track 2: Power and Energy Basket

Course Code: EEE3400	**Course Title: Solar Photovoltaic and wind energy systems** **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 provides an understanding of the conversion principles and technology behind Various Solar and Wind Energy Systems. It also examines the issues involved in the integration of various Solar Photovoltaic and wind energy sources with the help of Simulation and their economics for heat, power, and transportation needs. It also develops analytical thinking abilities.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Solar Photovoltaic and wind energy systems and attain **Employability Skills** through **Participative Learning** techniques.					

<table>
<tr><td>Course Outcomes</td><td colspan="4">On successful completion of this course the students shall be able to:
1) Summarize the various Global Energy scenarios and issues.
2) Explain the working principle of solar energy system components
3) Explain the working principle of Wind energy system components
4) Summarize about the modelling of Integrated energy systems.</td></tr>
<tr><td>Course Content:</td><td colspan="4"></td></tr>
<tr><td>Module 1</td><td>Global and National Energy Scenario</td><td>Assignment</td><td>data analysis task</td><td>12 Sessions</td></tr>
<tr><td colspan="5">Topics: Overview of conventional & renewable energy sources, need, potential &development of renewable energy sources, Future of Energy Use, Global and Indian Energy scenario, Energy for sustainable development, renewable electricity and key elements, CO2 reduction potential of renewable energy- concept of Hybrid systems.</td></tr>
<tr><td>Module 2</td><td>Solar Energy:</td><td>Paper Presentation</td><td>Programming/Simulation</td><td>12 Sessions</td></tr>
<tr><td colspan="5">Topics: Solar energy system, Solar Radiation, Availability, Measurement and Estimation, Solar Thermal Conversion Devices and Storage, Solar-Electrical Power Generation, general Solar Photo Voltaic (SVP) system, Different configurations, SPV system components and their characteristics, Stand-Alone and Grid Connected SPV systems</td></tr>
<tr><td>Module 3</td><td>Wind Energy</td><td>Paper Presentation</td><td>Programming/Simulation</td><td>11 Sessions</td></tr>
<tr><td colspan="5">Topics: Wind Energy Conversion, Potential, Nature of the wind, Wind Data and Energy Estimation, Site selection, Types of wind turbines, Wind farms, Wind Generation and Control using DFIG, classification of wind, characteristics, offshore wind energy – Hybrid systems, wind energy potential and installation in India.</td></tr>
<tr><td>Module 4</td><td>Integrated Energy Systems:</td><td>Paper Presentation</td><td>Simulation/Data Analysis</td><td>10 Sessions</td></tr>
<tr><td colspan="5">Topics: Introduction, Integrated Smart infrastructure, Integrated Energy system Modeling, Various Integrated energy schemes, their cost benefit analysis.</td></tr>
<tr><td colspan="5">Targeted Application & Tools that can be used:
Application Area is TATA Solar, Luminous, GE, Siemens, State and Regional load dispatch centres
Professionally Used Software: MI Power, MATLAB Simulink</td></tr>
<tr><td colspan="5">Text Book(s)
1: Renewable Energy- Edited by Godfrey Boyle-oxford university, press, 3rd edition, 2013.
2: Solar Photovoltaic Power Systems: Principles,Design and Applications, by <u>Dr. Sundaravadivelu S</u> (Author), <u>Mr. Suresh R. Norman</u> (Author), <u>Dr. Johnsi Stella I,</u> Notion Press, 2018.
Reference Book(s)
1. Integrated energy systems modeling--Karlsson, Kenneth Bernard; Skytte, Klaus Morthorst; Published in: DTU International Energy Report 2015
2. Solar Energy: Principles of Thermal Collection and Storage, S. P. Sukhatme and J. K. Nayak, TMH, New Delhi, 3rd Edition.
Online Resources
1. https://www.coursera.org/courses?query=solar%20energy
2. https://alison.com/courses/engineering/renewable-energy
3. https://www.youtube.com/watchv=mh51mAUexK4&list=PLwdnzlV3ogoXUifhvYB65lLJCZ74o_fAk&ab_channel=NPTELIITGuwahati
4. https://puniversity.informaticsglobal.com:2282/ehost/detail/detail?vid=3&sid=15d54a1f-070b-_4419-b1d2
5. https://www.tandfonline.com/doi/full/10.1080/23311916.2016.1189305</td></tr>
<tr><td colspan="5">Topics relevant to "EMPLOYABILITY SKILLS": Solar-Electrical Power Generation, Wind Generation, Wind Data and Energy Estimation for developing Employability skills through</td></tr>
</table>

Participative Learning techniques. This is attained through assessment component mentioned in course handout. **Topics relevant to "ENVIRONMENT AND SUSTAINIBILITY":** Over view of conventional & renewable energy sources, need, potential &development of renewable energy sources, Future of Energy Use, Global and Indian Energy scenario, Energy for sustainable development, renewable electricity and key elements, CO2 reduction potential of renewable energy	
Catalogue prepared by	Mr. Bishakh Paul
Recommended by the Board of Studies on	BoS No: 12th BoS held on 27/7/2021
Date of Approval by the Academic Council	16th Academic Council Meeting held on 23/10/2021

Course Code: EEE3401	**Course Title: Electrical Power Utilization** **Type of Course: Professional Elective & Theory Only**	**L-T-P-C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	EEE1200 Basics of Electrical and Electronics Engineering					
Anti-requisites	**Nil**					
Course Description	The purpose of this course is to enable the electrical power utilization, the course develops the ability to identify the importance of Electrical power in various utilities with illumination, heating and welding. The performance characteristics of electrical drives and their deployment with different loading environment. Also, the impact of acceleration, braking, retardation and adhesive weight in electric traction system is attained. The course aids the analytical skills in utility sector. 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 Utilization of Electrical Energy and attain **Employability Skills** through **Participative Learning** techniques.					
Course Outcomes	**On successful completion of the course the students shall be able to:** 1. Apply suitable electric heating and welding methods for industrial applications based on process requirements. 2. Calculate illumination parameters for various lighting systems using appropriate laws and photometric principles. 3. Calculate speed-time curves and train movement parameters for various traction services using standard equations of motion. 4. Solve traction-related problems using electric braking methods such as plugging, rheostatic braking, and regenerative braking. 5. Calculate tractive effort, power, and specific energy consumption for a given run in electric traction systems.					

Course Content:

Module 1	Electric Heating and Welding	Assignment	Data Collection	**10 Sessions**
Topics: Electric heating: Advantages and methods of electric heating, resistance heating induction heating and dielectric heating: Electric welding: resistance and arc welding, electric welding equipment, comparison between AC and Welding.				
Module 2	Illumination	Assignment/Case Study	Data collection	**10 Sessions**
Topics: Illumination: Introduction, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere. Sources of light: Discharge lamps, MV and SV lamps, basic principles of light control, types and design of lighting and flood lighting.				

Module 3	Train Mechanics	Assignment/Case Study	Data collection	**13 Sessions**
Topics: System of electric traction and track electrification, special features of traction motor, methods of electric braking-plugging, rheostat braking and regenerative braking, mechanics of train movement, speed-time curves for different service.				
Module 4	Electric Traction	Assignment/Case Study	Simulation/Data Collection/	**12 Sessions**
Topics: Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight and braking retardation adhesive weight and coefficient of adhesion.				

Targeted Application & Tools that can be used:
Application Area is Power System utilization in real time. Professionally Used Software: MATLAB.

Text Book:

1. S Sivarnagaraju, D Srilatha, M Balasubbareddy, "Generation and Utilization of Electrical Energy", Pearson Education India, 1st Edition, 2010.
2. Utilization of Electric Power & Electric Traction. J. B. Gupta. S. K. Kataria & Sons, New Delhi, Latest edition.

References

1. N V Suryanarayana, "Utilization of Electrical Power including Electric drives and Electric traction New Age International (P) Limited, Publishers, 1st Edition, 1996.
2. C L Wadhwa, "Generation, Distribution and Utilization of electrical Energy", New Age International (P) Limited, 1st Edition, 1997.
3. Partab, "Art & Science of Utilization of electrical Energy", Dhanpat Rai &Sons 2nd Edition, 2000.
4. E Openshaw Taylor, Orient Longman, "Utilizations of Electric Energy", 1st Edition, 2003.

Online Resources:

1. EBook: https://presiuniv.knimbus.com/user#/home
2. https://nptel.ac.in/noc/courses/noc20/SEM2/noc20-ee99/
3. 2G59q7SbOts062q7JKtJzxgeKzs3nhqeNOtqqrUd%2bprkWyq99%2bq9eze7Kj30zhqrFP4qyzebbZvorj2.ueLpOLfhuWz44ak2uBV59%2fmPvLX5VW%2fxKR57LOvUbWntk6xraR%2b7ejrefKz7nzkvPOE6srjkPIA&vid=29&sid=5ac3e684-9a30-45af-a5c4-a4c437d65a8c@redis.

Topics relevant to "EMPLOYABILITY SKILLS": Design of lighting and flood lighting, methods of electric braking-plugging, rheostat braking and regenerative braking for developing **Employability Skills** through **Participative Learning Techniques**. This is attained through assessment component mentioned in Course Plan.
Topics relevant to "HUMAN VALUES & PROFESSIONAL ETHICS": Standard Test methods, safety procedure.

Catalogue prepared by	Dr. K Sreekanth Reddy
Recommended by the Board of Studies on	12th BoS held on 27/7/2021
Date of Approval by the Academic Council	16th Academic Council Meeting held on 23/10/2021

Course Code: EEE3402	**Course Title: Power System Operation and Control** **Type of Course: Discipline Elective & Theory only**	**L-T-P-C**	3	0	0	3
Version No.	**3.0**					

Course Pre-requisites	EEE2506 Transmission and Distribution			
Anti-requisites	**NIL**			
Course Description	The purpose of this course is to introduce the operation and control of power systems. The course develops analytical ability to study the unit commitment for load dispatch, load frequency control, effective generation in interconnected power systems. The course aids the analytical skills in effective operation of power system. This course develops programming abilities with the help of MATLAB software tools.			
Course Objective	The objective of the course is to familiarize the learners with the concepts of Power System Operation and Control and attain **Employability Skills** through **Participative Learning** techniques.			
Course Out Comes	**On successful completion of the course the students shall be able to:** 1. Demonstrate the unit commitment problem for economic load dispatch. 2. Describe the knowledge of LFC of a single Area System. 3. Describe the knowledge of LFC of a Two Area System. 4. Inspect the usage of energy with limited resources and interchange in inter connected power systems.			
Course Content:				
Module 1	Unit Commitment Problem and Solution for Optimal Power Flow	Assignment	Data Collection	**10 Sessions**
Topics: Introduction, Operating States of Power System, Objectives of Control, Key Concepts of Reliable Operation, Preventive and Emergency Controls, Energy Management Centers. Constraints in UCP, UCP solution methods. Priority list method, introduction to Dynamic programming Approach. OPF without inequality constraints, inequality constraints on control variables and dependent variables.				
Module 2	LFC for Single Area System	Assignment/Case Study	Data collection	**12 Sessions**
Topics: Definition of control area, single area control, Block diagram representation of an isolated Power System, Steady State analysis, Dynamic Response-Uncontrolled case. Proportional plus Integral control of single area and its block diagram representation, steady state response.				
Module 3	LFC for Two Area System	Assignment/Case Study	Data collection	**12 Sessions**
Topics: Load frequency control of two-area system, uncontrolled case and controlled case, tie-line bias control, steady state representation. Optimal two-area LF control- performance Index and optimal parameter adjustment. Load frequency control and Economic dispatch control, regulation of two generators in parallel.				
Module 4	Generation based on limited Supply of Energy	Assignment/Case Study	Simulation/Data Collection/	**10 Sessions**

Topics: Take-or-pay fuel supply contract, composite generation production cost function. Solution by gradient search techniques, Hard limits and slack variables, Fuel scheduling by linear programming. PMU – system monitoring, data acquisition and controls – System hardware configurations – SCADA and EMS functions – state estimation problem – measurements and errors.
Targeted Application & Tools that can be used: Application Area is Power System operation in real time. Professionally Used Software: MATLAB and Simulink and MI Power.
Text Books 1. Power Generation, Operation and Control - by A.J. Wood and F.Wollenberg, John wiley & sons Inc. 1984. 2. Modern Power System Analysis - by I.J. Nagrath & D.P. Kothari, Tata McGraw-Hill Publishing Company ltd, 2nd edition.
Topics relevant to "EMPLOYIBILITY SKILLS": Load frequency control of two-area system, uncontrolled case and controlled case, tie-line bias control, steady state representation for Developing **"Employability Skills"** through **Participative Learning Techniques**. This is attained through assessment components mentioned in course handout.

Catalogue prepared by	Mr Bishakh Paul
Recommended by the Board of Studies on	12th BoS held on 27/07/2021
Date of Approval by the Academic Council	16th Academic Council meeting held on 23/10/2021

Course Code: **EEE3403**	**Course Title: Energy Audit and Demand side Management** **Type of Course: Professional Elective & Theory only**	**L- T- P- C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	EEE2506 Transmission and Distribution EEE2507 Electrical Power Generation and Economics					
Anti-requisites	**NIL**					
Course Description	Energy Audit helps to map the flow of energy (in its various forms) across the value chain, highlighting areas for interventions. It also introduces to the methods of evaluating lifetime of machine based on time value money and demand, economic analysis with respect to demand side management. This course is designed to develop analytical ability on the mechanism of energy audit and the technologies/simulation tools typically employed to undertake an audit exercise, supported by case studies & site visits.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Energy Audit and Demand side Management and attain **Entrepreneurial Skills** through **Problem Solving** methodologies.					
Course Outcomes	**On successful completion of this course the students shall be able to:** 1. **Describe** the need of energy audit and energy audit methodology. 2. **Explain** audit parameters and working principles of measuring instruments used to measure the parameters.					

	3. **Illustrate** energy audit of boilers, furnaces, power plant, steam distribution system and compressed air systems. 4. **Illustrate** energy audit HVAC systems, motors, pumps, blowers and cooling towers. 5. **Explain** load management techniques, effects of harmonics, electricity tariff, improvement of power factor and losses in transmission.			
Course Content:				
Module 1	**Energy Audit: Methodology and Types**	Assignment	Data Collection	**11 Sessions**
Topics: Energy Scenarios: Energy Conservation, Energy Audit, Energy Scenarios, Energy Consumption, Energy Security, Energy Strategy, Codes, standards and Legislation. Definition of Energy Audit, Place of Audit, Energy – Audit Methodology, Financial Analysis, Sensitivity Analysis, Project Financing Options, Energy Monitoring and Training.				
Module 2	**Energy Audit: Boilers & Buildings**	Case Study/ Assignment	Data Collection/ Design	**9 Sessions**
Topics: Classification of Boilers, Parts of Boiler, Efficiency of a Boiler, Role of excess Air in Boiler Efficiency, Energy Saving Methods. Energy Audit Applied to Buildings: Energy – Saving Measures in New Buildings, Water Audit, Method of Audit, General Energy – Savings Tips Applicable to New as well as Existing Buildings.				
Module 3	**Energy Audit of HVAC Systems**	Case study	Data Collection	**11 Sessions**
Topics: Introduction to HVAC, Components of Air – Conditioning System, Types of Air – Conditioning Systems, Human Comfort Zone and Psychrometry, Vapour – Compression Refrigeration Cycle, Energy Use Indices, Energy – Saving Measures in HVAC, Star Rating and Labelling by BEE. Electrical-Load Management: Electrical Basics, Electrical Load Management, Variable- Frequency Drives, Harmonics and its Effects, Electricity Tariff, Power Factor.				
Module 4	**Energy Audit: Motors, Lighting system and DSM**	Assignment/ Presentation	Data Collection / Estimation	**14 Sessions**
Topics: Energy Audit of Lighting Systems: Fundamentals of Lighting, Different Lighting Systems, Ballasts, Fixtures (Luminaries), Reflectors, Lenses and Louvres, Lighting Control Systems, Lighting System Audit, Energy Saving Opportunities. Demand side Management: Scope of DSM, Evolution of DSM concept, DSM planning and Implementation, Load management as a DSM strategy, Applications of Load Control, End use energy conservation, Tariff options for DSM.				
Targeted Application & Tools that can be used: Application Area is Power System Data collection, Electricity Transmission and Distributed companies, Power Grid and State Electricity Boards **Professionally Used Software:** Mi Power/ PS CAD				
Textbooks: 1. **"**Industrial Energy management systems" Array .C, White,Philip S, David R Brown, Hemisphere publishing corporation, New York. 2. "Handbook on Energy Audit "Sonal Desai McGraw Hill 1st Edition, 2015				
References **1.** "Energy management "by W.R. Murphy & G. Mckay Butter worth, Heinemann publications. **Online resources:** 1. https://www.youtube.com/watch?v=iY2YaIlfEGk 2. https://vemu.org/uploads/lecture_notes/03_01_2020_1480276911.pdf 3. https://idoc.pub/documents/anilkumar-km-notes-for-energy-auditing-demand-side-management-unit1-1pdf-klzzqgxxpglg				

4. Case study: A Research article onDemand Side Management: Demand Response, Intelligent Energy Systems, and Smart Loads 5. Ebook: https://puniversity.informaticsglobal.com:2069/document/7503335
Topics relevant to "ENTREPRENEURIAL SKILLS": The load Management techniques, effects of harmonics, electricity tariff, improvement of power factor and losses in transmission for developing **Entrepreneurial Skills** through **Problem Solving methodologies.** This is attained through assessment component mentioned in course handout. **Topics relevant to HUMAN VALUES and PROFESSIONAL ETHICS:** Energy- Saving measures in New buildings, Audit, Saving Tips .

