PRESIDENCY UNIVERSITY

Private University Estd. in Karnataka State by Act No. 41 of 2013
Itgalpura, Rajankunte, Yelahanka, Bengaluru – 560064

PRESIDENCY SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

Program Regulations and Curriculum

2023-2027

BACHELOR OF TECHNOLOGY (B.Tech.) in Computer Science and Engineering- INTERNET OF THINGS(CIT)

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

Regulation Number: PU/AC-21.5/SoCSE2/CIT/2023-2027

Resolution No. 5 of the 21st Meeting of the Academic Council held on 06th Sept 2023, and ratified by the Board of Management in its 22nd Meeting held on 02nd Nov 2023.

(As amended up to 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)

September 2023

Table of Contents

Clause No.	Contents	Page Number
PART A – PROGRAM REGULATIONS		
1.	Vision & Mission of the University and the School / Department	4
2.	Preamble to the Program Regulations and Curriculum	4
3.	Short Title and Applicability	5
4.	Definitions	5
5.	Program Description	7
6.	Minimum and Maximum Duration	8
7.	Programme Educational Objectives (PEO)	9
8.	Programme Outcomes (PO) and Programme Specific Outcomes (PSO)	10
9.	Admission Criteria (as per the concerned Statutory Body)	10
10.	Lateral Entry / Transfer Students requirements	11
11.	Change of Branch / Discipline / Specialization	12
12.	Specific Regulations regarding Assessment and Evaluation	13
13.	Additional clarifications - Rules and Guidelines for Transfer of Credits from MOOC, etc.	15
PART B: PROGRAM STRUCTURE		
14.	Structure / Component with Credit Requirements Course Baskets & Minimum Basket wise Credit Requirements	17
15.	Minimum Total Credit Requirements of Award of Degree	18
16.	Other Specific Requirements for Award of Degree, if any, as prescribed by the Statutory Bodies	18
PART C: CURRICULUM STRUCTURE23		
17.	Curriculum Structure – Basket Wise Course List	23

18.	Practical / Skill based Courses – Internships / Thesis / Dissertation / Capstone Project Work / Portfolio / Mini project	26
19.	List of Elective Courses under various Specializations / Stream Basket	29
20.	List of Open Electives to be offered by the School / Department (Separately for ODD and EVEN Semesters).	31
21.	List of MOOC Courses	44
22.	Recommended Semester Wise Course Structure/ Flow including the Program / Discipline Elective Paths / Options	47
23.	Course Catalogue of all Courses Listed including the Courses Offered by other School / Department and Discipline / Program Electives	51

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 Computer Science and Engineering

To be a value based, practice-driven School of Computer Science and Engineering, committed to developing globally-competent Engineers, dedicated to developing cutting-edge technology, towards enhancing Quality of Life.

1.4 Mission of Presidency School of Computer Science and Engineering

- Cultivate a practice-driven environment, with computing-based pedagogy, integrating theory and practice.
- Attract and nurture world-class faculty to excel in Teaching and Research, in the realm of Computing Sciences.
- Establish state-of-the-art computing facilities, for effective Teaching and Learning experiences.
- Promote Interdisciplinary Studies to nurture talent for global impact.
- Instill Entrepreneurial and Leadership Skills to address Social, Environmental and Community-needs.

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 2023-2027.
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 2023-2027 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 2023-2024.

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, 2023-2027;*

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

gg. *"PSCS" means the Presidency School of Computer Science and 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, 2021;*

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 2023-2027 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 2023-2027 offered by the Presidency School of Computer Science and Engineering (PSCS):

1. Bachelor of Technology in Computer Science and Engineering, abbreviated as CSE
2. Bachelor of Technology in Computer Science and Technology (Big Data), abbreviated as CBD
3. Bachelor of Technology in Computer Science and Engineering (Block Chain), abbreviated as CBC
4. Bachelor of Technology in Computer Science and Technology (Dev Ops), abbreviated as CDV
5. Bachelor of Technology in Computer Science and Engineering (Cyber Security), abbreviated as CCS
6. Bachelor of Technology in Computer Science and Engineering (Internet of Things), abbreviated as CIT
7. Bachelor of Technology in Computer Science and Engineering (Data Science), abbreviated as CSD
8. Bachelor of Technology in Computer Science and Technology, abbreviated as CSG
9. Bachelor of Technology in Information Science and Technology, abbreviated as IST
10. Bachelor of Technology in Computer Science and Information Technology, abbreviated as CSI
11. Bachelor of Technology in Computer Science and Engineering (Networks), abbreviated as CSN
12. Bachelor of Technology in Computer Engineering, abbreviated as COM
13. Bachelor of Technology in Information Science and Engineering, abbreviated as ISE and
14. Bachelor of Technology in Computer Science and Engineering (Artificial Intelligence and Machine Learning) abbreviated as CAI

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 (Sub-Clauses 18.1 and 18.2 of Academic Regulations), shall stand terminated and no Degree shall be awarded.