Catalogue prepared by **Catalogue Updated by**	Ms. Ramya N Mr. K Sreekanth Reddy
Recommended by the Board of Studies on	BoS No: 12th BoS held on 27/7/2021
Date of Approval by the Academic Council	16th Academic Council Meeting held on 23/10/21

Course Code: **EEE3404**	**Course Title: Microgrid Operation and Control** **Type of Course: Professional Elective & Theory only**	**L-T- P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	**EEE2508 Power Electronics**					
Anti-requisites	**NIL**					
Course Description	The course describes the concept of Microgrid with emphasis on its configuration, characteristics, distributed renewable and non-renewable generation technologies. The course deals with the IEEE standard used for DER Integration I, integration of solar sources and PV control. The course is conceptual in nature and improves analytical skills.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Microgrid Operation and Control and attain **Employability Skills** through **Participative Learning** techniques.					
Course Outcomes	**On successful completion of this course the students shall be able to:** 1. **Outline** the significance of microgrid in big utility grid. 2. **State** IEEE standard 1547-2018 while designing the controllers. 3. **Explain** PWM based controllers to extract maximum power from SPV system 4. **Summarize** the hierarchical microgrid control					
Course Content:						
Module 1	Concept of Microgrid	Assignment	Data Analysis	**8 Sessions**		
Topics: Concept of Microgrid, Distributed generation and Microgrid concept: Introduction, Power System Structure, Traditional Grid, Microgrid definition and characteristics, typical micro grid configuration, distributed renewable energy technologies, non-renewable distributed generation technologies, interconnection of microgrids, technical and economical advantages of micro grid, key challenges,						
Module 2	DER integration I	Quiz	Data Analysis	**7 Sessions**		

Topics: IEEE Standard for Interconnection (IEEE Std 1547™-2018) : concept of area electric power system, point of common coupling, point of coupling, General interconnection technical specifications and performance Requirements, Reactive power capability and voltage/power control requirement, Voltage and Frequency disturbance ride-through requirements				
Module 3	DER integration II	Assignment	Simulation	**7 Sessions**
Topics: Integration of solar sources: Modeling of the Entire PV Energy Conversion System, PV Controller, EES Controller, Grid Connection Control. Steps of control of entire PV energy system. Integration of wind power: Speed and power relations, Power extracted from the wind, Aerodynamic torque control, Control of a PMSG based wind energy generation system.				
Module 4	DER integration III	Case study	Programming	**11 Sessions**
Topics: Hierarchical Microgrid Control, Local or primary Control : Droop Control, Droop Control in Inverter-based Distributed Generators, performance of primary controller, Secondary Control and Tertiary Control. Centralized and decentralized Energy Management System (EMS) in microgrids				
Targeted Application is Power-grid, KPTCL ,BHEL. **Tools that can be used: MATLAB**				
Text Books 1. " H. Lee Willis, Walter G. Scott, 'Distributed Power Generation – Planning and Evaluation', Marcel Decker Press, 2000. 2. Robert Lasseter, Paolo Piagi, 'Micro-grid: A Conceptual Solution', PESC 2004, June 2004.				
References 1.M. Godoy Simoes, Felix A. Farret, 'Renewable Energy Systems – Design and Analysis with Induction Generators', CRC press. 2.F. Katiraei, M.R. Iravani, 'Transients of a Micro-Grid System with Multiple Distributed Energy Resources', International Conference on Power Systems Transients (IPST'05) in Montreal, Canada on June 19-23, 2005. **Online resources** **Case Study** 1. https://www.electricalindia.in/power-distribution-systems-in-india/Assignment 2. https://onlinelibrary.wiley.com/doi/full/10.1002/2050-7038.12885 3. https://puniversity.informaticsglobal.com				
Topics relevant to "EMPLOYABILITY SKILLS": Reactive power capability and voltage/power control requirement for developing **Employability Skills** through **Participative Learning techniques**. This is attained through the assessment component mentioned in course handout.. **Topics relevant to "ENVIRONMENT & SUSTTAINABILITY":** Integration of solar sources, PV Energy Conversion System, wind energy generation system.				
Catalogue prepared by	Ms Jisha L k/Mr Sumit Kumar Jha			
Recommended by the Board of Studies on	15th BoS held on 27/7/2022			
Date of Approval by the Academic Council	18th Academic Council Meeting held on Dated 03/08/2022			

Course Code: EEE3405	**Course Title: Smart Grid Technologies** **Type of Course: Professional Elective Elective & Theory only**	**L-T-P- C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	EEE2506 Transmission and Distribution EEE2507 Electrical Power Generation and Economics					
Anti-requisites	**NIL**					
Course Description	The purpose of this course is to enable to realize the need for smart grid architecture and role of information and communication technology (ICT) in					

	smart grid. The course needs basic knowledge of power generation, transmission and distribution scheme. The course is both conceptual and analytical in nature and help students to develop critical thinking abilities in building simulation models through projects and case studies/ Assignments.			
Course Objective	The objective of the course is to familiarize the learners with the concepts of Smart Grid Technologies and attain **Employability Skills** through **Participative Learning** techniques.			
Course Outcomes	**On successful completion of this course the students shall be able to:** 1: **Compare** the concepts of traditional grid to Smart Grid. 2: **Summarize** the aspects of communication and information technologies in Smart grid 3: **Explain** the key components of Smart metering and related communication protocols. 4: **Describe** the components of modern substation and Distribution management system 5: **Distinguish** different types of Energy storage Technologies in Smart Grid			
Course Content:				
Module 1	Basic Concepts of Smart Grid	Assignment	Data collection Task	**4 Sessions**
Topics: **Definitions of SG – SG Domains – Functionalities of SG –ICT in SG – Issues and Challenges in SG – Characteristics of SG – Overview of technologies required for smart grid**				
Module 2	Communication and information technology in Smart Grid and smart metering.	Assignment	Data collection task	**14 Sessions**
Topics: Data communication -Dedicated and shared communication channels -Switching techniques- Communication channels - Layered architecture and protocols. Smart metering – Smart Meters-Overview -Communications infrastructure and protocols for smart metering – Demand side Management				
Module 3	Distribution Automation and DMS	Simulation Project/ programming/Case study	Data Analysis	**10 Sessions**
Topics: Distribution automation equipment - Introduction -Substation automation equipment, Faults in distribution systems, Voltage regulation Distribution Management Systems –Introduction, SCADA, Modelling and analysis tools, Applications of DMS				
Module 4	Energy Storage Technologies in SG.	Case study / Presentation	Data collection	**4 Sessions**
Topics: Energy Storage system – Introduction –Application areas of Energy storage systems-Different Energy storage technologies.				
Targeted Application & Tools that can be used: Application Area is Power System Data collection, Electricity Transmission and Distributed companies, Power Grid and State Electricity Boards Professionally Used Software: Mi Power/ PS CAD, NexGrid				
Textbook Book(s) 1. "Smart Grid Technologies and Applications" Janaka Ekanayake et al, Wiley 2012 2. Smart Grid: Fundamentals Of Design And Analysis by James Momoh, John Wiley, 2015. **Reference Book(s)** 1. Kundur P., „Power System Stability and Control, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 10th reprint, 2010. 2. Pai M A, „Computer Techniques in Power System Analysis", Tata Mc Graw-Hill Publishing Company Ltd., New Delhi, Second Edition, 2007 "Gonen"				

Web Resources: 1. https://onlinecourses.nptel.ac.in/noc19_ee64/preview 2. https://npti.gov.in/smart-grid-technologies 3. https://nmcdn.io/e186d21f8c7946a19faed23c3da2f0da/8273a55233334806bb7a7189b8794fba/files/e-learning-center/Smart-Grid-Curriculum-Unit1.pdf 4. **https://www.youtube.com/watch?v=KgVFJnmJvKk&list=PLLy_2iUCG87D59Bc8Jqfqt43LvPC0KgC&ab_channel=IITRoorkeeJuly2018** 5. https://puniversity.informaticsglobal.com:2282/ehost/detail/detail?vid=3&sid=15d54a1f-070b-4419-b1d2 6. https://www.cs.cmu.edu/~jmartins/smart.html 7. Ebook: https://presiuniv.knimbus.com/user#/home
Topics relevant to "EMPLOYABILITY SKILLS": Substation automation equipment, Faults in distribution systems, Voltage regulation for developing **Employability Skills** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout. **Topics relevant to development of "ENIVIRONMENT AND SUSTAINABILITY":** Different Energy storage technologies.

Catalogue prepared by	Ms. Ramya N
Recommended by the Board of Studies on	12th. BoS held on 27/7/2021
Date of Approval by the Academic Council	16th Academic Council meeting held on 23/10/2021

Course Code: EEE3406	**Course Title: Big Data Analytics in Power System** **Type of Course Professional Elective &Theory only**	**L-T-P- C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	EEE2506 Transmission and Distribution EEE2507 Electrical Power Generation and Economics.					
Anti-requisites	**Nil**					
Course Description	This course introduces power system developments that lead to high data collection. The internet of things relies on a vast number of smart machines connected without human intervention in a smart grid scenario. The course identifies and analyses the various sources of big data used in general and in power systems; the importance of data in analytics in smart grid communication; an emphasis on optimization techniques; data mining techniques used in distribution systems; and power system severity prediction using big data and machine learning. Critical thinking and analysis are taught. Assignments boost programming and simulation skills.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Big Data Analytics in Power System and attain **Employability Skills** through **Participative Learning** techniques.					
Course Out Comes	**On successful completion of the course the students shall be able to:** 1. **Identify** the various sources of data in power system. 2. **Explain** the role of big data in smart grid communications. 3. **Explain** the concept of optimization of big data in electric power systems.					

	4. **Describe** the various data mining techniques to optimize the big data in power system. 5. **Describe** the severity prediction of power system by using Big data and machine learning.			
Course Content:				
Module 1	Role of Big Data Analytics in Power System Application	Assignment	QUIZ/True or FALSE Type	**10 Sessions**
Topics: Introduction Big Data, Big Data: Why and Where, General Applications of Big Data, Characteristics of Big Data and Dimensions of Scalability. Big Data Role in Power System, Sources of Big Data in Power System, Big Data Characteristics in Power System, Important applications of Big Data in Power System Sector.				
Module 2	Big Data in Smart Grid communications	Case Study	Data collection of Local distribution systems and data analysis.	**10 Sessions**
Topics: Introduction, The Grid Modernization, The Grid Interconnection with the Internet of Things, Data Traffic Pattern in a Smart Grid Environment, The Massive Flow of Information in a Smart Scenario, The Volume of Generated Data in a Smart Distribution System, Intelligent Data Collection Devices in Smart Grid: PMU: An Intelligent Data Collection Device in Smart Grid, Role of PMU in Smart Grid , Emerging Trends and BIg Data Analytics at Distribution level Grid , D PMUs: Design and Prototyping, Data Science Pertaining to field of Smart Grid , Smart Grid Use Cases, Analytics in Smart Grids. Tools and Technologies for Smart Grid.				
Module 3	Optimization Techniques of Big Data in Electric Power Systems	Assignment	Digital Report	**10 Sessions**
Topics: Big Data Optimization in Electric Power Systems: Introduction, Background, Scientometric Analysis of Big Data, Big Data and Power Systems, Optimization Techniques Used in the Big Data Analysis.				
Module 4	Data - Mining Methods in Distribution system.	Assignment	Technical Seminar	**10 Sessions**
Topics: Introduction, Transmission and Distribution System Losses, Electricity Theft Methods, Data Mining and Electricity Theft, Issues and Directions in Electricity Theft-Related Data-Mining Research.				
Module 5	Role of Big Data in Contingency Analysis	Case Study	Programming/ Simulation, Data Collection, Data analysis and prediction	**5 Sessions**
Topics: Introduction, Concept of Load Flow Studies, Contingency analysis, Data Processing and Preprocessing, Prediction of Severity of the System.				
Targeted Application & Tools that can be used: Professionally Used Software: MATLAB/Simulink/MI-Power/Python/R/Excel/HADOOP/Weka/Tensor Flow/AML/BigML.				
Text Book				

1. Big Data Application in Power Systems, by Reza Arghandeh (Editor), Yuxun Zhou (Editor), Elsevier Science (27 November 2017)
References 1. Big Data Analytics in Future Power Systems, by Ahmed F. Zobaa, Trevor J. Bihl, 2020 by CRC Press. 2. Smart Electrical and Mechanical Systems, by Rakesh Sehgal, Neeraj Gupta, Anuradha Tomar, Academic Press, 2022, ISBN 978-0-323-90789-7
Online Resources: 1. EBook:https://energyinformatics.springeropen.com/articles/10.1186/s42162-018-0007-5 2. Case study: EBook: https://presiuniv.knimbus.com/user#/home 3. Case study: https://www.sciencedirect.com/science/article/pii/B9780323907897010010
Topics relevant to development of "EMPLOYABILITY SKILLS": Smart Distribution System and interpret the collected data for the different time zones for developing **Employability skills** through **Participative Learning techniques.** This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mr. Ravi V Angadi
Recommended by the Board of Studies on	BoS No: 14th BoS held on 22/2/22
Date of Approval by the Academic Council	18th Academic Council Meeting held on 03/08/2022

Course Code: EEE3407	**Course Title: Energy Storage Systems** **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	The subject deals with various energy storage technologies, their configurations and working. The course also covers mobile and hybrid storage system used in Electric vehicles. The subject is conceptual and is directly related to Industrial applications. This course gives fair knowledge in various forms of energy and the need for the storage of energy. The course develops critical thinking and programming abilities of students.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Energy Storage 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] **Summarize** various energy storage technologies. 2] **Explain** different electrical energy storage systems. 3] **Explain** about mobile and hybrid energy storage devices. 4] **Describe** the energy management with storage systems.					
Course Content:						

Module 1	Introduction to energy storage systems	Assignment	Data Collection	**6 Sessions**
Introduction to energy storage systems- Role of energy storage systems, applications. Overview of energy storage technologies: Thermal, Mechanical, Chemical, Electrochemical, Electrical. Efficiency of energy storage systems.				
Module 2	Electrical energy storage	Assignment	Data Collection	**8 Sessions**
Electrical energy storage- Batteries, Super capacitors, Superconducting Magnetic Energy Storage (SMES), charging methodologies, SoC, SoH estimation techniques. Hydrogen production and storage, fuel cells. Numerical				
Module 3	Mobile storage system & Hybrid Energy storage systems	Case Study	Data Collection	**6 Sessions**
Mobile storage system: electric vehicle, G2V, V2G. Hybrid Energy storage systems: configurations and applications.				
Module 4	Storage for renewable energy systems	Case Study	Data Collection	**6Sessions**
Storage for renewable energy systems: Solar energy, Wind energy, pumped hydro energy, fuel cells. Energy storage in Microgrid and Smart grid.				
Module 5	Energy Management with storage systems	Assignment	Programming/Simulation/Data Collection/any other such associated activity	**7Sessions**
Energy Management with storage systems - Increase of energy conversion efficiencies by introducing energy storage Concept of Distributed Energy Storage System (DESS)				
Targeted Application & Tools that can be used: Application areas are in Power sector, Portable electronic devises, Electric and Hybrid Electric Vehicles etc **Professionally Used Software: MATLAB/Mi Power.**				
Textbooks 1. A. R. Pendse, "Energy Storage Science and Technology", SBS Publishers & Distributors Pvt. Ltd., New Delhi, (ISBN - 13:9789380090122), 2011. 2. Energy Storage: Fundamentals, Materials and Applications by Robert Huggins, Springer. **References Books** 1. James M. Eyer, Joseph J. Iannucci and Garth P. Corey ", "Energy Storage Benefits and Market Analysis", Sandia National Laboratories, 2004. 2. The Electrical Energy Storage by IEC Market Strategy Board. **Online Resources** 1. https://www.youtube.com/watchv=j7RaL_XKywk&ab_channel=EnergyConservationandWasteheatRecovery 2. https://ieeexplore.ieee.org/document/4635523 3. https://www.worldenergy.org/publications/entry/innovation-insights-brief-five-steps-to-energy-storage 4. https://puniversity.informaticsglobal.com:2282/ehost/detail/detail?vid=3&sid=15d54a1f-070b-_4419-b1d2. 5. https://energystorage.org/resources/industry-resources/case-studies/.				
Topics relevant to "EMPLYOBILITY SKILLS": Role of energy storage systems, applications, Energy Management with storage systems for developing **Employability skills** through **Participative Learning techniques.** This is attained through assessment component mentioned in course handout.				

Topics relevant to "ENVIRONMENT and SUSTAINABILITY": Storage for renewable energy systems, Distributed Energy Storage System (DESS)	
Catalogue prepared by	Ms. Jisha L K
Recommended by the Board of Studies on	12th BoS held on 27/7/21
Date of Approval by the Academic Council	16th Academic Council Meeting held on 23/10/2021

Course Code: EEE3408	**Course Title: Electrical Distribution System** **Type of Course: Professional Elective & Theory only**	**L- T- P- C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	EEE1200 Basics of Electrical and Electronics Engineering					
Anti-requisites	**Nil**					
Course Description	The course teaches electrical power distribution. The course covers supply system and distribution practises, load characteristics and load modelling, distribution feeders, voltage drop and power loss calculations, substation equipment, location and grounding, protection, system planning, and automation. Critical thinking and analysis are also taught. Improve design and simulation skills in the course with AutoCAD, MATLAB, MiPower, and other current tools.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Electrical Distribution System and attain **Skill Development** through **Participative Learning** methodologies.					
Course Out Comes	**On successful completion of the course the students shall be able to:** 1. **Determine** the various factors associated with the distribution systems. 2. **Sketch** the Single line diagram of various types of Substations. 3. **Calculate** the voltage drop for the given feeder system. 4. **Identify** the basic requirements of protection scheme and automation system.					
Course Content:						
Module 1	Introduction to Distribution Systems	Assignment	Programming	**10 Sessions**		
Topics: Introduction, supply systems, the distribution systems, load characteristics and load modelling: Loads and Load Characteristics, Various factors, Relation Between Load and Loss Factor: A Simplified Approach, Load Growth and Diversified Demands, Load Modeling, Load Growth and Forecasting.						
Module 2	Substations Equipment, Location and Grounding	Assignment	Design a SLD of SS using CAD Software.	**10 Sessions**		
Topics: Introduction, Substation Components, Symbols for Equipment in Sub-Stations, Classification of Sub-Stations, Comparison between Outdoor and Indoor Sub-Stations, Bus-Bar						

Arrangements in Sub-Stations, Key Diagram of 66/11 kV Sub-Station, Key Diagram of 11kV/400 V Indoor Sub-Station, Gas Insulated Substation (GIS), Grounding and Earth Connections and Earthing System.				
Module 3	Distribution Feeders	Assignment	Case Study	**10 Sessions**
Topics: Introduction, Primary and Secondary Distribution, Distribution Substation Location and Planning, Feeder Loading and Voltage-Drop Considerations, Voltage-Drop in Feeder Lines with Different Loadings, primary and secondary distribution networks and Design Considerations. Numerical examples on voltage droop in feeder.				
Module 4	Protection & Distribution system Automation	Assignment	Programming/Simulation	**10 Sessions**
Topics: Introduction, Basic Requirements, and Overcurrent Protection: Fuses, Circuit Breakers, Protective Relays and Relaying, Coordination Between Different Protective Devices. Distribution Automation: Basic Definitions, Project Planning, Communication, Sensors, Supervisory Control and Data Acquisition (SCADA), Consumer Information Service (CIS), Geographical Information System (GIS), Automatic Meter Reading (AMR) & Automation Systems.				

Targeted Application & Tools that can be used:

Various industries/ organization like KPTCL, HESCOM, BESCOM, CHESCOM, GESCOM, MESCOM and other states government and private sector working in the field of Power distribution analysis and protection system. Professionally Used Software: Mi Power/ ETAP/ MATLAB/PSCADA/Power World Simulator/PSSE.

Text Books

1. Electric Power Distribution – by A.S. Pabla, Tata McGraw–hill Publishing Company, 6th edition, 1997
2. Electric Power Distribution systems- by VKamaraju, Tata McGraw–hill Publishing company, 2009.

References

1. Electric Power Distribution system, Engineering – by TuranGonen, McGraw–hill Book Company.
2. Principles of Power System- by S. Chand Publishers (Revised Edition)
3. William H. Kersting, Distribution System Modeling and Analysis, CRC Press
4. Anthony J. Pansini, 'Guide to Electrical Power Distribution Systems, The Fairmont Press

online learning resources

9. EBook: https://presiuniv.knimbus.com/user#/home
10. Seminar: https://onlinecourses.nptel.ac.in/noc19_ee62/
11. Case Study:https://www.emerald.com/insight/content/doi/10.1108/eb010130/pdfplus/html
12. https://www.emerald.com/insight/content/doi/10.1108/COMPEL-12-2016-0586/pdfplus/html

Topics relevant to "SKILL DEVELOPMENT": Various types of Distribution Modelling and applications for **Skill Development** through **Participative Learning**. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	**Dr. Ravi V Angadi**
Recommended by the Board of Studies on	21st BoS, Held on 09/06/2025
Date of Approval by	26th Academic Council meeting held on 25th July 2025

the Academic Council	

Course Code: EEE3409	**Course Title: Power Market and Policy** **Type of Course: Professional Elective and Theory only**	**L-T-P-C**	3	0	0	3
Version No.	**1.0**					
Course Pre-requisites	EEE2507 Electrical Power Generation and Economics EEE2506 Transmission and Distribution					
Anti-requisites	**NIL**					
Course Description	This course explores the economics of electricity markets, pricing structures, regulatory frameworks, and environmental policies. It aims to provide students with a comprehensive understanding of how electricity markets operate and the economic principles that underpin them.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Power Market and Energy policies and attain **Employability Skills** through **Participative Learning** techniques.					
Course Out Comes	**On successful completion of the course the students shall be able to:** 1. **Summarize** the structure and functioning of electricity markets. 2. **Describe** the economic principles, regulatory frameworks and various agreements of electricity market. 3. **Explain** the market design and financial instruments in energy market. 4. **Interpret** environmental policies impact on energy markets.					
Course Content:						
Module 1	Introduction : Electricity Markets, Structure and Pricing	Assignment	Data Collection	**10 Sessions**		
Topics: Fundamental concepts of electricity markets, structure and operation, historical context of electricity markets, transition of regulated monopolies to competitive markets, key terminology in market, different market structures - monopoly, oligopoly, competitive markets, implications for pricing, pricing mechanisms – cost based pricing, market-based pricing, and demand response in price setting.						
Module 2	Economic Principles and Regulatory Frameworks	Assignment/Case Study	Data collection	**12 Sessions**		
Topics: Overview of economic theories of electricity markets, supply and demand dynamics, price elasticity, and market equilibrium, real-world electricity market scenarios, regulatory environment governing electricity markets, roles of government agencies, regulatory bodies, and international agreements in market operations and competition.						
Module 3	Electricity Market Design and Financial Instruments	Assignment/Case Study	Data collection	**12 Sessions**		
Topics: Analysis of market design, role of market clearing mechanisms, capacity markets, and ancillary services, different market designs, financial instruments for electricity trading, contracts, options, and swaps, concept of market risk.						
Module 4	Renewable Energy Integration and Environmental Policies	Assignment/Case Study	Data Collection	**11 Sessions**		

Topics: Challenges and opportunities associated with integrating renewable energy sources in electricity markets, policies promoting renewable energy sources, analysis of environmental policies affecting electricity generation and consumption, carbon pricing, emissions trading systems, and renewable portfolio standards, market behavior and investment decisions.	
Targeted Application & Tools that can be used: Application Area is energy market in real time. Professionally Used Software: POMATO and NemSight.	
Text Books 1. Power System Economics: Designing Markets for Electricity by Steven Stoft. 2. Electricity Markets: Pricing, Structures and Economics by Chris Harris. 3. Energy Policy and the Environment: A Global Perspective by J.R. Moroney. 4. The Economics of Electricity Markets by Marija Ilic and Ljupco Kocarev.	
Topics relevant to "EMPLOYIBILITY SKILLS": Pricing mechanisms, regulatory environment governing electricity markets, Analysis of market design, financial instruments for electricity trading for Developing **"Employability Skills"** through **Participative Learning Techniques.** This is attained through assessment components mentioned in course handout.	
Catalogue prepared by	Dr. D P Somashekar
Recommended by the Board of Studies on	21st BoS, Held on 09/06/2025
Date of Approval by the Academic Council	26th Academic Council meeting held on 25th July 2025

Professional Elective Courses (PEC)

Track 3: Automotive Electronics Basket

Course Code: EEE3500	**Course Title: Electric Vehicle Technology** **Type of Course: Professional Elective and Theory only**	**L-T- P-C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	EEE1200 Basics of Electrical and Electronics Engineering					
Anti-requisites	NIL					
Course Description	This course introduces the fundamental concepts, principles, analysis and design of hybrid and electric vehicles. This course helps students to understand vehicle mechanics and working of Electric Vehicles and recent trends. The course enables them to analyze different power converter topology used for electric vehicle applications. Also, it provides the ability to develop the electric propulsion unit and its control for application of electric vehicles through assignments. The course is both conceptual and analytical in nature and needs fair knowledge of mathematical and computing. The course develops the critical thinking and analytical skills.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Electric Vehicles and attain **Entrepreneurial Skills** through **Participative Learning** techniques.					
Course Out Comes	**On successful completion of the course the students shall be able to:** 1. **Describe** the fundamental laws and vehicle mechanics. 2. **Explain** the basics of electric and hybrid electric vehicles, their architecture, technologies and fundamentals. 3. **Analyze** DC and AC drive topologies used for electric vehicle application.					

	4. **Summarize** different energy storage technologies used for hybrid electric vehicles and their control.			
Course Content:				
Module 1	Introduction and Vehicle Fundamentals	Assignment	Computation and Data Analysis	**No. of Sessions : 6**
Introduction : Environmental Impact and History of Modern Transportation, Vehicle fundamentals: General Description of Vehicle Movement, Vehicle Resistance, dynamic equation, tractive force Determination; vehicle parameters and performance metrics.				
Module 2	Electric and Hybrid Electric Vehicles	Quiz	Data collection and Analysis	**of Sessions: 10**
Electric Vehicles: Architecture of an electric vehicle, essentials and performance of electric vehicles – Traction motor characteristics, tractive effort, transmission requirements, vehicle performance, energy consumption, advantage and limitations Hybrid electric drivetrains: Concepts, architecture, design, control strategies, merits and demerits, Sizing of major components.				
Module 3	Electric Propulsion Systems	Case study	Simulation and data analysis	**No. of Sessions:8**
Electric Propulsion Systems: DC motor drives, induction motor drives and permanent magnet motor drives, switched and synchronous reluctance				
Module 4	Energy storage Devices	Assignment	Data collection	**No. of Sessions:8**
Energy storage Devices: Electrochemical batteries – Reactions, thermodynamic voltage, lead-acid batteries, nickel based batteries, lithium based batteries, flywheel and ultra-capacitors, Battery management systems.				

Targeted Application & Tools that can be used:

Application: Automotive industry.

Software tools: Matlab-Simulink

Text Book

1.Mehrdad Ehsani, YiminGao, sebastien E. Gay and Ali Emadi, —Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design‖, CRC Press, 2009.

2. Iqbal Husain, —Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2011, Second Edition.

References

1. James Larminie and John Loury, —Electric Vehicle Technology-Explained‖, John Wiley & Sons Ltd., 2003, Second Edition.

2. C.C. Chan and K.T. Chanu Modern Electric Vehicle Technology, OXFORD University, 2011

3. Sheldon S. Williamson,- Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles, Springer,2013

4. Chris Mi, M. A. Masrur and D. W. Gao, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", John Wiley & Sons, 2011, Second Edition

Online resources:

1.https://nptel.ac.in/courses/108/102/108102121/

2.https://nptel.ac.in/courses/108/106/108106170/

3.IEEE Explore - School of Engineering

4.https://www.coursera.org/learn/electric-vehicles-mobility

5.Seminar**:**https://puniversity.informaticsglobal.com:2069/search/searchresult.jsp?newsearch=true&queryText=ELECTRIC%20VEHICLES

6.Video: https://www.youtube.com/watch?v=GHGXy_sjbgQ

7.Text book of Electric and Hybrid Vehicles : Power Sources, Models, Sustainability, Infrastructure and the Market, Gianfranco Pistoia, 1st ed. Amsterdam : Elsevier. 2010 https://puniversity.informaticsglobal.com:2284/ehost/detail/detail?vid=0&sid=52da4e6e-8813-45d5-87f9-73b9f493f358%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=342445&db=nlebk

Case Study:

I.https://www.simpli.com/answers

II. https://www.upgrad.com/ev_technology/iit-delhi
III. https://www.coursera.org/

Topics relevant to "ENTREPRENEURIAL SKILLS": Vehicle fundamentals, total tractive effort calculation and design of drive train for different vehicle architectures for developing **Entrepreneurial Skills** through **Participative Learning techniques.** This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Ms. Ragasudha C P
Recommended by the Board of Studies on	BoS No: 14th BoS held on 22/2/2022
Date of Approval by the Academic Council	18th Academic Council meeting held on 3/8/2022

Course Code: EEE3501	**Course Title: Battery Management Systems** **Type of Course: Professional Elective and 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 will provide a firm foundation on the architecture and functioning of battery-management-system, how Lithium-ion batteries work and how to model their behavior mathematically. It also gives an exposure to the role of battery management system in Electric Vehicles. The course is of analytic type which involves building the equivalent circuit models of batteries and learning various algorithms. The course develops analytical and problem-solving abilities.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Battery Management Systems and attain **Entrepreneurial Skills** through **Problem Solving** methodologies.					
Course Out Comes	On successful completion of the course the students shall be able to: 1. **Summarize** the basic components and functionality of the Battery Management System 2. **Explain** various requirements and topologies of Battery Management System. 3. **Explain** various algorithms used in Battery Management System 4. **Describe** the Battery Management System of Electric Vehicles. 5. **Describe** the function of battery in electric vehicle application.					
Course Content:						
Module 1	Introduction to Battery Management Systems	Assignment	Data Analysis	**6 Sessions**		
Topics: Introduction to Battery Management Systems (BMS), important terminology used to describe battery cells, Architecture of BMS, Classification of BMS, principles of operation of standard electrochemical battery cells.						
Module 2	Lithium-ion cells			**8 Sessions**		
Topics: Lithium-ion cells - Advantages of Lithium-ion cells over standard electrochemical battery cells, primary components of Lithium-ion cells, and their working. Equivalent circuit model Lithium – ion cells and the simulation						

Module 3	BMS requirements & BMS Topologies	Assignment	Problem Solving	**6 Sessions**
Topics: BMS requirements - Requirements for sensing and high-voltage control, requirements for protection, interface, performance management, and diagnostics, BMS Topologies - Distributed topology, modular topology and centralised topology				
Module 4	Algorithms used in BMS	Assignment	Problem Solving	**8 Sessions**
Topics: Algorithms used in BMS - Cell Balancing Algorithm, Communication Algorithms, Battery Pack Balancing and Power Estimation, numerical				
Module 5	BMS in Electric Vehicles	Assignment	Problem Solving	**6 Sessions**
Topics: BMS in Electric Vehicles- Functions of BMS in EVs and HEVs, IoT-Based Battery Management System for EVs				

Targeted Application & Tools that can be used:

BMS is an integral part of smart phones, EVs and HEVs, Laptops etc.
Software tools: Matlab/Simulink can be used to model and test BMS model.

TextBooks

1. Davide Andrea, "Battery management Systems for Large Lithium-Ion Battery Packs", Artech House, 2010.
2. Battery Management Systems, Volume I: Battery Modeling **by Gregory L. Plett**

References

1. Iqbal Hussain, "Electric and Hybrid Vehicles-Design Fundamentals", CRC Press, Second Edition, 2011.
2. Chris Mi, MA Masrur, and D W Gao, "Hybrid Electric Vehicles- Principles and Applications with Practical Perspectives", Wiley, 2011
3. Mehrdad Ehsani, Yimin Gao, Ali Emadi, "Modern Electric, Hybrid Electric and Fuel Cell Vehicles; Fundamentals Theory and Design", Second Edition, CRC Press.

Online resources:

1. https://puniversity.informaticsglobal.com/openFullText.html?DP:2232/cgi-bin/koha/opac-detail.plbiblionumber=8072&query_desc=kw%2Cwrdl%3A%20Electronic%20Devices%20and%20Circuits
2. https://www.coursera.org/learn/battery-management-systems
3. https://www.youtube.com/watch?v=MZyY1dpka7c
4. https://www.youtube.com/watch?v=jFMvphaEiJs

Topics relevant to " ENTREPRENEURIAL SKILLS": BMS in Electric Vehicles, Functions of BMS in EVs and HEVs, IoT-Based Battery Management Systems for EVs for developing **Entrepreneurial Skills** through **Problem Solving** methodologies**.** This is attained through assessment components mentioned in the course handout.

Topics relevant to "ENVIRONMENT AND SUSTAINABILITY": Battery cells, Lithium-ion cells, Battery Pack Balancing and Power Estimation.

Catalogue prepared by	Ms. Ramya N
Recommended by the Board of Studies on	BoS No: 12th BoS held on 27/7/21
Date of Approval by the Academic Council	16th Academic Council Meeting held on 23/10/2021

<table>
<tr><td>Course Code:
EEE3502</td><td colspan="4">Course Title: Automotive Embedded Systems
Type of Course:
Professional 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="9">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="9">ECE2521 Embedded system design using Microcontrollers
ECE2021 Digital Electronics</td></tr>
<tr><td>Anti-requisites</td><td colspan="9">NIL</td></tr>
<tr><td>Course Description</td><td colspan="9">This course gives an introduction to embedded systems design and implementation and provides the fundamental skill to assemble the hardware components, program using software and interface with other devices. This course offers a range of topics of immediate relevance to industry.</td></tr>
<tr><td>Course Objective</td><td colspan="9">The objective of the course is to familiarize the learners with the concepts of Automotive Embedded Systems 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:
1. Identify the Embedded system components.
2. Explain the various technological aspects of embedded systems.
3. Illustrate software aspects and programming concepts to the design of Embedded System.
4. Demonstrate the interfacing subsystems with external systems.</td></tr>
<tr><td>Course Content:</td><td colspan="9"></td></tr>
<tr><td>Module 1</td><td colspan="3">Concept of Embedded System Design</td><td>Assignment</td><td colspan="2">Data Analysis</td><td colspan="2">6 Sessions</td></tr>
<tr><td colspan="10">Topics: Components, classification, skills required. Embedded Micro controller cores: Architecture of 6808 and 6811. Embedded Memories ROM variants, RAM</td></tr>
<tr><td>Module 2</td><td colspan="3">Technological Aspects of Embedded System</td><td>Assignment</td><td colspan="2">Problem Solving</td><td colspan="2">10 Sessions</td></tr>
<tr><td colspan="10">Topics: Applications of embedded system: Examples of Embedded systems SOC for bar code scanner. Interfacing between analog and digital blocks, Signal conditioning, digital signal processing, DAC & ADC interfacing, Sample & hold, multiplexer interface Internal ADC interfacing (excluding 6805 & 6812)</td></tr>
<tr><td>Module 3</td><td colspan="3">Design Trade Offs</td><td>Assignment</td><td colspan="2">Problem Solving</td><td colspan="2">8 Sessions</td></tr>
<tr><td colspan="10">Topics: Data Acquisition System and Signal conditioning using DSP, Issues in embedded system design. Design challenge, design technology, trade-offs. Thermal considerations</td></tr>
<tr><td>Module 4</td><td colspan="3">Embedded Systems and Subsystem interfacing</td><td>Assignment</td><td colspan="2">Quiz</td><td colspan="2">12 Sessions</td></tr>
<tr><td colspan="10">Topics: Real time programming Languages, operating systems. Programming concepts and embedded programming in C. Round Robin, Round Robin with interrupts, function queue-scheduling architecture.
Subsystem interfacing: With external systems user interfacing, Serial I/O devices, Parallel port interfaces: Input switches, Key boards and Memory interfacing.</td></tr>
<tr><td colspan="10">Targeted Application & Tools that can be used:
Application Area is Aerospace and defense electronics, Robotics, Automotive, broadcast and entertainment, consumer and internet appliances, Data Imaging, Data Communications, Telecommunications and Mobile data infrastructure Industries.
Professionally Used Software: MP LAB, Visual Studio, PROTEUS SOFTWARE,AVR STUDIO SOFTWARE,ATMEGA16</td></tr>
<tr><td colspan="10">TextBooks:</td></tr>
</table>

1. "Embedded Microcomputer systems: Real time interfacing" Valvano J.W, Cengage Learning, 2nd Edition.
2. "Embedded System, Architecture, Programming and Design" Raj Kamal TMH, 2nd Edition 2008.

References

1. "The Art of Designing Embedded systems" Jack Ganssle Newnes 2 nd Edition, 2008.
2. A Unified Hardware/Software Introduction, Frank Vahid, Tony Givargis Wiley student edition 2002.

Online resources:

1. https://skill-lync.com/electrical-engineering-courses/introduction-automotive-embedded- systems-autosar/about
2. https://dl.acm.org/doi/10.5555/1523336
3. https://cse.buffalo.edu/~bina/cse321/fall2015/Automotive-embedded-systems.pdf
4. Seminar:https://puniversity.informaticsglobal.com:2069/search/searchresult.jsp?newsearch=true&qu eryText=op%20amps
5. Video: https://www.youtube.com/watch?v=yfl7lSZU5pg.
6. Ebook: https://d1.amobbs.com/bbs_upload782111/files_38/ourdev_629261ASTZIF.pdf.
7. https://puniversity.informaticsglobal.com:2284/ehost/detail/detail?vid=0&sid=52da4e6e-8813- 45d5-87f9-
8. 73b9f493f358%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=342445&db=nlebk
9. Case Study: https://www.skill-lync.com/embedded
10. https://community.ruggedboard.com/embedded/training
11. https://in.seekweb.com/search/quick_results

Topics relevant to "EMPLOYABILITY SKILLS": Applications of embedded system, Embedded systems SOC for bar code scanner, Interfacing between analog and digital blocks for developing **Employability skills** through **Participative Learning techniques.** This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Dr. Snehaprabha T V
Recommended by the Board of Studies on	BoS No: 12th BoS held on 27/7/21
Date of Approval by the Academic Council	16th Academic Council Meeting held on 23/10/21

Course Code: EEE3503	**Course Title: Power Electronics Applications for Electrical Vehicles** **Type of Course: Professional Elective and Theory only**	**L-T- P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	EEE3058 Electrical Drives					
Anti-requisites	**Nil**					
Course Description	The course includes an overview of system architectures of EV's and system dynamic modelling and control at levels appropriate to determine requirements, also this course introduces a concept of design and control of power converters for electric drive vehicles, also enables to know the various drives used for EV's and energy management in EV's. The course develops an analytical skills and enhances the programming/Simulink modeling abilities through assignments.					

Course Objectives	The objective of the course is to familiarize the learners with the concepts of Power Electronics Applications for Electrical Vehicles and attain **Entrepreneurial Skills** through **Problem Solving** methodologies.			
Course Out Comes	**On successful completion of the course the students shall be able to:** 1] **Explain** the various technologies are associated with EV's. 2] **Describe** the architectures of HEV, PHEV and EV's. 3] **Analyze** the modelling of DC-DC converter systems for EV's. 4] **Describe** the AC Motor drive operation for EV's 5] **Analyze** the electrical circuit modelling of Battery system.			
Course Content:				
Module 1	An Overview of Power Electronics in EV's	Assignment	QUIZ/True or FALSE Type	**No. of Sessions: 7**
Topics: Introduction, Multidisciplinary Technologies (Body Design, Batteries, Electric Propulsion, Intelligent Energy Management), EV Propulsion (Motors, Power Converters, Electronic Controllers), Battery Charging, Power Accessories (Temperature Control Unit, Power Steering, Auxiliary Power Converter Unit. Hybrid Electric Vehicles.				
Module 2	System overview	Assignment	Data Collection rating of various Electric Vehicles	**No. of Sessions:7**
Topics: Vehicle dynamics, Architectures of hybrid (HEV), plug-in hybrid (PHEV) and electric vehicles (EV), Rating and sizing of drivetrain components.				
Module 3	Bidirectional DC-DC converters	Assignment	Modeling and simulations of DC-DC Converter.	**No. of Sessions: 8**
Topics: Introduction, Introduction to switched-mode power converters, isolated and non-isolated converters, Steady-state operation, analysis and simulations, Modeling of losses and efficiency.				
Module 4	Inverter Based AC Motor Drives	Assignment	Modeling and simulations	**No. of Sessions: 8**
Topics: An introduction to AC machine operation and models, Permanent magnet synchronous machine, Induction machine, DC-to-AC inverter operation and controls, advanced control techniques, AC drive modeling.				
Module 5	Energy Management Strategies	Assignment	Modeling and simulations of battery systems	**No. of Sessions:8**
Topics: An introduction to battery electro- chemistry, Types and characteristics of battery cells, energy, power, cycle life, calendar life, cost, Cell charge/discharge characteristics, electrical circuit modeling, Battery management system, cell balancing, Modeling battery systems.				
Targeted Application & Tools that can be used: The major targeted applications of the course is extended to various fields such as mainly Automotive electrical and electronic systems, commercial, industrial, residential, telecommunication, transportation, utility systems and Aerospace etc. In case of automotive electronics, the electrically-generated systems are used in automobiles such as road vehicles like telematics, in-car entertainment systems, and so on. The need to control engines of automobiles originated in automotive electronics for proper controlling and conversion. Professionally Used Software: MATLAB/Simulink				
Text Book 1. Ehsani, Mehrdad, Yimin Gao, Stefano Longo, and Kambiz Ebrahimi, "Modern electric, hybrid electric, and fuel cell vehicles", CRC press, 2018, 3rd Edition. 2. Haitham Abu-Rub, Mariusz Malinowski, Kamal Al-Haddad, "Power Electronics for Renewable Energy Systems, Transportation and Industrial Applications",Wiley Publishers, June 2014.				
References 1. Yangsheng Xu, Jingyu Yan, Huiihuan Qian and Tin Lun Lam, "Hybrid Electric Vehicle Design and Control: Intelligent Omni directional Hybrids", Mc-Graw Hill Education, 2014.				

2. R. Erickson, D. Maksimovic, Fundamentals of Power Electronics, Springer 2001 (Chapters 1-5); on-line access available from CU network.
3. Evaluation of the 2010 Toyota Prius Hybrid Electric Drive System, Oak Ridge National Lab report.
4. Davide Andrea, Battery Management Systems for Large Lithium-Ion Battery Packs, Artech House, 2010.
5. C.Mi, M.A.Masrur, D.W.Gao, Hybrid Electric Vehicles, Wiley 2011.

Online Resources:

1.Ebook: https://puniversity.informaticsglobal.com:2282/ehost/ebookviewer/ebook/bmxlYmtfXzE2NjQ0OF9fQU41?sid=5ac3e684-9a30-45af-a5c4-a4c437d65a8c@redis&vid=3&format=EB

2.Casestudy: https://puniversity.informaticsglobal.com:2282/ehost/ebookviewer/ebook/bmxlYmtfXzE2NjYwNV9fQU41?sid=5ac3e684-9a30-45af-a5c4-a4c437d65a8c@redis&vid=4&format=EB

3. Seminar: https://puniversity.informaticsglobal.com/menu
4. https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-ee18/
5. https://www.elprocus.com/power-electronics-in-automotive-applications/
6. https://www.energy.gov/eere/vehicles/power-electronics-research-and-development

Topics relevant to "ENTREPRENEURIAL SKILLS": The Vehicle dynamics, Architectures of hybrid (HEV), plug-in hybrid (PHEV) and electric vehicles (EV), Rating and sizing of drivetrain components **Entrepreneurial Skills** through **Problem Solving methodologies.** This is attained through the assessment component mentioned in the course handout.