7 Programme Educational Objectives (PEO)

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

PEO1. Demonstrate as a Computer Engineering Professional

PEO2. Engage in lifelong learning through research and professional development

PEO3. Serve as a leader in the profession through consultancy, extension activities and/ or entrepreneurship

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 the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. Problem Analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6. The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-Long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning 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: [Problem Analysis]: Identify, formulate, research literature, and analyze complex engineering problems related to Internet of Things principles and practices, Programming and Computing technologies reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PSO 02: [Design/development of Solutions]: Design solutions for complex engineering problems related to Internet of Things principles and practices, Programming and Computing technologies and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, cultural, societal and environmental considerations.

PSO 03: [Modern Tool usage]: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities related to Internet of Things principles and practices, Programming in Internet of Things Computing & analytics with an understanding of the limitations.

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 percentages (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, 2023-2027, 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. (Internet of Things) 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 Internet of Things for a student who joins the Program through the provision of the Lateral Entry, shall be "N – M" Credits.

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

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

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

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

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

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

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

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

11 Change of Branch / Discipline / Specialization

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

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

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

under any circumstances whatsoever.

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

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

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

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

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

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

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

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

12.2 Academic performance evaluation of every registered student in every Course registered by the student is carried out through various components of Assessments spread across the Semester. The nature of components of Continuous Assessments and the weightage given to each component of Continuous Assessments (refer Clause 12.5 of Academic Regulation) 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 Regulation) shall be awarded to a student based on her/his overall performance relative to the class performance distribution in the concerned Course. These Letter Grades not only indicate a qualitative assessment of the student's performance but also carry a quantitative (numeric) equivalent called the Grade Point.

12.5 **Assessment Components and Weightage**

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

Nature of Course and Structure	Evaluation Component	Weightage
Lecture-based Course 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.)	Continuous Assessments	50%
	End Term Examination	50%
Lab/Practice-based Course P component in the L-T-P Structure is predominant (Examples: 0-0-4; 1-0-4; 1-0-2; etc.)	Continuous Assessments	75%
	End Term Examination	25%

Skill based Courses like Industry Internship, Capstone project, Research Dissertation, Integrative Studio, Interdisciplinary Project, Summer / Short Internship, Social Engagement / Field Projects, Portfolio, and such similar Non-Teaching Credit Courses, where the pedagogy does not lend itself to a typical L-T-P structure	Guidelines for the assessment components for the various types of Courses, with recommended weightages, shall be specified in the concerned Program Regulations and Curriculum / Course Plans, as applicable.

The exact weightages of Evaluation Components shall be clearly specified in the concerned PRC and 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.

13.1 Minimum Performance Criteria:

13.1.1 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.

13.1.2 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.

13.1.3 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 Clause 13.1.1, 13.1.2 of Academic Regulation) 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:

14.1 The transfer of credits shall be examined and recommended by the Equivalence Committee (Refer ANNEXURE B of Academic Regulation) and approved by the Dean - Academics.

14.2 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.

14.3 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:

14.3.1 A student may complete SWAYAM/NPTEL/other approved MOOCs as mentioned in Clause 14.3 (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.

14.3.2 SWAYAM/NPTEL/ other approved MOOCs as mentioned in Clause 14.3 (As Per Academic Regulations) shall be approved by the concerned Board of Studies and placed (as Annexures) in the concerned PRC.

14.3.3 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.

14.3.4 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.

14.3.5 A student shall request for transfer of credits only from such approved Courses as mentioned in Sub-Clause 14.3.2 above.

14.3.6 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.

14.3.7 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 be forwarded to the COE for processing of results of the concerned Academic Term.

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

14.3.9 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.