Catalogue prepared by	Mr. Ravi V Angadi & Mr. K Sreekanth Reddy
Recommended by the Board of Studies on	BoS No: 12th BoS held on 27/7/21
Date of Approval by the Academic Council	16th Academic Council Meeting held on 23/10/2021

Course Code: EEE3504	**Course Title: AI Techniques for EVs and HEVs** **Type of Course: Professional Elective and Theory only**	**L-T- P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CSE2280: C Programming and Data Structures CSE2264: Essentials of AI					
Course Description	The purpose of this course is to introduce about the battery management techniques using IoT. This course helps students to understand different AI techniques and algorithms used for the control of Electric Vehicles. Each topic will be developed in logical progression with up-to-date information. The course is both conceptual and analytical in nature and needs basic knowledge of mathematics. The course develops the critical thinking and analytical skills. The course also enhances the programming abilities through projects**.**					
Course Objective	The objective of the course is to familiarize the learners with the concepts of AI Techniques for EVs and HEVs and attain **Employability Skills** through **Participative Learning** techniques.					
Course Outcomes	**On successful completion of this course the students shall be able to:** 1] **Summarize** IoT Based Battery Management System and type of batteries for EV and HEV. 2] **Identify** the features of different AI Techniques used for the control operation of EVs.					

	3] **Explain** AI Based BLDC drive for optimum operation of EV 4] **Explain** the Modelling of three phase converters for EV applications.			
Module 1	IoT-Based Battery Management System for Electric Vehicle	Assignment	Programming Task	**08 Sessions**
Topics: Introduction, Battery configuration, Types of batteries for HEV and Electric Vehicles (EV), Functional Blocks of Battery Management Systems, IoT based BMS.				
Module 2	AI Techniques	Quiz	Simulation / control algorithm implementation	**08 Sessions**
Topics: Basics of Artificial Intelligence, Advantages of Artificial Intelligence in EV, Fuzzy Control, Genetic Algorithm, Artificial Neural Network-Based Controller.				
Module 3	AI Techniques for optimum operation of EV.	Project work	Simulation	**09 Sessions**
Topics: Brushless DC Motor, Closed-Loop Model of BLDC Motor Drive, BLDC Motor Speed Controller with ANN Based PID Controller, Analysis of Different Speed Controllers, Basic Components of an Active Magnetic Bearing (AMB).				
Module 4	Modeling and Analysis of Three-Phase Power Converters for EV Applications	Project work	Simulation	**09 Sessions**
Topics: Introduction, Overall System Modeling, Mathematical Modeling and Analysis of Small Signal Modeling, Modeling of HESS and its Analysis.				
Targeted Application & Tools that can be used: Artificial intelligence is first reflected in the electrical design for electrical equipment, automation control, automotive Fault Diagnosis, EV manufacturing companies, state estimation of permanent magnet synchronous motors, harmonic reduction, research and development, image processing and signal processing. **Professionally Used Software:** MATLAB / Simulink				
Text Books: T1. Artificial Intelligent Techniques for Electric and Hybrid Electric Vehicles, Chitra A, P.Sanjeevikumar, and S. Himavathi, Wiley-2020. T2.S. Rajasekaran and G. A. V. Pai, "Neural Networks, Fuzzy Logic & Genetic Algorithms"- PHI, New Delhi,2003.				
References R1. Hybrid vehicles and hybrid electric vehicles new developments, energy management and emerging technologies, Hilda bridges, Nova Publishers, New York. R2. D. E. Goldberg," Genetic Algorithms"- Addison Wesley 1999. **Web Resources:** 1. https://www.researchgate.net/publication/342918764_Artificial_Intelligent_Techniques_for_Electric_and_Hybrid_Electric_Vehicles 2. https://www.mdpi.com/2076-3417/8/2/187/pdf 3. https://puniversity.informaticsglobal.com:2069/search/searchresult.jsp?newsearch=true&queryText=op%20amps 4. Video: https://www.youtube.com/watch?v=DRvgoSFj0PE. 5. **https://puniversity.informaticsglobal.com:2284/ehost/detail/detail?vid=0&sid=52da4e6e881345d587f973b9f493f358%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=342445&db=nlebk** 6. **https://www.wiley.com/enus/Artificial+Intelligent+Techniques+for+Electric+and+Hybrid+Electric+Vehicles-p-9781119681908.** 7. **Case Study:**				

https://www.ijcrt.org	
Topics relevant to "EMPLOYABILITY SKILLS" : Fuzzy Control, Genetic Algorithm, Artificial Neural Network-Based Controller for developing **Employability skills** through **Participative Learning techniques.** This is attained through assessment component mentioned in course handout. **Topics relevant to "ENIVIRONMENT AND SUSTAINABILITY":** Types of batteries for HEV and Electric Vehicles (EV)	
Catalogue prepared by	Mr. K Sreekanth Reddy Mr. Sarin M V
Recommended by the Board of Studies on	12th BoS held on 27/7/2021
Date of Approval by the Academic Council	16th Academic Council Meeting held on 23/10/2021

Course Code: EEE3505	**Course Title: Micro Electro Mechanical Systems** **Type of Course: Professional Elective and Theory only**	**L- T-P-C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	**NIL**					
Anti-requisites	**NIL**					
Course Description	This course intends to provide basic knowledge of fabrication of different microelectronics system. The course deals with various sensors and actuators. It enhances mathematical modelling ability and programming skills to interface the hardware models of MEMS. The course develops the analytical thinking ability.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Introduction to Micro Electro Mechanical Systems and attain **Employability Skills** through **Participative Learning** techniques.					
Course Outcomes	**On successful completion of this course the students shall be able to:** 1. **Explain** the semiconductors and solid mechanics to fabricate MEMS devices. 2. **Classify** various sensors and actuators, 3. **Describe** different MEMS devices. 4. **Associate** MEMS sensors and actuators using Intelli-Site software.					
Course Content:						
Module 1	INTRODUCTION	Quiz	Data Analysis task	**08 Sessions**		
Topics : Energy Domains and Transducers- Sensors and Actuators- Definition of MEMS.-MEMS devices. Silicon as a MEMS material - mechanical properties of silicon. Mechanical components in MEMS. Design concepts of mechanical components, Working Principles of Microsystems- Engineering Science for Microsystems design and Fabrication Technologies						
Module 2	**SENSORS AND ACTUATORS-I**	Case Study	Data Collection and Analysis	**08 Sessions**		
Topics : Electrostatic sensors – Applications – Interdigitated Finger capacitor – Comb drive devices– Micro Motors – Thermal Sensing and Actuation – Thermal expansion – Thermal couples – Thermal resistors Magnetic Actuators – Micromagnetic components – Case studies of MEMS in magnetic actuators						
Module 3	**SENSORS AND ACTUATORS-II**	Assignment	Data Collection and Analysis	**08 Sessions**		

Topics :Piezoresistive sensors – Piezoresistive sensor materials – Stress analysis of mechanical elements – Applications to Inertia, Pressure, Tactile and Flow sensors – Piezoelectric sensors and actuators Applications to Inertia , Acoustic, Tactile and Flow sensors.				
Module 4	Electrostatic Actuation	Assignment	Modelling and Simulation	**09 Sessions**
Topics: Electrostatic Forces, Normal Force, Tangential Force, Fringe Effects, Electrostatic Driving of Mechanical Actuators: Parallel-plate Actuator, Capacitive sensors. Step and Alternative Voltage Driving: Step Voltage Driving, Negative Spring Effect and Vibration Frequency.				
Targeted Application & Tools that can be used: The applications areas include various design and manufacture jobs on various Electrical , mechanical and Electronics companies. **Software Tool- :** IntelliSuite Software				
Textbooks: 1. Chang Liu, 'Foundations of MEMS', Pearson Education Inc., 2012, 2nd edition 2. Stephen D Senturia, 'Microsystem Design', Springer Publication, 2000. 3. Tai Ran Hsu, "MEMS & Micro systems Design and Manufacture" Tata McGraw Hill, New Delhi, 2002.				
References 1. Nadim Maluf," An Introduction to Micro Electro Mechanical System Design", Artech House, 2000. 2. Mohamed Gad-el-Hak, editor, " The MEMS Handbook", CRC press Baco Raton, 2001. 3. Julian w. Gardner, Vijay K. Varadan, Osama O.Awadelkarim, Micro Sensors MEMS and Smart Devices, John Wiley & Son LTD, 2002, 2nd edition 4. James J.Allen, Micro Electro Mechanical System Design, CRC Press Publisher, 2005, 1st edition. 5. Thomas M.Adams and Richard A.Layton, "Introduction MEMS, Fabrication and Application," Springer, 2010.				
Online Resources 1. https://nptel.ac.in/courses/117/105/117105082/ 2. **Seminar:** https://puniversity.informaticsglobal.com:2069/search/searchresult.jsp?newsearch=true&queryText=op%20amps 3. **Case Study:** https://ieeexplore.ieee.org/abstract/document/4745240. 4. **Ebook:** https://puniversity.informaticsglobal.com				
Topics relevant to "EMPLOYABILITY SKILLS": Engineering Science for Microsystems design and Fabrication Technologies for developing **Employability Skills** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout.				
Catalogue prepared by	Ms. Ramya K			
Recommended by the Board of Studies on	BoS No: 12th. BoS held on 27/7/21			
Date of Approval by the Academic Council	Academic counselling meeting No.16, Dated 23/10/2021			

Course Code: EEE3506	**Course Title: Sensors and Transducers** **Type of Course: Professional Elective and Theory only**	**L- T- P- C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	Nil					
Anti-requisites	Nil					
Course Description	This course imparts the knowledge of fundamentals, classification and characterization of various sensors and transducers. It also develops knowledge in selection of suitable sensor based on requirement and application. The course is both conceptual and analytical in nature and					

	needs basic knowledge of mathematical and computing. The course develops the critical thinking and analytical skills.			
Course Objective	The objective of the course is to familiarize the learners with the concepts of Sensors, Transducers and their applications 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** the usage of gauges and transducers to measure pressure, direction and distance. 2. **Describe** the use of light transducers and other devices used for the measurement of electromagnetic radiations. 3. **Explain** the working of different temperature sensing devices. 4. **Summarize** the principles and applications of various electronic sensors			
Course Content:				
Module 1	Gauges & Transducers	Assignment	Quiz	**12 Sessions**
Resistance strain gauge, piezoelectric pressure gauge, characteristics. Electronic circuits for strain gauge, load cells. Interferometer, Fibre-optic methods. Pressure gauges Aneroid capacitance pressure gauge, ionization gauge, Using the transducers for applications, Capacitor plate sensor, Inductive sensors, LVDT Accelerometer systems, rotation sensors drag cup, devices, piezoelectric devices. Rotary encoders.				
Module 2	Light radiation	Assignment	Data collection	**12 Sessions**
Colour temperature, light flux, photo sensors, photomultiplier, photo resistor and photoconductors, photodiodes, phototransistors, photovoltaic devices, fiber-optic applications, light transducer, solid-state, transducers liquid crystal devices.				
Module 3	Heat and Temperature	Assignment	Developing a measurement system	**11 Sessions**
Bimetallic strip, Bourdon temperature gauge, thermocouples, Resistance thermometers, thermistors, PTC thermistors, bolometer, Pyroelectric detector.				
Module 4	Electronic Sensors	Case study	Application	**10 sessions**
Proximity detectors – Inductive and capacitive, ultrasonic, photo beam detectors Reed switch, magnet and Hall-effect units, Doppler detectors, liquid level detectors, flow sensors, smoke sensors.				
Targeted Application & Tools that can be used: **Application:** Various types of Industries, Robotics, Automation of machines **List of Software/learning website:** NPTEL, Multisim, PSpice, LabVIEW (NI)				
Text Books 1. Doebelin E O, —Measurement Systems, Application and Design , McGraw Hill, Fifth Edition, 2004 2. Ian R Sinclair, —Sensors and Transducers‖, Third Edition, Newness publishers, 2001.				
References 1. R 1. Jack P Holman, —Experimental Methods for Engineers‖, Seventh Edition, McGraw Hill, USA, 2001. 2. Robert G Seippel, —Transducers, Sensors and Detectors‖, Reston Publishing Company, USA, 1983. **Online resources** 1. https://nptel.ac.in/courses/108/108/108108147/ 2. https://www.coursera.org/learn/sensors-circuit-interface https://www.udemy.com/course/sensors-sensor-fundamentals				

3. **Seminar:** https://puniversity.informaticsglobal.com:2069/search/searchresult.jsp?newsearch=true&qeryText=op%20amps 4. **Video:** https://www.youtube.com/watch?v=nSeW3R2hr1A. 5. **E-book:** https://puniversity.informaticsglobal.com
Topics relevant to "EMPLOYABILITY SKILLS": knowledge of various types of sensors for developing **Employability Skills** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout..

Catalogue prepared by	Ms. Ragasudha C P
Recommended by the Board of Studies on	BoS No: 14th. BoS held on 22/2/2022
Date of Approval by the Academic Council	18th Academic Council meeting held on 3/8/22

Course Code: EEE3507	**Course Title: Advanced Drive Assistant Systems** **Type of Course: Professional Elective and Theory only**	**L-T-P-C**	3	0	0	3
Version No.	**1.0**					
Course Pre-requisites	EEE1200 Basics of Electrical and Electronics Engineering CSE1500 Computational Thinking with Python EEE2502 DC Machines and Special Machines EEE2503 AC Machines					
Anti-requisites	**NIL**					
Course Description	This course provides an in-depth exploration of Advanced Driver Assistance Systems (ADAS) and Autonomous Vehicles (AVs), focusing on their technologies, functionalities, regulatory frameworks, and future trends. The course draws on multiple authoritative sources to provide a comprehensive understanding of the course.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Power Market and Energy policies 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** the fundamental technologies behind Advanced Driver Assistance Systems (ADAS) and Autonomous Vehicles (AVs). 2. **Summarize** the functionalities and components that contribute to vehicle automation. 3. **Explain** the machine learning and control systems for autonomous driving systems. 4. **Describe** safety assurance methodologies for autonomous driving technologies.					
Course Content:						
Module 1	Introduction to Autonomous Vehicles	Assignment	Data Collection		**10 Sessions**	
Topics: Concept of autonomous vehicles, historical evolution of AV technology, various levels of automation, SAE standards and consider the societal implications of AV adoption, including potential benefits and challenges, Basic components of ADAS and AVs, sensors, actuators, and control units.						
Module 2	Sensor Technologies	Assignment/Case Study	Data collection		**12 Sessions**	

Topics: Types of sensors, Cameras-Types (monocular vs. stereo), role in object detection, lane keeping, and traffic sign recognition. Radar-Functionality, advantages in distance measurement and velocity detection, applications in adaptive cruise control and collision avoidance, LiDAR-Principles of operation, 3D maps of surroundings, and obstacle detection.				
Module 3	Control Systems for Autonomous Driving and Machine Learning in Autonomous Vehicles	Assignment/Case Study	Data collection	**12 Sessions**
Topics: Control theory to vehicle dynamics, PID control, trajectory planning, motion control strategies, various driving conditions, machine learning techniques used in autonomous vehicles, neural networks for perception tasks, reinforcement learning for decision-making processes.				
Module 4	Vehicle Automation Levels and Future Trends of ADAS	Assignment/Case Study	Simulation/Data Collection/	**11 Sessions**
Topics: SAE levels of driving automation from Level 0 (no automation) to Level 5 (full automation). Examination of the implications, challenges, driver monitoring systems, user interfaces designs, safety assurance methodologies for AVs, testing protocols, simulation environments, real-world validation techniques for safe operation, fail-safe mechanisms and redundancy strategies. Future Trends in ADAS and AV Technology: vehicle-to-everything (V2X) communication technologies, advancements in AI technologies for navigation and perception, and integration with smart infrastructure.				
Targeted Application & Tools that can be used: Application Areas are Autonomous Valet Parking systems and Navigation System in real Professionally Used Software: MATLAB software.				
Text Books 1. Autonomous Vehicles: The Road to Driverless Cars by Chris Urmson and Laura S. Desch. 2. Advanced Driver Assistance Systems: A Comprehensive Guide by Ravendra Singh and R. K. Gupta. 3. Introduction to Autonomous Robots: Mechanisms, Sensors, Actuators, and Algorithms by Nikolaus Correll et al. 4. Vehicle Automation edited by Gereon Meyer and Sven Beiker. 5. Fundamentals of Autonomous Vehicles by Francisco M. M. Ramos et al.				
Topics relevant to "EMPLOYIBILITY SKILLS": Trajectory planning, Machine Learning Techniques, Communication technologies, for Developing **"Employability Skills"** through **Participative Learning Techniques.** This is attained through assessment components mentioned in course handout.				
Catalogue prepared by	Dr. D P Somashekar			
Recommended by the Board of Studies on	21st BoS, Held on 09/06/2025			
Date of Approval by the Academic Council	26th Academic Council meeting held on 25th July 2025			

Course Code: EEE3508	**Course Title: Electric Mobility and Charging Infrastructure**	**L-T- P- C**	**3**	**0**	0	**3**

	Type of Course: Professional Elective and Theory only					
Version No.	**1.0**					
Course Pre-requisites	NA					
Anti-requisites	**Nil**					
Course Description	The Course is designed with an objective of giving an overview of Electric Mobility and Charging Infrastructure The Course discusses the introduction to energy storage and charging methods. The Course is conceptual and analytical in nature and needs fair knowledge of mathematical computation. The course develops the critical thinking and analytical skills .					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Electric mobility and Charging infrastructure and attain **Entrepreneurial Skill** through **Problem solving** methodologies.					
Course Out Comes	**On successful completion of the course the students shall be able to:** 1.**Outline** the Energy Storage requirements of Electric Vehicles and recent trends 2.**Explain** the Concepts of Charging methods and its technology for Electric vehicle. 3.**Describe** about the types of charges and its types. 4.**Explain** the concepts of EVSE communication and its usage. 5.**Summarize** the types charging communication					
Course Content:						
Module 1	**Introduction**	Assignment	Any Energy Storage Device	**10 Sessions**		
Topics: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles - Battery based energy storage - Fuel Cell based energy storage - Super Capacitor based energy storage - Fly wheel based energy storage.						
Module 2	**Charging methods**	Assignment	Data collection and Analysis	**8 Sessions**		
Topics: Electric Vehicle Technology and Charging Equipment's - Basic charging Block Diagram of Charger - Difference between Slow charger and fast charger - Slow charger design rating - Fast charger design rating.						
Module 3	**Types of chargers**	Assignment	Case study	**10 Sessions**		
Topics: AC charging and DC charging - On board and off board charger specification - Type of Mode of charger Mode 2, Mode 3 and Mode 4 - EVSE associated charging time calculation - Selection and sizing of fast and slow charger (AC & DC) - AC Pile Charger, DC Pile Charger.						
Module 4	**Evse communication**	Assignment	Computation and Data Analysis	**8 Sessions**		
Topics: EVSE Power Module selection and technical specification - Selection of EVSE Communication Protocol (PLC / Ethernet / Modbus/ CAN Module) - Communication gateway - Specification of open charge point protocol (OCCP 1.6/2.0) - Bharat DC001 & AC001 Charger specification - Communication Interface between charger and CMS (Central Management System) - Payment apps.						
Module 5	**Charging communication**	Assignment	Computation and Data Analysis	**9 Sessions**		
Topics: Selection of AC charger type-1 , type -2 and type -3 - Communication between AC charger and EV - Selection of DC charger connector GB/T, CHAdeMO, CCS-1 and CSS-2 - Communication methodology of DC fast chargers.						
Targeted Application & Tools that can be used: The Course is designed with an objective of giving an overview of Electric Vehicles and battery technology. The Course discusses the history, configurations of Electric vehicles and the electrical characteristics of batteries. The Course is conceptual and analytical in nature and needs fair						

knowledge of mathematical computation. The course develops the critical thinking and analytical skills.