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

14.4 The maximum number of credits that can be transferred by a student shall be limited to forty percent (40%) of the mandatory minimum credit requirements specified by the concerned Program Regulations and Curriculum for the award of the concerned Degree. However, the grades obtained in the Courses transferred from other Institutions/MOOCs, as mentioned in this Section (13.0), shall not be included in the calculation of the CGPA.

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

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

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

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

PART B: PROGRAM STRUCTURE

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

The B.Tech-CSE(Internet of Things) Program Structure (2023-2027) totalling 160 credits. Table 3.0 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 3.0: B.Tech-CSE (Internet of Things) 2023-2027: Summary of Mandatory Courses and Minimum Credit Contribution from various Baskets

Sl. No.	Baskets	Credit Contribution
1	School Core	**68**
2	Program Core	**65**
3	Discipline Elective	**18**
4	Open Elective	**9**
	Total Credits	**160 (Minimum)**

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-CSE(Internet of Things) program of four years' duration.

15. Minimum Total Credit Requirements of Award of Degree

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

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

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

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

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

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

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

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

PART C: CURRICULUM STRUCTURE

17. Curriculum Structure – Basket Wise Course List (not Semester Wise)
List of Courses Tabled – aligned to the Program Structure
(Course Code, Course Name, Credit Structure (LTPC), Contact Hours, Course Basket, Type of Skills etc., as applicable).

Type of Skill
F - Foundation
S - Skill Development
EM – Employability
EN – Entrepreneurship SS-Soft Skills AT-Aptitude Training

Course Caters to
GS - Gender Sensitization
ES - Environment and sustainability
HP - Human values and Professional Ethics

Table 3.1: List of School Core Courses									
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Contact Hour**	**Type of Skill/Focus**	**Pre-requisites/Co-requisites**
1	MAT1001	Calculus and Linear Algebra	3	0	2	4	5	F	-
2	PHY1002	Optoelectronics and Device Physics	2	0	2	3	4	F	-
3	ECE1001	Elements of Electronics Engineering	3	0	2	4	5	F	-
4	ENG1002	Technical English	1	0	2	2	3	S	ENG1001
5	PPS1001	Introduction to soft skills	0	0	2	1	2	S	-
7	CHE1018	Environmental Science	1	0	2	0	3	ES	-
8	PPS1011	Introduction to Verbal Ability	0	2	0	0	2	S	-
9	MAT1003	Applied Statistics	1	0	2	2	3	EM	-
10	ECE2007	Digital Design	2	0	2	3	4	F	ECE1001
11	CIV1008	Basic Engineering Sciences	2	0	0	2	2	F	-
12	MEC1006	Engineering Graphics	2	0	0	2	2	F	-
13	CSE1006	Problem Solving using JAVA	1	0	4	3	4	S / EM	-
14	ENG2001	Advanced English	1	0	2	2	3	S	ENG1002
15	PPS1012	Enhancing Personality Through Soft Skills	0	0	2	1	2	S	-
16	ECE2010	Innovative Projects Using Arduino	-	-	-	1	0	S	
17	MAT1002	Transform Techniques, Partial Differential Equations and Their Applications	3	0	0	3	3	F	MAT1001
18	CSE2001	Data Structures and Algorithms	3	0	2	4	5	s	
19	MAT2004	Discrete Mathematical Structures	3	0	0	3	3	EM	MAT1001
20	ECE2011	Innovative Projects Using Raspberry Pi	-	-	-	1	0	S	
21	PPS4002	Introduction to Aptitude	0	0	2	1	2	S/ EM	

22	MAT2003	Numerical Methods for Engineers	1	0	2	2	3	F	
23	PPS4004	Aptitude Training Intermediate	0	0	2	1	2	S/EM	
24	CSE3216	Mastering Object-Oriented Concepts in Python	0	0	2	1	2	S/ EM	
25	CSE7000	Internship	-	-	-	2	0	S/EM/EN	
26	APT4006	Logical and Critical Thinking	0	0	2	0	2	AT	
27	APT4026	Aptitude for Employability	0	0	2	0	2	AT	
28	PPS4027	Preparedness for Interview	0	0	2	0	2	SS	
29	LAW7601	Indian Constitution	0	0	0	0	-		
29	CSE2510	Competitive Programming and Problem Solving	0	0	4	2	4	S/EM	
30	CSE1004	Problem Solving Using C	1	0	4	3	5	S	
31	CSE7101	Mini Project	-	-	-	5	0		
32	CSE7300	Capstone Project	-	-	-	10	0		
Total No of Credits earned						68			

Table 3.2: List of Program Core Courses

S. No	Course Code	Course Name	L	T	P	C	Contact Hours	Type of Skills	Pre-Requisites
1	CSE3155	Data Communications and Computer Networks	3	0	2	4	5	S/EM	ECE2007
2	CSE2009	Computer Organization and Architecture	3	0	0	3	3	S/EM	ECE2007
3	CSE3190	Fundamentals of Data Analytics	2	0	2	3	4	S/EM	
4	CSE2014	Software Engineering	3	0	0	3	3	S/EM	

5	CSE1005	Programming in Python	1	0	4	3	5	S/EM	
6	CSE2007	Design and Analysis of Algorithms	3	0	0	3	3	S/EM	CSE2001
7	CSE3156	Database Management Systems	3	0	2	4	5	S/EM	
8	CSE3351	Operating Systems	3	0	0	3	3	S/EM	CSE2009
9	CSE3078	Cryptography and Network Security	3	0	0	3	3	S/EM	CSE3155
10	CSE2264	Essentials of AI	3	0	0	3	3	S/EM	
11	CIT2500	FoG Computing for IoT	3	0	0	3	3	S/EM	
12	CIT2503	Mobile Application for IoT	3	0	0	3	3	S/EM	
13	CSE2266	Theory of Computation	3	0	0	3	3	S/EM	
14	CIT2501	Wireless Communication in IoT	3	0	0	3	3	S/EM	CSE3155
15	CSE2258	Web Technologies	3	0	0	3	3	S/EM	
16	CSE2259	Web Technologies Lab	0	0	2	1	3	S/EM	
17	CSE2265	Essentials of AI Lab	0	0	2	1	3	S/EM	
18	CIT2504	AI and Deep Learning for IoT	3	0	0	3	3	S/EM	CSE2264
19	CIT2502	Privacy and Security in IoT	3	0	0	3	3	S/EM	CSE3155
20	CIT2401	Blockchain for IoT	3	0	0	3	3	S/EM	
21	CSE2272	Cloud Computing	2	0	0	2	4	S/EM	CSE3155
22	CSE2273	Cloud Computing Lab	0	0	2	1	2	S/EM	CSE3155
23	CSE2505	Mobile Application Development	2	0	0	2	2	S/EM	CSE1514
24	CSE2506	Mobile Application Development Lab	0	0	4	2	4	S/EM	CSE1514
Total No. of Credits						**65**			

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, 2021, are simply assigned the number of Credits based on the quantum of work / effort required to fulfil 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 / In-plant Training / Skill-based Program / International Immersion (IM) / Recognition of Prior Learning (RPL)

A student may undergo an Internship / In-plant Training / Skill-based Program / IM / RPL for a period minimum 04 weeks in an industry / company, government bodies, academic / research institution or recognized online platforms offering certified skill-based programs during the semester break between 4^{th} and 5^{th} semesters, subject to the following conditions:

18.1.1 The Internship / In-plant Training / Skill-based Program / IM / RPL shall be conducted in accordance with the Internship Policy prescribed by the University from time to time.

18.1.2 Internship: student shall undergo internship, either in industry / company, academic / research organizations, government bodies, or international institutions. The objective is to provide practical exposure, industry insights, and real-world experience relevant to the student's field of study.

18.1.3 In-plant Training: student shall undergo training / industrial exposure program aimed at providing with practical insights into real-world working environments. The training may be conducted by industries / companies on-campus or through student visits to industries / companies, government bodies / institutions, or technical organizations.

18.1.4 Skill-based Program: student shall undergo a certified skill-based program of 30 hours / 04 weeks. Skill-based program should cater to Skill-Enhancement, Practical Focus, and Career orientation, Complementary to Curriculum or Industry relevant.

18.1.5 International Immersion (IM): student shall undergo IM aimed at providing global exposure through collaborations with foreign universities, industries, or research institutions. The

International Immersion may include industry visits, expert interactions, and cultural exchange activities, enhancing students' international outlook, communication skills, and professional readiness.

18.1.6 Recognition of Prior Learning (RPL): student who shall undergo any formally recognize relevant prior work experience, internships, or project-based learning that meet the internship learning outcomes, thereby allowing students to earn internship credit without repeating equivalent practical training.