Text Book

1. "Vehicle Inspection Handbook", American Association of Motor Vehicle Administrators.
2. Mehrdad Ehsani, Yimin Gao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles_ Fundamentals, Theory, and Design, Second Edition", CRC Press, 2010.
3. Amir Khajepour, Saber Fallah and Avesta Goodarzi, "Electric and Hybrid Vehicles Technologies, Modeling and Control: A Mechatronic Approach", John Wiley & Sons Ltd, 2014.
1.

References

1. Hybrid Electric Vehicle System Modeling and Control - Wei Liu, General Motors, USA, John Wiley & Sons, Inc., 2017.
2. Hybrid Electric Vehicles – Teresa Donateo, Published by ExLi4EvA, 2017
3. Electric and Hybrid Vehicles Power Sources, Models, Sustainability, Infrastructure and the Market Gianfranco Pistoia Consultant, Rome, Italy, Elsevier Publications, 2017.
4. Modern Electric, Hybrid Electric, and Fuel Cell Vehicles, MehrdadEhsaniYiminGao Stefano Longo Kambiz M. Ebrahimi, Taylor & Francis Group, LLC, 2018.

Online learning resources:

1. EBook:https://presiuniv.knimbus.com/user#/home
2. https://elearn.nptel.ac.in/shop/executive-workshops/execedu-closed/https-elearn-nptel-ac-in-shop-iit-workshops-ongoing-cpoem-cohort-4/?v=c86ee0d9d7ed
3. https://archive.nptel.ac.in/courses/108/106/108106170/
4. https://elearn.nptel.ac.in/shop/iit-workshops/completed/emobility-and-electric-vehicle-engineering-cohort-3/?v=c86ee0d9d7ed

Topics relevant to 'SKILL DEVELOPMENT': Analysis of battery storage systems and their Application, the role of storage devices and controller for the application of Electric vehicles. Topics relevant to 'ENVIRONMENT AND SUSTAINABILITY': AC charger type-1 , type -2 and type -3 - Communication between AC charger and EV - Selection of DC charger connector GB/T, CHAdeMO, CCS-1 and CSS-2 - Communication methodology of DC fast chargers

Catalogue prepared by	Dr. Sunil Kumar A V
Recommended by the Board of Studies on	21st BoS, Held on 09/06/2025
Date of Approval by the Academic Council	26th Academic Council meeting held on 25th July 2025

Course Code: **EEE3509**	**Course Title: Vehicle Electrification and Renewable Integration** **Type of Course: Professional Elective and Theory only**	**L-T- P- C**	**3**	**0**	0	**3**
Version No.	**1.0**					
Course Pre-requisites	Nil					
Anti-requisites	**Nil**					
Course Description	The key aspect of vehicle Electrification and Renewable integration systems is the efficiency and effectiveness of energy transfer. This course equips students to understand and analyse the various modes and equipment used in electric vehicle charging. It covers the classification, sizing, and standards of chargers, including communication protocols and their role in ensuring interoperability. Additionally, the course addresses the planning and implementation of public					

	charging infrastructure, along with emerging technologies and future trends, such as wireless charging and the integration of renewable energy sources.			
Course Objective	The objective of the course is to familiarize the learners with the concepts of Vehicles Electrification and Renewable Integration and attain **Entrepreneurial Skills** through **Problem Solving** methodologies.			
Course Out Comes	**On successful completion of the course the students shall be able to:** 1. **Explain** the various components of Electric vehicle charging system 2. **Summarize** the different types of Electric vehicle chargers and their standards. 3. **Interpret** the various communication protocols used in Electric vehicle charging. 4. **Explain** the recent trends in Electric vehicle charging.			
Course Content:				
Module 1	**Introduction to EV charging**	Assignment	Computation and Data Analysis	**10 Sessions**
Topics: Introduction to EV charging Electric Vehicle Charging; Charging Modes; Electric Vehicle Supply Equipment (EVSE): Types, Components of EV Battery Chargers; Challenges in Electric Vehicle Charging.				
Module 2	**Charger sizing and standards**	Assignment	Data collection and Analysis	**11 Sessions**
Topics: Charger sizing and standards Charger Classification; Slow Charging and Fast Charging; DC Charging and AC Charging; Selection and Sizing of Chargers: Charger Connectors and Cables; Charging Standards: Connectors, Supply Equipment; EMI/EMC; Testing Methods for Chargers and EVSE				
Module 3	**Public charging infrastructure**	Assignment	Infrastructure and policy	**12 Sessions**
Topics: Public charging infrastructure Location, Planning and Implementation of Public Charging Stations; Components; Selection and Sizing - HT/LT Equipment & Cables; Protection; Safety Standards: Policy and Regulatory Aspects; EV Charging Station and their Business Models; Economic Aspects; Major Challenges.				
Module 4	**Renewable Sources Integration**	Assignment	Case study	**12 Sessions**
Topics: Types of Renewable Energy Sources, Connection Between RE and EV Infrastructure, Challenges of Integrating Renewable Energy into EV Charging Networks, Regulatory and Policy Challenges, Opportunities for Sustainable Integration of Renewables with EV Charging, Environmental Impact.				
Targeted Application & Tools that can be used: The course subject finds it application in many major areas of technologies like Charger sizing and standards Charger, Public charging infrastructure Location and Integration of Renewables with EV Charging. Software tools: Matlab-Simulink, Application: Automotive industry.				

Text Book

1. Iqbal Husain, "Electric and Hybrid Vehicles: Design Fundamentals", 3rd Edition, CRC Press, 2021 2.
2. Code of Practice for Electric Vehicle Charging Equipment Installation, 4th Edition, IET, 2020.

References

3. Sheldon S. Williamson, "Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles", 1st Edition, Springer, 2013. 2.
4. Tom Denton, "Automotive Electrical and Electronic Systems", 5th Edition, Routledge, 2018 3. Wolf hard Lawrenz, "CAN System Engineering: From Theory to Practical Applications", Springer, 2nd Edition, 2013.
5. Modern Electric, Hybrid Electric, and Fuel Cell Vehicles, Mehrdad Ehsani Yimin Gao Stefano Longo Kambiz M. Ebrahimi, Taylor & Francis Group, LLC, 2018.

Online learning resources:

1. EBook:https://presiuniv.knimbus.com/user#/home
2. https://onlinecourses.nptel.ac.in/noc21_ee112/preview
3. https://elearn.nptel.ac.in/shop/iit-workshops/completed/emobility-and-electric-vehicle-engineering-cohort-3/?v=c86ee0d9d7ed.
4. https://elearn.nptel.ac.in/shop/executive-workshops/execedu-closed/certificate-programme-on-emobility-cpoem-cohort-5/?v=c86ee0d9d7ed.

Topics relevant to 'SKILL DEVELOPMENT': The Sustainable Integration of Renewables with EV Charging. Topics relevant to 'ENVIRONMENT AND SUSTAINABILITY': Types of Renewable Energy Sources, Connection Between RE and EV Infrastructure , Challenges of Integrating Renewable Energy into EV Charging Networks.

Catalogue prepared by	Dr. Sunil Kumar A V
Recommended by the Board of Studies on	21st BoS, Held on 09/06/2025
Date of Approval by the Academic Council	26th Academic Council meeting held on 25th July 2025

Professional Elective Courses (PEC)
Track 4: Power Electronics and Industrial Drives Courses Catalogs

Course Code: EEE3600	**Course Title: Special Electrical Machines** **Type of Course: Professional Elective and Theory only**	**L- T-P- C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	EEE2502 DC Machines and Special Machines EEE2503 AC Machines					
Anti-requisites	**NIL**					

Course Description	The basic objective of this course is to introduce the theory, construction, design, control electronics and in-depth analysis of several special electrical machines as an extension to the study of AC & DC electrical machines. This course also extend the fundamental principles into a way of critical thinking for problem solving in real time applications thereby learning analytical skills and programming skills through Lab VIEW/MATLAB.			
Course Objective	The objective of the course is to familiarize the learners with the concepts of Special Electrical Machines and their Applications and attain **Employability Skills** through **Problem Solving** methodologies.			
Course Outcomes	**On successful completion of the course, the students shall be able to:** 1. Select a suitable power converter for switched reluctance motor and stepper motor applications. 2. Examine performance characteristics for a brushless DC motor and the permanent magnet synchronous motor. 3. Classify the various control strategies for special electrical machines. 4. Use the microprocessor and DSP control techniques to control the speed and torque of electrical machines. **5.** Analyze the AC and DC motor drives for traction applications.			
Course Content:				
Module 1	**Switched Reluctance Motor and Stepper Motor**	**Assignment**	**Simulation task**	**10 Sessions**
Switched Reluctance Motor Construction, Principle of operation, design of stator and rotor pole arc, power converter for switched reluctance motor. **Stepper Motors** Construction, principle of operation-theory of torque production, Types of stepping motor.				
Module 2	**Permanent Magnet Brushless D.C. Motors and Permanent Magnet Synchronous Motors**	**Assignment**	**Simulation task/Data collection Task**	**10 Sessions**
Permanent Magnet Brushless D.C. Motors Construction, principle of operation ,EMF and Torque equations , Torque speed characteristics , Sensor less motors , Motion control **Permanent Magnet Synchronous Motors** Construction, Principle of operation , EMF and torque equations, Starting, Rotor configurations, Dynamic model				
Module 3	**Control of Special Machines and Applications**	**Quiz**	**Data Analysis**	**10 Sessions**
Open loop control and closed loop control of stepper motor using Microprocessor, Characteristics of stepper motor in open loop drive, DSP Control of switched reluctance motor for fraction type load, DSP/Microprocessor Control of brushless dc motor, Applications.				
Module 4	**Electric Motors for traction drives**	**Group Discussion**	**Data Analysis**	**9 Sessions**
AC motors, DC motors, single sided linear induction motor for traction drives, comparison of AC and DC traction.				
Targeted Application & Tools that can be used: Application Areas are Motor Design, Automation companies like Schneider Electric, Mitsubishi electric etc, Automobiles and Electrical Vehicle Manufacture companies like Tesla etc. **Professionally Used Tools:** LabVIEW/MATLAB				
TextBooks: **1. Venkata Ratnam K, Special Electrical Machines, CRC Press, 2009.** **2. Krishnan, R., "Permanent Magnet and BLDC Motor Drives", CRC Press, 2009.**				
References				

1. Chang-liang, X., "Permanent Magnet Brushless DC Motor Drives and Controls", Jun 2012.
2. Kenjo, T., and Sugawara, A., Stepping Motors and their Microprocessor Controls, Oxford Science Publications, 1984.
3. Miller, T. J. E., Brushless Permanent Magnet and Reluctance Motor Drives, Oxford Science Publications, 1989.

Online Resources

1. https://nptel.ac.in/courses/108/102/108102156/
2. https://www.youtube.com/watch?v=DMDTkXeFkb8
3. Ebook : https://puniversity.informaticsglobal.com/login
4. Seminar topic: https://ieeexplore.ieee.org/search/searchresult.jsp?newsearch=true&queryText=special%20electric%20machines%20review%20papers
5. Case study: https://www.researchgate.net/publication/342360681_Economic_Benefits_of_Energy-Efficient_Electrical_Machines_A_Case_Study

Topics relevant to "EMPLOYABILITY SKILLS": PMBL DC Motor, Control of switched reluctance motor for developing **Employability Skills** through **Problem Solving methodologies**. This is attained through assessment component mentioned in course handout.

Catalogue prepared by **Catalogue updated by**	Ms. Ramya K Mr. K Sreekanth Reddy
Recommended by the Board of Studies on	BoS No: 12th BoS held on 27/7/2021
Date of Approval by the Academic Council	16th Academic Council Meeting held on 23/10/2021

Course Code: EEE3601	**Course Title: Power Quality and Harmonics** **Type of Course: Professional Elective and Theory only**	**L- T- P- C**	3	0	0	3
Version No.	**2.0**					
Course Pre-requisites	**Nil**					
Anti-requisites	**Nil**					
Course Description	The Power Quality and Harmonics course focuses on the study and analysis of power quality issues in electrical systems, with a particular emphasis on harmonic distortion, its sources, effects, and mitigation techniques. Students will learn how harmonics are generated, their impact on power systems and equipment, and how to measure, analyze, and correct power quality problems.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Power Quality and Harmonics and attain **Skill Development** through **Experiential Learning techniques**					
Course Out Comes	**On successful completion of the course the students shall be able to:** 1.**Analyze** harmonic distortion using advanced tools and techniques, including Fourier analysis and spectral analysis. 2.**Apply** techniques for harmonic mitigation and power factor correction such as passive and active filters, and active power compensation systems. 3.**Evaluate** the economic impact of power quality issues and provide solutions to optimize energy use and system reliability					

	4.**Identify** and quantify harmonics in power systems, understanding their sources and the effects on electrical equipment and systems			
Course Content:				
Module 1	Harmonic Analysis and Advanced Measurement Techniques	Quiz	Data Analysis task	08 Sessions
Fourier Series and Fourier Transform for Harmonic Analysis, Spectral Analysis, Advanced Harmonic Measurement Techniques, Practical applications: Analyzing harmonic distortion in real-world systems (e.g., industrial motor drives, power supplies).				
Module 2	Harmonic Mitigation Techniques and Power Factor Correction	Group Discussion	Data Collection	08 Sessions
Passive Filters for Harmonic Mitigation, Active Filters, Power Factor Correction (PFC), Advanced Power Compensation Systems, Case studies on designing harmonic filters for industrial loads and power systems.				
Module 3	Economic Impact of Power Quality Issues and Optimization Solutions	Assignment	Programming Task	08 Sessions
Economic Impact of Harmonics and Power Quality Disturbances, Energy Optimization Solutions, Cost-Benefit Analysis of Harmonic Mitigation Strategies, Designing for Power Quality and Energy Efficiency.				
Module 4	Harmonics in Power Systems and Their Impact	Assignment	Data Collection and Analysis	08 Sessions
Introduction to Power Quality and Harmonics, Sources of Harmonics, Effects of Harmonics, Measurement of Harmonics.				
Targeted Application & Tools that can be used: Power System harmonic studies, protection and stability for real time test systems. Professionally Used Software: MATLAB & Simulink, PSCAD				
Text Book 1. Ewald F. Fuchs and Mohammad A. S. Masoum, "Power Quality in Power Systems and Electrical Machines", 2nd Edition.				
References 1. Arun G. Phadke, James S. Thorp, "Power Quality: Problems and Mitigation Techniques", 1st Edition (2008) . 2. Surya Santoso, H. Wayne Beaty, Robert C. Dugan, "Power Quality: Monitoring, Analysis, and Enhancement", 2nd Edition (2009) **online learning resources** 1.https://nptel.ac.in/courses/108/105/108105153/ 2.https://www.youtube.com/watch?v=xLjk5DrScEU&list=PLt5syl71JKf0IacRzLI-02Q_udP4nJiJg 3. https://www.researchgate.net/publication/50366322_POWER_QUALITY_AN_IMPORTANT_ASPECT 4.https://puniversity.informaticsglobal.com/login?qurl=https://search.ebscohost.com%2flogin.aspx%3fdirect%3dtrue%26db%3dnlebk%26AN%3d2706929%26site%3dehost-live				
Topics relevant to development of "SKILL DEVELOPMENT"Economic Impact of Harmonics and Power Quality Disturbances, Energy Optimization Solutions, Cost-Benefit Analysis of Harmonic Mitigation Strategies **Skill Development** through **Experiential Learning techniques**. This is attained through assessment component mentioned in course hand-out.				
Catalogue prepared by	**Mr. Bishakh Paul**			

Recommended by the Board of Studies on	BoS No: 12th BoS held on 27/7/21
Date of Approval by the Academic Council	16th Academic Council Meeting held on 23/10/21

Course Code: EEE3602	**Course Title: Modern power electronics and AC drives** **Type of Course: Professional Elective and Theory only**	**L-T- P-C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	EEE2508 Power Electronics					
Anti-requisites	**NIL**					
Course Description	The purpose of this course is to understand the basic concepts and design of advanced power electronics and AC drives. This course includes the detailed analysis of several AC drives used and their analysis. The course is both conceptual and analytical in nature. The course develops the simulation abilities through assignments and project work. The course also enhances the ability to identify suitable drives for specific industrial applications.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Modern power electronics and AC drives and attain **Employability Skills** through **Problem Solving** methodologies.					
Course Outcomes	**On successful completion of this course the students shall be able to:** 1. **Explain** the torque speed characteristics for different control parameters by their equivalent circuit analysis 2. **Select** different slip recovery drive schemes for speed control of I.M. at rotor side. 3. **Explain** Vector control of Induction Motor Drive 4. **Illustrate** the characteristics of synchronous motor using UPF and constant flux linkage control 5. Interpret the speed Control of variable Reluctance motor drive and brushless DC motor drive.					
Course Content:						
Module 1	AC Drives	Assignment	Data collection	**10 Session**		
Topics: Introduction to AC Drives: Introduction to motor drives – Torque production – Equivalent circuit analysis – Speed – Torque Characteristics with variable voltage operation Variable frequency operation constant v/f operation – Variable stator current operation.						
Module 2	Control of Induction motor drives	Assignment	Problem solving	**13 Session**		
Topics: Control of Induction motor drives at Stator side Scalar control – Voltage fed inverter control – Open loop volts/Hz control – Control of Induction Motor Drive at Rotor Side and Vector Control Slip power recovery drives – Static Kramer Drive – Phasor diagram – Torque expression – speed control of a Kramer Drive – Static Scherbius Drive – modes of operation. Vector control of Induction Motor Drives: Principles of Vector control – Vector control methods – Direct methods of vector control – Indirect methods of vector control – Adaptive control principles						
Module 3	Control of Synchronous motor drives	Assignment	Problem Solving	**12 Session**		

Topics: Synchronous motor and its characteristics – Control strategies – Constant torque angle control – Unity power factor control – Constant mutual flux linkage control. Controllers: Flux weakening operation – Maximum speed – Direct flux weakening algorithm – Constant Torque mode controller – Flux Weakening controller – indirect flux weakening – Maximum permissible torque – speed control scheme				
Module 4	Variable Reluctance and Brushless DC Motor drives	Assignment	Problem Solving	**10 Session**
Topics: Variable Reluctance motor drive – Torque production in the variable reluctance motor Drive characteristics and control principles – Current control variable reluctance motor service drive. Brushless DC Motor drives: Three phase full wave Brushless dc motor – Sinusoidal type of Brushless dc motor- current controlled Brushless dc motor Servo drive.				

Targeted Application & Tools that can be used:
Application Area is Power Electronics and Electric Drives, Automobile industries, Electric Vehicles
Software Tools: MATLAB/Simulink

Textbooks

1. Electric Motor Drives Pearson Modeling, Analysis and control – R. Krishnan – Publications – 1 st edition – 2002
2. Modern Power Electronics and AC Drives B K Bose – Pearson Publications 1st edition

References

1. Power Electronics and Control of AC Motors – MD Murthy and FG Turn Bull pergman Press (For Chapters II, III, V) 1st edition
2. Power Electronics and AC Drives – BK Bose – Prentice Hall Eagle wood diffs New Jersey (for chapters I, II, IV) - 1 st edition
3. Power Electronic circuits Devices and Applications – M H Rashid – PHI – 1995.
4. Fundamentals of Electrical Drives – G.K. Dubey – Narora publications – 1995 (for chapter II) Power Electronics and Variable
5. frequency drives – BK Bose – IEEE Press – Standard publications - 1 st edition – 2002.

Online Resources

1. https://nptel.ac.in/courses/108/104/108104011/
2. https://lecturenotes.in/subject/1374/advanced-electric-drives
3. Ebook: https://puniversity.informaticsglobal.com
4. Seminar topic: https://ieeexplore.ieee.org/search/searchresult.jsp?newsearch=true&queryText=modern%20power%20 electronics%20and%20ac%20drives%20review%20paper
5. Case study: https://www.researchgate.net/publication/251830696_Power_Electronics_and_AC_Machine_Drives_-Advances_and_Trends

Topics relevant to "EMPLOYABILITY SKILLS": Control of Induction Motor Drive at Rotor Side, Brushless DC Motor drives are for developing **Employability Skills** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mr Sarin MV
Recommended by the Board of Studies on	BoS No: 14th BoS held on 22/2/22
Date of Approval by the Academic Council	18th Academic Council Meeting held on 3/8/2022

Course Code: EEE3603	**Course Title: Flexible A. C Transmission Systems (FACTS) Type of Course: Professional Elective and Theory only**	**L-T-P-C**	3	0	0	3
Version No.	2.0					

Course Pre-requisites	EEE3057 Power System Analysis EEE2508 Power Electronics			
Anti-requisites	**NIL**			
Course Description	This course deals with various FACTS devices which are used for proper operation of existing AC system and make it more flexible in normal and abnormal conditions. The course develops the analytical skills. It also develops Simulation abilities of different types of FACTS Controllers in MI power Software.			
Course Objective	The objective of the course is to familiarize the learners with the concepts of Flexible A. C Transmission Systems (FACTS) and attain **Employability Skills** through **Participative Learning** techniques.			
Course Outcomes	**On successful completion of this course the students shall be able to:** 1) **Classify** various compensators suited for various power system purposes. 2)**Describe** the converter configuration for different power systems applications such as HVDC, FACTS etc. 3) **Explain** the behaviour of the power system with different shunt and series compensators. 4) **Summarize** the benefits of incorporating FACTS devices in Power System			
Course Content:				
Module 1	Power Transmission control	Assignment	data analysis task	**9 Sessions**
Topics: FACTS concept and General system considerations - Transmission Interconnections, Flow of power in an AC system, basic types of FACTS controllers, IEEE definitions, FACTS devices in India and abroad. Shunt compensation and shunt FACTS devices - Concept of shunt compensation, objectives of shunt compensation, variable impedance type shunt compensators (TCR, TSC, FC-TCR, TSC-TCR) - circuit diagram, principle of operation, working, waveforms / characteristics. Simulation assignment in MI Power				
Module 2	Static power convertor:	Paper Presentation	Simulation and Programming Task	**12 Sessions**
Topics: Switched converter type shunt compensator (STATCOM) - circuit diagram, principle of operation, working, waveforms / characteristics, control schemes for shunt compensators. Series compensation and Series FACTS devices - Concept of series compensation, objectives of series compensation, variable impedance type series compensators (GCSC, TSSC, TCSC), Switching converter type series compensators - circuit diagram, principle of operation, working, waveforms/characteristics, control schemes for series compensators. Simulation assignment in MI Power				
Module 3	Unified Power Flow Controllers	Case Study	Simulation and data analysis task	**12 Sessions**
Topics: Static voltage and phase angle regulators - Objectives of voltage and phase angle regulators, power flow control, improvement of transient stability, power oscillation damping, thyristor-controlled voltage and phase angle regulators. Combined FACTS compensators and other special purpose FACTS devices - Unified Power flow Controller (UPFC) - objectives and need, principle of operation, Interline power flow controller (IPFC) - objectives and need, principle of operation. NGHSSR damper, thyristor-controlled braking resistor (TCBR). Simulation assignment in MI Power				
Targeted Application & Tools that can be used: Application Area is Power System Stability and reactive power compensation using FACTS Devices in organizations like Power-grid, BESCOM, NTPC and Tata Power Corporation. Professionally Used Software: MI Power, MATLAB				
Text Books 1. Padiyar K. R, "FACTS controllers in power transmission and distribution", New Age Publishers, India, 2007. 2. Narayan G Hingorani, Laszlo Gyugyi, "Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems", Wiley-IEEE Press; 1st edition (10 December 1999)				
References				

1. T. J. E. Miller, "Reactive power control in Electric systems", Wiley-Interscience Publication, John Wiley and sons, 1982.
2. Narain G. Hingorani and Laszlo Gyugyi, "Understanding FACTS – Concepts and technology of Flexible AC transmission system", IEEE power Engineering Society, 1999.

Online resources

1.Seminar:https://nptel.ac.in/courses/108/107/108107114/

2.Case study:
https://www.academia.edu/41556656/Flexible_AC_Transmission_Systems__FACTS__Controllers_FACTS_D

3. Ebook:https://puniversity.informaticsglobal.com

Topics relevant to "EMPLOYABILITY SKILLS": Static Power converters, SVC and STATCOM for developing **Employability Skills** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Mr. Bishakh Paul
Recommended by the Board of Studies on	12th BoS held on 27/07/2021
Date of Approval by the Academic Council	16th Academic Council Meeting held on 23/10/2021

Course Code: EEE3604	**Course Title: HVDC Transmission** **Type of Course: Professional Elective and Theory only**		**L-T- P-C**	3	0	0	3
Version No.	2.0						
Course Pre-requisites	EEE2506 Transmission and Distribution EEE2508 Power Electronics						
Anti-requisites	**Nil**						
Course Description	The purpose of this course is to explain the HVDC power transmission. The course also briefs the various converters used, their control aspects and modern trends in HVDC transmission. The course is both conceptual and analytical in nature and needs fair knowledge of Power electronics circuits and their working. The course develops the critical thinking and analytical skills.						
Course Objective	The objective of the course is to familiarize the learners with the concepts of HVDC Transmission and attain **Employability Skills** through **Problem Solving** methodologies.						
Course Out Comes	On successful completion of the course the students shall be able to: 1. **Explain** the advantages of dc transmission over ac transmission. 2. **Explain** the operation of Line Commutated Converters and Voltage Source Converters. 3. **Summarize** the control strategies used in HVDC transmission system. 4. **Summarize** the modern trends in HVDC transmission. 5. **z** the requirement of protection circuit for different types of HVDC system.						
Course Content:							
Module 1	DC Transmission Technology	Assignment	Data Collection	**9 Sessions**			
Topics:							

DC Transmission Technology- Comparison of AC and DC Transmission. Application of DC Transmission. Types of HVDC Systems. Components of a HVDC system, Modern trends in DC transmission

Module 2	Line Commutated Converter based systems	Assignment	Programming	**10 Sessions**

Topics:
Line Commutated Converter based systems Line Commutated Converters (LCCs): Six pulse converter, Analysis neglecting commutation overlap, harmonics, Twelve Pulse Converters. Inverter Operation. Effect of Commutation Overlap. Expressions for average dc voltage, AC current and reactive power absorbed by the converters. Effect of Commutation Failure, Misfire and Current Extinction in LCC links.

Module 3	Voltage Source Converter based systems	Assignment	Simulation	**8 Sessions**

Topics:
Voltage Source Converter based systems- Two and Three-level VSCs. PWM schemes: Selective Harmonic Elimination, Sinusoidal Pulse Width Modulation. Analysis of a six-pulse converter. Real and Reactive power control using a VSC.

Module 4	Control of HVDC Converters	Assignment	Programming	**9 Sessions**

Topics:
Control of HVDC Converters- Principles of Link Control in a LCC HVDC system. Control Hierarchy, Firing Angle Controls – Phase-Locked Loop, Current and Extinction Angle Control, Starting and Stopping of a Link. Higher level Controllers - Power control, Frequency Control, Stability Controllers. Reactive Power Control.

Module 5	Converter faults, protection and smoothing reactors	Assignment	Data Collection	**9 Sessions**

Topics:
Converter faults, Protection against over-currents, Overvoltage's in a converter station, Surge arresters, Protection against over-voltages, Smoothing reactors, DC line, Transient over voltages in DC line, Protection of DC line, DC breakers, Monopolar operation, Effects of proximity of AC and DC transmission lines.

Targeted Application & Tools that can be used:
Application Area is Power System, Electricity Transmission and Distributed companies, Power Grid Corporation and State Electricity Boards
Professionally Used Software: MATLAB/Mi Power.

Text Book(s)

1: K. R. Padiyar, "HVDC Power Transmission Systems", New Age International Publishers, 2011

2: HVDC Transmission, Second Edition by **S Kamakshaiah**, **V Kamaraju**

References Book(s)

1. Edwart, K., Direct Current Transmission (Vol. 1), John Wiley and Sons (2008)
2. HVDC Transmission: Power Conversion-Applications in Power Systems, Chan-Ki Kim. *et al*, Wiley(2009)
3. Arrillaga, J. and Smith, B.C., AC to DC Power System Analysis, IEE Press (2008).

Online Resources:

1. https://nptel.ac.in/courses/108/104/108104013/
2. https://www.youtube.com/watch?v=pRZ2ygbbyTg
3. https://studymaterialz.in/hvdc-power-transmission-systems-by-padiyar/

4. https://puniversity.informaticsglobal.com:2282/ehost/detail/detail?vid=3&sid=15d54a1f-070b- 4419-b1d2 5. https://ieeexplore.ieee.org/abstract/document/4745240 6. EBook: https://puniversity.informaticsglobal.com
Topics relevant to "EMPLOYABILITY SKILLS ": Application of DC Transmission, Voltage Source Converter based systems, Voltage Source Converter based systems for developing **Employability skills** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Ms Jisha L K
Recommended by the Board of Studies on	BoS No: 14th BoS held on 22/2/2022
Date of Approval by the Academic Council	18th Academic Council Meeting held on 3/8/2022

Course Code: EEE3605	**Course Title: Wireless Power Transfer and Emerging Technologies** **Type of Course: Professional Elective and Theory only**	**L-T-P-C**	3	0	0	3
Version No.	**1.0**					
Course Pre-requisites	EEE2501 Electromagnetic Field Theory EEE2504 Control Systems Engineering ECE2021 Signals and Systems					
Anti-requisites	**NIL**					
Course Description	The purpose of this course delves into the principles, design considerations, and applications of wireless power transfer (WPT) technology, exploring various emerging methods for transmitting electrical energy without physical wires, including inductive coupling, resonant coupling, and radiative techniques, while also examining potential applications in diverse fields like electric vehicles, consumer electronics, alongside discussions on the latest advancements and challenges in this rapidly evolving field.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Wireless Power Transfer and emerging technologies attain **Employability Skills** through **Participative Learning** techniques.					
Course Out Comes	**On successful completion of the course the students shall be able to:** 1. **Summarize** the fundamental principles behind various wireless power transfer technologies. 2. **Describe** the efficiency factors affecting WPT systems. 3. **Explain** the various wireless power transfer systems technologies. 4. **Describe** the Dynamic wireless charging techniques for electric vehicles.					
Course Content:						
Module 1	Basic Principles	Assignment	Data Collection		**10 Sessions**	
Topics: Wireless Power Transfer Methods, Near-field Technology, Far-field Technology, Wireless Power Transfer Standards, Wireless Power Consortium, Air Fuel Alliance, NFC standard, SAE J2954, Proprietary System Solutions, Functionality of a Wireless Power Transfer System, Basic Principles of Inductive Components, Basic Transformer Model, Capacitive Compensation, Coupling and Efficiency, Leakage, Shielding Material.						
Module 2	Wireless Power Receiver and Transfer Efficiency	Assignment/Case Study	Data collection		**12 Sessions**	
Topics: Wireless power receiver architecture, Building blocks of wireless power receiver, coupling efficiency, power losses, and compensation techniques for resonant						

coupling, design methodologies for WPT systems, component selection (transmitters and receivers), and layout considerations.				
Module 3	Emerging Technologies of WPT	Assignment/Case Study	Data collection	**12 Sessions**
Topics: Microwave Power Transmission, Efficiency improvement, Safety assurance, Real-time reconfigurability, Retro-reflective beam forming scheme, capacitive coupling, resonant inductive coupling advancements.				
Module 4	Dynamic Wireless Power charging Technologies for EVs	Assignment/Case Study	Data collection	**11 Sessions**
Topics: Challenges and solutions related to alignment, control strategies, and real-time power management, Dynamic Wireless Power Transfer for In-Motion Electric Vehicles, Power rails and pickups, Segment and power supply scheme, Circuit topologies and impedance matching, Control strategies, Electromagnetic interference, standards - SAE J2954, infrastructure requirements, and market trends in EV wireless charging technology.				
Targeted Application & Tools that can be used: Application Areas are power transfer industries, and Electric vehicle charging stations in real time. Professionally Used Software: MATLAB.				
Text Books 1. Wireless Power Transfer - Fundamentals and Technologies, Eugen Coca, 2016. 2. Wireless Power Transfer: Principles and Applications, Zhen Zhang, Hongliang Pang, 1st Edition, John Wiley & Sons, Inc., 2022. 3. Wireless Power Transfer: Fundamentals, Technologies, and Applications by Chun T. Liu and Yusuke Watanabe. 4. Wireless Power Transfer: Theories and Applications by S.P. Singh et al. 5. Wireless Power Transfer and Wireless Charging by Zhongfeng Wang. 6. Wireless Charging Technology for Electric Vehicles by Hongyu Wu et al. 7. Emerging Technologies in Wireless Power Transfer: Principles and Applications by Sourabh Bhardwaj and Sandeep Kumar.				
Topics relevant to "EMPLOYIBILITY SKILLS": Wireless power receiver architecture, Microwave Power Transmission, Dynamic Wireless Power Transfer for In-Motion Electric Vehicles, Power rails and pickups, Segment and power supply schemes, EV wireless charging technology for Developing **"Employability Skills"** through **Participative Learning Techniques.** This is attained through assessment components mentioned in course handout.				
Catalogue prepared by	Dr. D P Somashekar			
Recommended by the Board of Studies on	21st BoS, Held on 09/06/2025			
Date of Approval by the Academic Council	26th Academic Council meeting held on 25th July 2025			

Course Code: EEE3606	**Course Title: Electromagnetic Interference (EMI) and Protection** **Type of Course: Professional Elective and Theory only**	**L- P-C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	EEE2501 Electromagnetic Fields EEE2504 Control Systems Engineering ECE2021 Signals and Systems					
Anti-requisites	**Nil**					
Course Description	All systems that generate or consume electrical energy can produce electromagnetic noise that may interfere with the operation of the system itself and/or other systems. Electromagnetic interference (EMI) is a potential					

	threat to present-day electronic devices. The course shows the students how the principles of electricity and magnetism can be applied to design electrical and electronic systems that can co-exist harmoniously, that is, to design systems that are electromagnetically compatible with each other. The students will learn how electromagnetic disturbances are generated in systems, how they couple to other systems, and how systems can be protected.
Course Objective	The objective of the course is to enumerate sources of electromagnetic interferences, to design EMI Filter for insertion loss and for switch mode power supplies, to understand concept of Faraday screens for EMI Prevention and attain **Skill Development** through **Problem Solving methodologies**.
Course Out Comes	On successful completion of the course, the students shall be able to: 1. **Identify** the sources of conducted and radiated EMI in power electronic converters and consumer appliances and suggest remedial measures to mitigate the problems. 2. **Explain** the insertion loss and design EMI filters to reduce the loss and design EMI filters, common-mode chokes, and RC-snubber circuits measures to keep the interference within tolerable limits. 3. **Analyze** EMI propagation, design filters/inductors, apply safety regulations, and conduct EMI measurements using LISN. 4. **Apply** Faraday screens and shielding techniques to minimize EMI in switching devices, transformers, and power electronics while ensuring EMC compliance.
Course Content:	

Module 1	Introduction	Assignment	Analyze the effect of power supply components on Conducted emissions.	**10 Sessions**
Topics: Sources of conducted and radiated EMI, EMC standardization and description, measuring instruments, conducted EMI references, EMI in power electronic equipment: EMI from power semiconductors circuits.				
Module 2	Noise suppression in relay systems and EMI filter elements	Assignment	Describing various EMI filters	**13 Sessions**
Topics: **Noise suppression in relay systems:** AC switching relays, shielded transformers, capacitor filters, EMI generation and reduction at source, influence of layout and control of parasites. **EMI filter elements:** Capacitors, choke coils, resistors, EMI filter circuits. Ferrite breeds, feed through filters, bifilar wound choke filter, EMI filters at source, EMI filter at output.				
Module 3	EMI in switch mode power supplies	Assignment	Understand the effect of conducted EMI noise on power supply lines	**13 Sessions**
Topics: EMI propagation modes, power line conducted-mode inference, safety regulations (ground return currents), Power line filters, suppressing EMI at sources, Line impedance stabilization network (LISN), line filter design, common mode line filter inductors- design& example, series –mode inductors and problems, EMI measurements.				
Module 4	Faraday screens for EMI prevention	Assignment	Prevention of EMI	**09 Sessions**
Topics: Faraday Screens for EMI prevention in switching devices, transformers, safety screens, faraday screens on output components, reducing radiated EMI on gapped transformer cores, metal screens, and electrostatic screens in transformers.				
Targeted Application & Tools that can be used: The course subject finds its application in many major areas of technologies like power electronics & smart grids, industrial automation & robotics, automotive & transportation, and many more. Tools that can be used are Altair Feko, Ansys HFSS, MATLAB, LTspice, PSpice, etc.				

Text Book

1. Electromagnetic Compatibility in Power Electronics, Laszlo Tihanyi, IEEE Press.
2. EMI Filter Design, Pullen Timotty. M. Ozenbaugh, N. Richard Lee, CRC Press, Taylor & Francis.
3. Practical Design for Electromagnetic Compatibility, R. F. Ficchi Hayden Book Co.

References

1. Stuart Borlase, "Smart Grid: Infrastructure Technology Solutions", CRC Press.
2. Handbook on Switch-Mode Power Supplies, Keith H. Billings, McGraw-Hill Publisher, 1989.
3. Dr. V.P. Kodali, Engineering Electromagnetic Compatibility, IEEE Publication Printed in India by S. Chand & Co. Ltd., New Delhi, 2000.
4. Henry W. Ott, Electromagnetic Compatibility Engineering, John Wiley & Sons Inc, New York, 2009
5. Clayton R.Paul, Introduction to electromagnetic compatibility, John Wiley and Sons, Inc. 1991.
6. Daryl Gerke and William Kimmel, EDN's Designer's Guide to Electromagnetic Compatibility, Elsevier Science & Technology Books, 2002.
7. Dr Kenneth L Kaiser, 2005. The Electromagnetic Compatibility Handbook, CRC Press.
8. Bernhard Keiser, Principles of Electromagnetic Compatibility, 3rd Edition, Artech house, 1986.

Online learning resources

1. https://presiuniv.knimbus.com/user#/home
2. https://nptel.ac.in/courses/108106138
3. https://www.ee.iitb.ac.in/web/course_lists/ee-785-electromagnetic-interference-and-compatibility/
4. https://www.youtube.com/playlist?list=PLFxhgwM1F4ywicEggR3pzF0FcFcGQvZ82

Topics relevant to development of "SKILL DEVELOPMENT": Performing the EMI filters designing for **Skill Development** through **Problem Solving methodologies**. This is attained through the assessment component mentioned in the course hand-out.

Topics relevant to "ENVIRONMENT & SUSTAINABILITY": EMI prevention.

Catalogue prepared by	**Dr. Markala Karthik**
Recommended by the Board of Studies on	21st BoS, Held on 09/06/2025
Date of Approval by the Academic Council	26th Academic Council meeting held on 25th July 2025

Course Code: EEE3607	**Course Title: Machine Modeling & Analysis** **Type of Course: Professional Elective and Theory only**	**L-T-P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	EEE1200 Basics of Electrical and Electronics Engineering EEE2502 DC Machines and Special Machines EEE2503 AC Machines					
Anti-requisites	**NIL**					
Course Description	In this course, mathematical models of electrical machines are developed. The most common alternating current machines, synchronous and asynchronous machines, are treated thoroughly. The mathematical models are used in stationary and dynamic analysis of their behavior in power grids, industrial applications and motor drives. The models that are developed are based on classic 2-axis theory. Different variants of the models are developed and demonstrated for different areas of use. The subject further deals with the physical origin of the parameters included in the models. How these can be manipulated by design is dealt					

	with to some extent. The course also describes factors that determine the load capacity of the machines.			
Course Objective	The objective of the course is to familiarize the learners with the concepts of Machine modeling and attain **Skill Development** through **Participative Learning** techniques.			
Course Outcomes	**On successful completion of this course the students shall be able to:** 1. **Explain** the various static and dynamic models of the synchronous and asynchronous machine. 2. **Choose** a model with sufficient accuracy, depending on the applications. 3. **Describe** the machine's static and dynamic properties and behavior in various application. 4. **Analyze** the physical parameters limit the capability of the machines.			
Course Content:				
Module 1	**Introduction to Electrical Circuits**	Assignment/ Quiz	Numerical solving Task	**10 Sessions**
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.				
Module 2	**Semiconductor and Diode applications**	Assignment/ Quiz	Memory Recall based Quizzes	**10 Sessions**
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, Clipping and clamping circuits. Zener diode, characteristics and its applications like voltage regulator.				
Module 3	**Transistors and its Applications**	Assignment/ Quiz	Memory Recall-based Quizzes	**10 Sessions**
Transistor characteristics, Current components, BJT Configurations (CB, CC, CE configurations) and their current gains. Operating point, Biasing & stabilization techniques: Fixed Bias, Voltage divider bias and its stability factor and load line analysis. Single and multistage amplifier, Darlington pair. 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.				
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. **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):

1. Bhattacharyya Mrittunjay, "Electrical Machines: Modelling And Analysis", PHI learning Pvt Ltd. Delhi.2016.
2. Paul C. Krause, Oleg Wasynczuk, Scott D.Sudhoff, "Analysis of Electric Machinery and Drive Systems" John Wiley and Sons, 2nd Edition, 2006.
3. CheeMunOng, "Dynamic Simulation of Electric Machinery: Using MATLAB/SIMULINK", Prentice Hall, 1st Edition, 1997.

Reference Book (s):

1. R Krishnan, "Permanent Magnet Synchronous and Brushless DC Motor Drives, CRC Press; 2009.
2. Bimbhra P.S., "Generalized Circuit Theory of Electrical Machines", Khanna Publishers Limited, 5th Edition, New Delhi, 2000.
3. R Krishnan, "Electric Motor Drives – Modelling, Analysis and Control", Pearson Education, 2015.

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

1. https://presidencyuniversity.linways.com
2.

E-content:

1. "Modeling and Analysis of Electric Machines. Instructor: Dr. Krishna Vasudevan, Department of Electrical Engineering, IIT Madras: https://archive.nptel.ac.in/courses/108/106/108106023/"
2. NPTEL Videos: Advanced Electric Drives by Prof. S P Das(https://nptel.ac.in/courses/108/104/108104011/#)
3. S. Ji and J. Ye, "Generalized Linear Discriminant Analysis: A Unified Framework and Efficient Model Selection," in IEEE Transactions on Neural Networks, vol. 19, no. 10, pp. 1768-1782, Oct. 2008, doi: 10.1109/TNN.2008.2002078
   https://ieeexplore.ieee.org/document/4633689
4. S. Ruoho, E. Dlala and A. Arkkio, "Comparison of Demagnetization Models for Finite-Element Analysis of Permanent-Magnet Synchronous Machines," in IEEE Transactions on Magnetics, vol. 43, no. 11, pp. 3964-3968, Nov. 2007, doi: 10.1109/TMAG.2007.906749. https://ieeexplore.ieee.org/document/4352044

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	21st BoS, Held on 09/06/2025
Date of Approval by the Academic Council	26th Academic Council meeting held on 25th July 2025

Course Code: EEE3608	**Course Title: Switched Mode Power Supplies** **Type of Course: Professional Elective and Theory only**		**L- T- P- C**	3	0	0	3
Version No.	1.0						
Course Pre-requisites	EEE1200 Basics of Electrical and Electronics Engineering EEE2508 Power Electronics						
Anti-requisites	**Nil**						
Course Description	This course provides a comprehensive understanding of Switched-Mode Power Supplies (SMPS), including their working principles, circuit topologies, control strategies, and design considerations. Students will gain theoretical knowledge and exposure in designing and troubleshooting SMPS circuits.						
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Switched Mode Power Supplies** and attain the **EMPLOYABILITY SKILLS** through **PARTICIPATIVE LEARNING** methodologies.						
Course Out Comes	**On successful completion of the course the students shall be able to:** 1. **Explain** various topologies of DC/DC converter 2. **Select** the key Peripheral Components of SMPS 3. **Summarize** the Power Factor Correction of SMPS. 4. **Apply** the various SMPS Testing Technologies.						
Course Content:							
Module 1	Overview of SMPS & Topologies of DC/DC converter	Assignment	Data Collection	**12 Sessions**			
Topics: Switching-Mode Power Supply (SMPS): Overview, Classification of Integrated Regulated Power Supply, Characteristics of SMPS, New Development Trend of SMPS, Basic Principles of SMPS, Control Mode Type of SMPS, Working Mode of SMPS, Feedback Type of SMPS, Load Characteristics of SMPS. **Topologies of the DC/DC Converter:** Basic Principle of Buck Converter, Basic Principle of - Boost Converter, Buck-Boost Converter, Charge Pump Converter, (Single-ended primary inductor converter) SEPIC, Flyback Converter, Forward Converter, Push-Pull Converter, Half/Full Bridge Converter, Soft Switching Converter,						
Module 2	Key Peripheral Components of SMPS	Assignment/ Case Study	Data Collection	**12 Sessions**			
Topics: Method for Selecting Key Peripheral Components of SMPS: Selection Method for - Fixed Resistor, Capacitors, Inductor Characteristics and Selection Method for Magnetic Beads, Selection Method for EMI Filter - Input Bridge Rectifier, Output Rectifier, Transient Voltage Suppressor (TVS), Power Switching Tube, Optical Coupler, Adjustable Precision Shunt Regulator, SMPS Protection Elements.						
Module 3	Power Factor Correction of SMPS	Assignment	Programming/Simulation	**10 Sessions**			
Topics: Power Factor Correction of SMPS: Brief Introduction to Power Factor Correction (PFC), Basic Principle of Passive PFC Circuit, Examples of Passive PFC Circuit, Basic Principle of Active PFC Circuit, Examples of Active PFC Circuit, Principle and Application of High-Power PFC, Measures to Suppress PFC Electromagnetic Interference, PFC Configuration Scheme.						
Module 4	SMPS Testing Technology	Assignment/Case Study	Programming/Simulation/Data Collection/	**11 Sessions**			

Topics: SMPS Testing Technology: Parameter Testing of SMPS, Performance Testing of SMPS, SMPS Measurement Skills, Accurate Measurement Method of Duty Ratio, Method to Detect the Magnetic Saturation of High-Frequency Transformer with Oscilloscope, Digital Online Current/Resistance Meter, Electromagnetic Compatibility Measurement of SMPS, Waveform Test and Analysis of SMPS.
Targeted Application & Tools that can be used: Switched-Mode Power Supplies (SMPS) are widely used across various industries due to their high efficiency and compact size. Some key applications include Consumer Electronics, Industrial Applications, Automotive & Transportation, Renewable Energy. The tools that can be used are MATLAB/Simulink, SIMetrix/SIMPLIS, LTspice
Text Book 1. "Switching Power Supply Design" – Abraham I. Pressman, Keith Billings, Taylor Morey
References 1. "Switchmode Power Supply Handbook" – Keith Billings, Taylor Morey 2. "Power Electronics: Converters, Applications, and Design" – Ned Mohan, Tore M. Undeland, William P. Robbins 3. "Fundamentals of Power Electronics" – Robert W. Erickson, Dragan Maksimovic 4. "Switchmode Power Supplies: Theoretical and Practical Design" – Christophe Basso
Online Resources: 1. Book: https://presiuniv.knimbus.com/user#/home 2. http://sdnbvc.digimat.in/nptel/courses/video/108108036/L11.html 3. Case Study: http://www.digimat.in/nptel/courses/video/108102047/L01.html 4. http://www.eols.net/sample-chapters/c05/6-39a-06-02.pdf 5. https://www.youtube.com/watch?v=Od0k9nqtoCM
Topics relevant to "Employability skill": Selecting Key Peripheral Components of SMPS, SMPS Testing Technology for employability skill development through Participative Learning techniques. This is attained through assessment component mentioned in course plan.

Catalogue prepared by	Dr. Jisha L K
Recommended by the Board of Studies on	21st BoS, Held on 09/06/2025
Date of Approval by the Academic Council	26th Academic Council meeting held on 25th July 2025

Course Code: EEE3609	**Course Title: FPGA for Power Electronic Converters** **Type of Course: Professional Elective and Theory only**	**L- T- P- C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	EEE1200 Basics of Electrical and Electronics Engineering EEE2508 Power Electronics					
Anti-requisites	**Nil**					
Course Description	This course focuses on the application of Field-Programmable Gate Arrays (FPGAs) in Power Electronic Converters. Students will learn how to design, simulate, and implement FPGA-based controllers for DC-DC converters, inverters, rectifiers, and AC-AC converters. The course covers PWM control, real-time feedback systems, advanced modulation techniques, and FPGA programming for high-performance power conversion.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **FPGA for Power Electronic Converters** and attain the **EMPLOYABILITY SKILLS** through **PARTICIPATIVE LEARNING** methodologies.					

<table>
<tr><td>Course Out Comes</td><td colspan="4">On successful completion of the course the students shall be able to:
1. Explain various design and verification tools in FPGA
2. Explain the simulation using Xilinx Webpack
3. Develop verilog HDL program for Combinational and Sequential Logic Circuits.
4. Apply FPGA to generate triggering pulses for different power electronic circuits</td></tr>
<tr><td>Course Content:</td><td colspan="4"></td></tr>
<tr><td>Module 1</td><td>Introduction to Field Programmable Gate Arrays</td><td>Assignment</td><td>Data Collection</td><td>12 Sessions</td></tr>
<tr><td colspan="5">Topics: Introduction to Field Programmable Gate Arrays – CPLD Vs FPGA, Development and evolution of digital devices - design and verification tools, Abstraction levels of digital system design - Configurable logic Blocks (CLB), Input/Output Block (IOB) – Programmable Interconnect Point (PIP) – Xilinx 4000 series - overview of Spartan and Virtex FPGA boards. Significance of FPGA in Power Electronics</td></tr>
<tr><td>Module 2</td><td>Verilog HDL</td><td>Assignment/ Case Study</td><td>Data Collection</td><td>10 Sessions</td></tr>
<tr><td colspan="5">Topics: Verilog HDL : Introduction to Verilog HDL and simulation using Xilinx Webpack - Modeling styles: Behavioral, Dataflow, and Structural Modeling, gate delays, switch-level Modeling, Hierarchal structural modeling</td></tr>
<tr><td>Module 3</td><td>Verilog Programming</td><td>Assignment</td><td>Programming/Simulation</td><td>12 Sessions</td></tr>
<tr><td colspan="5">Topics: Verilog Programming for Combinational and Sequential Logic Circuits: Verilog HDL program for combinational logic circuits – Adder/subtractor – Multiplexers – Demultiplexers – Encoders – Priority Encoder - Decoders – Comparators, generating triggering pulses for power converters
Verilog HDL program for sequential logic circuits - Flip-Flops, Shift Registers, Counters, Clock divider circuit – Generation of multi-phase clock - Finite State Machine Modelling</td></tr>
<tr><td>Module 4</td><td>FPGA Applications</td><td>Assignment/Case Study</td><td>Programming/Simulation/Data Collection/</td><td>11 Sessions</td></tr>
<tr><td colspan="5">Topics: FPGA Applications to Power Electronic System : Gate Pulse generation for AC-AC converter, AC-DC converter, PWM generation for Buck Converter, SPWM generation. DC motor control, Induction Motor Control</td></tr>
<tr><td colspan="5">Targeted Application & Tools that can be used:
Renewable Energy & Smart Grid, Electric Vehicles (EVs) & Transportation, Industrial Motor Drives & Automation,. Aerospace, Defense & High-Performance Power Electronics The tools that can be used are Xilinx Vivado, SIMetrix/SIMPLIS, LTspice</td></tr>
<tr><td colspan="5">Text Book
1. Samir Palnitkar, “Verilog HDL: A Guide to Digital Design and Synthesis” Pearson, Second Edition, 2009.
2. Wayne Wolf, “FPGA-Based System Design”, Prentice Hall India Pvt. Ltd., 2005.</td></tr>
<tr><td colspan="5">References
1. Ming-Bo Lin., Digital System Designs and Practices Using Verilog HDL and FPGAs. Wiley, 2008
2. Woods, R., McAllister, J., Yi, Y. and Lightbody, G. FPGA-based implementation of signal processing systems. John Wiley & Sons, 2017.</td></tr>
<tr><td colspan="5">Online Resources:
1. Book: https://presiuniv.knimbus.com/user#/home
2. http://sdnbvc.digimat.in/nptel/courses/video/108108036/L11.html
3. Case Study: http://www.digimat.in/nptel/courses/video/108102047/L01.html
4. http://www.eols.net/sample-chapters/c05/6-39a-06-02.pdf</td></tr>
<tr><td colspan="5">Topics relevant to “Employability skill”: Verilog Programming for Combinational and Sequential Logic Circuits for employability skill development through Participative Learning techniques. This is attained through assessment component mentioned in course plan.</td></tr>
</table>

Catalogue prepared by	Dr. Jisha L K
Recommended by the Board of Studies on	21st BoS, Held on 09/06/2025
Date of Approval by the Academic Council	26th Academic Council meeting held on 25th July 2025

Open Elective Courses

Course Code: EEE3100	**Course Title: IoT Based Smart Building Technology** **Type of Course: Open 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 intends to provide a basic understanding of IoT based building technology as all modern buildings will have a heavy focus on automation and efficient usage of energy through IOT. The course uses the fundamentals of mathematics and software tools and enhances the process of learning. The course is both conceptual and analytical in nature and imparts the basic skills of developing the IoT based systems through assignments and mini projects. Gaining knowledge in this field gives an experience to build innovative projects that enhances and improves the chances of a great career in IOT.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of IOT Based Smart Building Technology and attain **Skill Development** through **Participative Learning** techniques.					
Course Out Comes	**On successful completion of the course the students shall be able to:** 1. **Summarize** about IOT Concepts and Applications. 2. **Explain** about communication over internet. 3. **Experiment** with Arduino architecture and its Programming. 4. **Develop** distinct models using PIR Sensors. 5. **Interpret** the knowledge about integration of cloud platform.					
Course Content:						
Module 1	Introduction to IoT	Assignment	Quiz	**6 Sessions**		
Topics: IOT an Introduction – Scope of IOT - Basics of Networking - Communication in Smart Buildings - Impact Of IOT On Smart Buildings - Energy and Cost Efficiency						
Module 2	Communication Over Internet	Assignment	Data Collection	**6 Sessions**		
Topics: How Internet works – understanding the Design of a Communication Network – Wireless Communication Devices – Concept of ESP 8266 and its powering up.						
Module 3	Arduino and its Interfacing	Assignment	Case study	**7 Sessions**		
Topics: An Introduction to Arduino and its architecture – Arduino UNO connection and Detection – Programming in Arduino - ESP 8266 AT Commands – Interfacing with Arduino – Debugging Techniques.						

Module 4	Sensing in IOT	Assignment	Simulation/Data Collection	**7 Sessions**
Topics: Sensors and Data Acquisition – PIR Sensors – Interfacing Arduino with Sensors – Sensor Calibration – Reading data from PIR Sensor.				
Module 5	Control and design of smart buildings using PIR for electrical loads	Simple model based on Case Study	Simulation/Data Collection	**7 Sessions**
Topics: Relay and Electrical loads – interfacing relay drivers to Arduino – Programming logic – Thinkspeak API - Smart Building using PIR - Design the Arduino Sketch – Testing the model.				

Targeted Application & Tools that can be used:

Application: To assess and analyze various parameters involved in a smart building using IOT.
Professionally Used Software: Arduino, Python Programming.

Text Book

1. Internet of Things: Principles and Paradigms by Raj kumarBuyya and Amir vahid
2. Foundational elements of an IOT by Joe Biron &Jonathan Follett.
3. Exploring Arduino: Tools and Techniques for Engineering Wizardry 1st Edition by Jeremy Blum

References

1. Gao, Xinghua, et al. "Internet of Things Enabled Data Acquisition Framework for Smart Building Applications." *Journal of Construction Engineering and Management* 147.2 (2021): 04020169.
2. Sivagami, P., et al. "Smart Home Automation System Methodologies-A Review." *2021 Third International Conference on Intelligent Communication Technologies and Virtual Mobile Networks (ICICV)*. IEEE, 2021.
3. Zahra, Syed Rameem, and Mohammad Ahsan Chishti. "Smart Cities Pilot Projects: An IoT Perspective." *Smart Cities: A Data Analytics Perspective*. Springer, Cham, 2021. 231-255.
4. Hu, Ming. "Smart Building and Current Technologies." *Smart Technologies and Design For Healthy Built Environments*. Springer, Cham, 2021. 75-91.
5. Deng, Der-Jiunn, and Abderrahim Benslimane. "Innovation and Application of Internet of Things for Smart Cities." *Mobile Networks and Applications*: 1-2.

Online Learning Resources

1. https://www.i-scoop.eu/internet-of-things-iot/facility-management-iot-smart-buildings/
2. Case study: https://www.hindawi.com/journals/js/2018/1757409/
3. Seminar:https://puniversity.informaticsglobal.com
4. Ebook:https://puniversity.informaticsglobal.com

Topics relevant to "SKILL DEVELOPMENT": Understanding the Design of a Communication Network – Wireless Communication Devices for developing **Skill Development** through **Participative Learning Techniques.** This is attained through assessment components mentioned in the Course Plan.

Catalogue prepared by	**Dr. Nageswara Rao Atyam**
Recommended by the Board of Studies on	BoS No: 12th. BoS held on 27/7/21
Date of Approval by the Academic Council	16th Academic Council Meeting held on 23/10/21

Course Code: EEE3101	**Course Title: Basic Circuit Analysis** **Type of Course: Open 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 intends to provide a basic understanding of electrical circuits which are used in several applications like computer hardware, Automotive electronics, mobile communications and so on and its analysis using NI lab view. The course is both conceptual and analytical in nature and imparts the basic skills of developing the Simulink models, Programming and hardware interfacing through assignments and mini projects.
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Basic Circuit Analysis** and attain **Skill Development** through **Problem Solving** methodologies.
Course Outcomes	**On successful completion of this course the students shall be able to:** 1. **Explain** Kirchhoff's Voltage Law and Kirchhoff's Current Law 2. **Summarize** Superposition theorem and Thevenin's theorem for DC excitation. 3. **Interpret** the behaviour of RL and RC circuits for DC and AC excitation. 4. **Explain** the concept of virtual Instrumentation using NI lab view 5. **Demonstrate** the Superposition theorem and Thevenin's theorem for DC excitation
Course Content:	

Module 1	Basic concepts of circuits and AC fundamentals	Assignment	Data sheet collection of resistors and inductors and validation of parameters values using NI lab view	**08 Sessions**
Topics: Concept of Potential difference. Current and network elements, Ohm's law, Kirchhoff's laws, ideal and practical voltage and current sources, series and Parallel circuits , AC fundamentals				
Module 2	Mesh and Nodal analysis using NI lab View	Hands on Task & programming	Lab-VIEW program with data acquisition and to measure resistance of a thermistor with change in the temperature	**08 Sessions**
Topics: Basic Mesh and Nodal analysis for DC excitation only				
Module 3	Introduction to basic circuit theorems	Assignment	Development of Simulink model and Analysis using MATLAB & NI lab View	**10 Sessions**
Topics: Super position theorem, Maximum power Transfer theorem and Thevenin's theorem for DC excitation, Validation of Theorems with dependent sources, numerical on theorems.				

Module 4	Analysis of series RL and RC circuits with AC excitation using NI lab View	Assignment	Simulation using NI lab view and Analysis	**10 Sessions**
Topics: Analysis of series RL and RC circuits with AC excitation, voltage and current waveforms, Concept of leading, lagging and power factor.				
Targeted Application & Tools that can be used: The knowledge of basic circuit analysis is required in the fields of circuit design, computer hardware, Automotive electronics, mobile communications, power systems and power converter circuit analysis. Furthermore, the concepts of NI lab view will be helpful in data acquisition and analysis in several applications like process industries, Electric Vehicles, boiler operation and petrochemical industries. **Professionally Used Software:** NI Lab view /MATLAB				
Textbooks 1. Ravish.R.Singh, "Electrical Networks", Mcgraw Hill company,2009, 2nd Edition. 2. D.P. Kothari and Nagrath "Theory and Problems in electrical Engineering", PHI edition 2011				
References 1. V. N. Mittal and Arvind Mittal, "Basic Electrical Engineering" McGraw Hill, 2nd Edition 2. Vincent DelToro, "Electrical engineering Fundamentals", PHI second edition 2011 **Online resources** 1. https://www.youtube.com/results?search_query=Lecture+on+KVL 2. https://www.tutorialspoint.com/network_theory/index.htm 3. https://nptel.ac.in/courses/108/105/108105159/ 4. https://puniversity.informaticsglobal.com				
Topics relevant to "SKILLS DEVELOPMENT": Analysis of series RL and RC circuits with AC excitation for developing **Skill Development** through **Problem Solving methodologies**. This is attained through assessment component mentioned in Course Plan.				
Catalogue prepared by	Mr Bishakh Paul			
Recommended by the Board of Studies on	BoS No: 12th, held on 27/07/2021			
Date of Approval by the Academic Council	16th Academic Council meeting held on 23/10/2021			

Course Code: EEE3102	**Course Title: Fundamentals of Industrial Automation** **Type of Course: Open 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 deals with the PLC hardware/software and their importance in automation. SCADA deals with communication protocols and real time control of power systems using EMS. The course is both conceptual and analytical in nature. It develops programming and simulation skills.						
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Fundamentals of Industrial Automation** and attain **Skill Development** through **Participative Learning** techniques.						
Course Outcomes	**On successful completion of this course the students shall be able to:** 1) **Explain** about the architecture of PLCs 2)**Apply** PLC codes for automation applications requiring special functions. 3) **Explain** about the SCADA and communication technologies. 4)**Apply** SCADA for various utilities. .						
Course Content:							
Module 1	Introduction to Programmable Logic Controllers:	Assignment	List all the PLC applications in industries like Siemens, ABB, Schneider Electric	**8 Sessions**			
Topics: Advantages & disadvantages of PLC with respect to relay logic, PLC architecture, Input Output modules, PLC interfacing with plant, memory structure of PLC.							
Module 2	PLC Programming Methodologies:	Quiz	Programming	**7 Sessions**			
Topics: Ladder diagram, STL, functional block diagram, SFC, Instruction List. Creating ladder diagram from process control descriptions, Introduction to IEC61131 international standard for PLC.							
Module 3	Introduction to SCADA	Assignment	Simulation	**7 Sessions**			
Topics: Data acquisition system, Evolution of SCADA, Communication Technologies, Monitoring and Supervisory Functions.							
Module 4	Distributed Control Systems:	Case study	Simulation	**11 Sessions**			

DCS detail engineering, specifications, configuration and programming, functions including database management, reporting, alarm management, communication, third party interface, control, display etc. Enhanced functions viz. Advance Process Control, Batch application, Historical Data Management, OPC support, Security and Access Control etc. Performance Criteria for DCS and other automation tools.
Targeted Application is **Siemens, ABB, Power-grid, Yokogawa Electric** **Tools that can be used: NI Lab-VIEW**
Text Books 1. W.Boldon, 'Programmable logic controllers', 5th Edition, Elsevier India Pvt. Ltd., New Delhi, 2011. 2. Stuart A.Boyer, "SCADA: 'Supervisory control and Data Acquisition', 4th Edition, ISA, 2010.
References 1. Robert Radvanovsky, Jacob Brodsky, "Handbook of SCADA/Control Systems Security", 2nd edition, CRC press, 2016. 2. G. K. McMillan, Douglas Considine, "Process/Industrial Instruments Hand book", 5th edition, McGraw Hill, New York, 2009. **Online learning resources** 1.Seminar https://electrical-engineering-portal.com/resources/plc-programming-training 2. Case Study: https://puniversity.informaticsglobal.com 3.Ebook:https://electrical-engineering-portal.com/download-center/books-and-guides/electrical-engineering/plc-book
Topics relevant to "SKILLS DEVELOPMENT": PLC programming, SCADA for developing **Skill Development** through **Participative Learning techniques**. This is attained through assessment component mentioned in Course Plan.

Catalogue prepared by	Mr. Bishakh Paul
Recommended by the Board of Studies on	BoS No: 12th BoS held on 27/7/21
Date of Approval by the Academic Council	Academic Council Meeting No.16, Dated 23/10/21

Course Code: EEE3103	**Course Title: Electric Vehicles & Battery Technology** **Type of Course: Open Elective and Theory only**	**L-T-P C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The Course is designed with an objective of giving an overview of Electric Vehicles and battery technology. The Course discusses the history,					

	configurations of Electric vehicles and the electrical characteristics of batteries. The Course is conceptual and analytical in nature and needs fair knowledge of mathematical computation. The course develops the critical thinking and analytical skills.		
Course objective	The objective of the course is to familiarize the learners with the concepts of Electric Vehicles & Battery Technology and attain **Entrepreneurial Skills** through **Problem Solving** methodologies.		
Course Outcomes	On successful completion of this course the students shall be able to: 1. **Explain** the working of Electric Vehicles and recent trends 2. **Explain** the working of Hybrid Electric Vehicles and recent trends 3. **Summarize** about the battery characteristic & parameters. 4. **Summarize** the importance of battery management system.		
Course Content:			
Module 1	Electric Vehicles	Assignment	Computation and Data Analysis
Topics: History of Electric vehicles, Configuration of Electric Vehicles, Performance of Electric Vehicles, Tractive effort and Transmission requirement, Vehicle performance, Tractive effort in normal driving, Energy consumption.			
Module 2	Hybrid Electric Vehicles	Case Study	Data collection and Analysis
Topics: Concept of Hybrid Electric Drive Trains, Architecture of Hybrid Electric Drive Trains, Series Hybrid Electric Drive Trains, Parallel hybrid electric drive trains.			
Module 3	Energy storage for EV and HEV	Assignment	Any energy storage device
Topics: Energy storage requirements, Battery parameters, Types of Batteries, Modelling of Battery, Fuel Cell basic principle and operation, Types of Fuel Cells.			
Module 4	Battery Management Systems (BMS	Assignment	Case study
Topics: Introduction to Battery Management Systems (BMS), important terminology used to describe battery cells, Architecture of BMS, Classification of BMS, principles of operation of standard electrochemical battery cells.			

Targeted Application & Tools that can be used:

Application: Automotive industry.

Software tools: Matlab-Simulink

Text Book

1. Mehrdad Ehsani, Yimin Gao, sebastien E. Gay and Ali Emadi, —Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design‖, CRC Press, 2009.
2. Iqbal Husain, —Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2011.

References

1. James Larminie and John Loury, —Electric Vehicle Technology-Explained‖, John Wiley & Sons Ltd., 2003.
2.C.C. Chan and K.T. Chanu Modern Electric Vehicle Technology, OXFORD University, 2011
3.Sheldon S. Williamson,- Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles, Springer,2013
4. Chris Mi, M. A. Masrur and D. W. Gao, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", John Wiley & Sons, 2011.

Online resources:

1. https://nptel.ac.in/courses/108/102/108102121/
2. https://nptel.ac.in/courses/108/106/108106170/
3. Text book of Electric and Hybrid Vehicles : Power Sources, Models, Sustainability, Infrastructure and the Market, Gianfranco Pistoia, 1st ed. Amsterdam : Elsevier. 2010https://puniversity.informaticsglobal.com:2284/ehost/detail/detail?vid=0&sid=52da4e6e-8813-45d5-87f9-73b9f493f358%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=342445&db=nlebk
4. Seminar https://puniversity.informaticsglobal.com:2069/search/searchresult.jsp?newsearch=true&queryText=electric%20vehicles
5. Case Study: Data collection/Quiz based on the basics of batteries and the characteristics of energy storage devices used in EVs.

Topics relevant to "ENTREPRENEURIAL SKILLS": Vehicle fundamentals, total tractive effort and design of drive train for different vehicle architectures for developing **Entrepreneurial Skills** through **Problem Solving methodologies**. This is attained through assessment component mentioned in Course Plan.

Topics relevant to "ENVIRONMENT AND SUSTAINABILITY": Types of Batteries, Materials of battery used, Fuel cell.

Catalogue prepared by	Mr. K Sreekanth Reddy
Recommended by the Board of Studies on	BoS No:14th BoS held on 22/2/2022

Date of Approval by the Academic Council	18th Academic Council meeting held on 03/8/2022

Course Code: EEE3104	**Course Title: Smart Sensors for Engineering Applications** **Type of Course: Open Elective &Theory Only**	**L-T- P-C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	Nil					
Anti-requisites	Nil					
Course Description	The course highlights the basics of sensors & transducers and on the integration of electronics and sensors to create a smart transducers or a system on a chip with multiple integrated devices. It also provides inputs in the selection of appropriate sensor based on requirement and application. The course is being analytical one it requires basic mathematical and computing knowledge.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Smart Sensors for Engineering Applications** and attain **Skill Development** through **Participative Learning** techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: 1. Identify the suitable transducer for the given application 2. Select the sensors for the given application 3. Choose the components of smart sensors 4. Identify suitable sensor interfaces and signal conditioning techniques for embedded and real-time systems. 5. Apply smart sensors with microcontrollers, data acquisition systems, and IoT platforms for monitoring and control.					
Course content:						
Module 1	Introduction to sensors &Transducers	Assignment	Quiz	**12 sessions**		
Introduction, Classification of Transducers , Basic Principle, Different types of Transducers : Resistive Transducers , capacitive Transducers , piezoelectric Transducers , Temperature Transducers						
Module 2	Sensor fundamentals	Assignment	Case study	**12 sessions**		
Sensor types and classification, Sensors parameters, Selection of sensors, Light sensing, technology, Proximity sensors: Inductive and capacitive, Pneumatic sensors, Motion sensors, Miscellaneous sensors						
Module 3	Components & Architecture of Smart Sensors	Mini project	Developing a measurement	**12 sessions**		

			system /Programming task	
Smart Sensors, Components of Smart Sensors, General Architecture of Smart Sensors, Evolution of Smart Sensors, Advantages, Telemetry				
Module 4	Application area of Smart Sensors	Mini project continued	Developing a measurement system /Programming task	**9 sessions**
Home Automation, Industrial, Medical, Robotics, Automobile, Aircrafts				
Targeted Application & Tools that can be used: **Application:** Various types of Industries, Robotics, Automation of machines **List of Open Source Software/learning website:** NPTEL, Matlab-Simulink, LabVIEW (NI),				
Text Books 1. Sensor Systems: Fundamentals and Applications, Clarence W. De Silva, CRC press, 1st edition, 2016. 2. Understanding Smart Sensors- Randy Frank, 2nd Edition. Artech House Publications, 2013. 3. Lecture notes(L1) /PPT				
References 1. A Course In Electrical And Electronic Measurements And Instrumentation, A. K. Sawhney, Dhanpat Rai publications, 4th edition 2. Smart sensor systems, Gerard C.M. Meijer, Willey Publications,2008, First Edition 3. G. K. Anantha suresh, K. J. Vinoy, S. Gopalakrishnan, K. N. Bhat, V. K. Aatre, Micro and Smart Systems: Technology and modeling, Willey Publications,2012 4. Measurement and Instrumentation: Theory and Applications By Alan S Morris, Reza Langari, Academic press, Elsevier, 2015. 5. Data Acquisition and Signal Processing for Smart Sensors by Nikolay Kirianaki, Sergey Yurish, Nestor Shpak, Vadim Deynega, John Wiley & Sons Ltd **Online resources:** 1. https://nptel.ac.in/courses/108/108/108108147/ 2. https://nptel.ac.in/courses/112/108/112108092/ 3. https://www.coursera.org/lecture/smart-device-mobile-emerging-technologies/2-4-sensors-0EIl 4. https://puniversity.informaticsglobal.com				
Topics relevant to "SKILLS DEVELOPMENT": Study of various types of smart sensors & Transducers used for practical applications for developing **Skill Development** through **Participative Learning techniques**. This is attained through assessment component mentioned in Course Plan.				
Catalogue prepared by	Ms. Ragasudha C P			
Recommended by the Board of Studies on	BoS No: 14th BoS held on 22/02/22			

Date of Approval by the Academic Council	18th Academic council Meeting held on 03/08/2022

Course Catalogues for Mandatory Courses (MAC)

Course Code: **CHE7601**	**Environmental Studies** **Type of Course: MOOC course**	**L- T- P- C**	-	-	-	-
		Contact hours	-	-	-	-
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.

Course Code: LAW7601	**Indian Constitution** **Type of Course: MOOC course**	**L- T- P- C**	**-**	**-**	**-**	**0**
		Contact hours	**-**	**-**	**-**	**-**
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

12. HM Seervai, Constitutional Law of India, 4th Ed. Vol I, II, & III
13. Uday Raj Rai, Constitutional Law-I
14. 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.

Course Code: PPS1025	**Course Title: Industry Readiness Program – I (Foundation skills)** **Type of Course: Practical**	**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 graduates to develop foundational communication and self-management skills essential for academic success, professional networking, and personal effectiveness. They will be able to initiate and maintain positive interactions, set and achieve goals efficiently, and communicate professionally in written form.					
Course Objective	The objective of the course is to **familiarize the learners with the concepts of "Soft Skills" and attain skill development through participative & reflective learning techniques**					
Course Outcomes	**On successful completion of this course the students shall be able to:** 1. Distinguish between phatic and informative communication, confidently network with people of all walks of life 2. Illustrate the components of a SMART goal using personal or academic examples and apply to real life situations 3. Apply standard email etiquette practices to compose professional and context-appropriate emails					
Course Content:						
Module 1	**Phatic Communion & Networking**	Activity based				**10 hours**
Subtopics: 1. Small talks - Mastering Conversations 2. Networking for Changing Times 3. Elevator Pitch 4. Evaluation (Elevator Pitch)						
Module 2	**The Power Trio: S.W.O.T, S.M.A.R.T Goals and Habits**	Activity Based	Brainstorming Q & A, Video Clips			**10 Hours**
Subtopics: 1. Personal SWOT analysis						

2. The Power of Habits & Habit Loop
3. Crafting Your Academic & Personal SMART Goals
4. Evaluation (Video on S W O T & SMART Goal worksheet)

Module 3	**Inbox Impact: Email Etiquette**	**Quiz**	Experiential learning	**10 hours**

Subtopics:

1. Email Etiquette Basics
2. Email Mishaps - Identify & correct mistakes
3. Introduction to AI Writing Prompt
4. AI Email Writing Challenge (Real time drafting of AI-Assisted Email

Targeted Application & Tools that can be used:

Application Areas are at business meetings, webinars, Social meeting places, Engaging business partners, cold calls -

Text Books: **Reference Books (For Module 1):**

1. Soft Skills - Enhancing Employability: Connecting Campus with Corporate" by M S Rao
2. Everyone Communicates, Few Connect: What the Most Effective People Do Different Hardcover

B. Reference Books (For Module 2):

3. Atomic Habits: An Easy & Proven Way to Build Good Habits & Break Bad Ones by James Clear
4. Goals! by Brian Tracy, 2018
5. S.M.A.R.T Goals –made simple by SJ Scott

References

REFERENCE MATERIALS:

A. **Movies recommended**. My Fair Lady – 1964, The Intern – 2015

B. **Videos to watch on Module 1**.

1. Phatic Communication pt1
2. How to communicate confidently ? #learnenglish #janhavipanwar #speaking #communication
3. How To Start & End A Conversation In English Politely? 10 Daily English Expressions You Should Know!
4. The Pursuit of Happyness: Chris is hired
5. What is your deepest fear? – Building Confidence & Overcoming barriers – COACH CARTER

C. Videos to watch on Module 2.

1. Steve Jobs' 2005 Stanford Commencement Address
2. Small Steps, Big Changes|The Power of Habits | Saurabh Bothra | TEDxYouth@TheShriramMillenniumNoida
3. Why the secret to success is setting the right goals | John Doerr | TED
4. The Battle for Your Time: Exposing the Costs of Social Media | Dino Ambrosi | TEDxLagunaBlancaSchool
5. Video Clip - https://youtu.be/1KJjyJGLD44?si=GKWejJ4wPBaNVCiw .

Virat Kholi on Fitness (HABITS)

6. SMART GOAL - Process Is More Important Than Results - MS Dhoni Motivational Video | Motivation Chase

Targeted Application & Tools that can be used:

Practicing small talk with purpose helps the student to network with people in academia, engage in meaningful conversations; identify their short term & long-term goals and achieve them in a planned way; change habits and draft e-mails with competency

Topics relevant to "INDUSTRY READINESS PROGRAM (Foundational Skills".

Topics which are associated with modules 1, 2 & 3 are gaining clarity, confidence, active listening & empathy,

Course Code: **PPS 1026**	**Course Title: Industry Readiness Program – II (Audited Course)** 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 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.					
Course Objective	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.**					
Course Out Comes	**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					
Course Content						

Module 1	**Effective Communication**	Classroom activities	**10 Hours**

Topics: Practice effective communication skills (Verbal, Non-verbal, Written and Visual) **Activity:** Use social media prompts to prepare self-introduction videos			
Module 2	**Team Building**	Group Activity	**10 Hours**
Topics: Skills of an effective team player **Activity:** Student group activity to build class networking			
Module 3	**Leadership**	Case study	**10 Hours**
Topics: Types of leadership, using empathy in leadership **Activity:** Individual presentation by students on corporate leaders.			
Faculty : L&D			
Targeted Application & Tools that can be used: 1. TED Talks 2. You Tube Links 3. Activities			
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			

The topics related 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.

Course Code: APT4002	**Course Title: Introduction to Aptitude** **(Audited)**	**L- P- C**	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.				

<table>
<tr><td>Course Code:

APT4004</td><td colspan="3">Course Title: Aptitude Training-Intermediate

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="8">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="8">Students should have the basic concepts of Quantitative aptitude along with its applications in real life problems.</td></tr>
<tr><td>Anti-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Course Description</td><td colspan="8">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.</td></tr>
<tr><td>Course Objective</td><td colspan="8">The objective of the course is to familiarize the learners with the concepts of Aptitude and attain Skill Development through Problem Solving techniques.</td></tr>
<tr><td>Course Out Comes</td><td colspan="8">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.</td></tr>
<tr><td>Course Content:</td><td colspan="8"></td></tr>
<tr><td>Module 1</td><td colspan="3">Quantitative Ability 1</td><td colspan="3">Assignment</td><td colspan="2">16 Hours</td></tr>
<tr><td colspan="9">Topics:

Number System, Percentage, Ratio and Proportion, Average, Mixture and Allegation, Time and Work, Profit and Loss</td></tr>
</table>

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.

<table>
<tr><td>Course Code: APT4006</td><td colspan="4">Course Title: Logical and Critical Thinking
Type of Course: Audited</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 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="9">Nil</td></tr>
<tr><td>Course Description</td><td colspan="9">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="9">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="9">On successful completion of the course the students shall be able to:</td></tr>
<tr><td colspan="9">CO1] Understand all the concepts.</td></tr>
<tr><td colspan="9">CO2] Apply the concepts in problem solving (Bloom’s taxonomy Level 3)</td></tr>
<tr><td colspan="9">CO3] Analyze and structure the reasoning techniques and spatial visualization skills</td></tr>
<tr><td colspan="10">Course Content:</td></tr>
<tr><td>Module 1</td><td colspan="3">Logical Thinking</td><td>Assignment</td><td colspan="4"></td><td>16 Hours</td></tr>
<tr><td rowspan="2"></td><td colspan="9">Topics:</td></tr>
<tr><td colspan="9">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="4"></td><td>14 Hours</td></tr>
<tr><td rowspan="2"></td><td colspan="9">Topics:</td></tr>
<tr><td colspan="9">Analogy, Symbol and Notations, Statement and assumption, Cause of action, Statement and conclusion, Puzzles</td></tr>
<tr><td rowspan="3"></td><td colspan="9">Targeted Application & Tools that can be used:</td></tr>
<tr><td colspan="9">Application area: Placement activities and Competitive examinations.</td></tr>
<tr><td colspan="9">Tools: LMS</td></tr>
<tr><td rowspan="3">Evaluation</td><td colspan="9">Continuous Evaluation</td></tr>
<tr><td colspan="9">· Topic wise evaluation</td></tr>
<tr><td colspan="9">· Internal Assessments</td></tr>
<tr><td rowspan="2"></td><td colspan="9">Text Book</td></tr>
<tr><td colspan="9">1. A new approach to reasoning verbal, non-verbal & analytical by BS Sijwali</td></tr>
</table>

	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.

Course Code: CIV7601	Course Title: Universal Human Values and Ethics Type of Course: MAC course	L-T-P-C	-	-	-	0
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	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.					
Course Objective	The objective of the course is 'SKILL DEVELOPMENT' of the student by using 'SELF LEARNING' techniques					
Course Outcomes	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.					
Course Content:						
Module 1	Introduction to Value Education	Online Assessment	MCQ Quiz	5 Sessions		
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.						
Module 2	Harmony in the Human Being	Online Assessment	MCQ Quiz	5 Sessions		
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				
Module 3	Harmony in the Family and Society	Online Assessment	MCQ Quiz	5 Sessions
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.				
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.				

<table>
<tr><td colspan="2">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</td></tr>
<tr><td colspan="2">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.</td></tr>
<tr><td>Catalog prepared by</td><td>Mrs. Divya Nair</td></tr>
<tr><td>Recommended by the Board of Studies on</td><td>20th BoS dated 06 June 2025</td></tr>
<tr><td>Date of Approval by the Academic Council</td><td>Academic Council no. 26 dated 25th July 2025</td></tr>
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