18.1.7 The number of Internships available for the concerned Academic Term. Further, the available number of Internships / In-plant training / Skill-based Program / IM / RPL shall be awarded to the students by the University on the basis of merit using the CGPA secured by the student and as per the selection criteria. Provided further, the student fulfils the criteria, as applicable, specified by the industry / company, government bodies, academic / research or through certified courses.

18.1.8 A student may opt for Internship / In-plant Training / IM / RPL in an industry / company, government bodies / academic / research institution, international bodies of her / his choice, subject to the condition that the concerned student takes the responsibility to arrange the Internship / In-plant Training / IM / RPL on her / his own. Provided further, that the industry / company, government bodies, academic / research institution national or international offering such Internship / Training confirms to the University that the Internship shall be conducted in accordance with the Program Regulations and Internship Policy of the University / Rubrics.

18.1.9 A student undergoing RPL must submit an application with supporting documents such as experience letters, project reports, employer feedback, certifications, a self-reflection report etc. Application must be submitted before the commencement of the internship semester.

18.1.10 A student selected for an Internship / In-plant Training / Skill-based Program / IM / RPL in an industry / company, government bodies, academic / research institution shall adhere to all the rules and guidelines prescribed in the Internship Policy of the University.

The performance will be assessed and grades awarded as per the university's academic grading policy. It may be included as a non-GPA course (Grade-based Satisfactorily Completed / Not Completed). The student must secure a minimum of 50% of the total marks to be declared as having successfully completed the course.

18.2 Mini Project

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

18.2.1 The Project Work shall be approved by the concerned HOD and be carried out under the

guidance of a faculty member.

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

18.3 Capstone Project

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

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

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

18.3.3 The number of Capstone Project available for the concerned Academic Term. Further, the available number of Capstone Project shall be awarded to the students by the University on the basis of merit using the CGPA secured by the student. Provided further, the student fulfils the criteria, as applicable, specified by the Industry / Company or academic / research institution providing the Capstone Project, as stated in Sub-Clause 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 I Capstone Project on her / his own. Provided further, that the Industry / Company or academic / research institution offering such Capstone Project confirms to the University that the Capstone Project shall be conducted in accordance with the Program Regulations and Capstone 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 18.4.4). 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

Type of Skill
F - Foundation
S - Skill Development
EM – Employability
EN – Entrepreneurship

Course Caters to
GS - Gender Sensitization
ES - Environment and sustainability
HP - Human values and Professional Ethics

Table 3.3: Discipline Electives Courses/Specialization Tracks – Minimum of 12 credits is to be earned by the student in a particular track and overall, 18 credits.

Track 01: Security and Industry Applications Basket

S.NO	Course Code	Course Name	L	T	P	C	Contact hour	Type of Skill	Pre-Requisites
1	CIT3410	Secure IoT	3	0	0	3	3	S/EM	CSE3078
2	CIT3412	IoT for Healthcare and Wearable Technology	3	0	0	3	3	S/EM	CSE3155
3	CIT3413	Industrial IoT (IIoT)	3	0	0	3	3	S/EM	CSE3155
4	CIT3414	Energy-Efficient IoT Systems	3	0	0	3	3	S/EM	CSE3155

Track 02 : Networking and Infrastructure Basket

S.NO	Course Code	Course Name	L	T	P	C	Contact hour	Type of Skill	Pre-Requisites
1	CIT3400	Architecting Smart IoT Devices	3	0	0	3	3	S/EM	ECE2010
2	CIT3401	Intelligent Sensors and Systems	3	0	0	3	3	S/EM	CSE3155
3	CIT3402	IoT Architecture and Protocols	2	0	2	3	4	S/EM	CSE3155
4	CIT3405	Edge and Fog Computing for IoT	3	0	0	3	3	S/EM	CIT2500
5	CIT3406	Cloud Computing for IoT	3	0	0	3	3	S/EM	CSE3351
Track 03: AI-Driven IoT Intelligence Basket									
S.NO	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Contact hour**	**Type of Skill**	**Pre-Requisites**
1	CIT3411	Big Data Analytics for IoT	2	0	2	3	4	S/EM	CSE3156
2	CIT3403	Embedded Systems for IoT	3	0	0	3	3	S/EM	ECE2010
3	CIT3404	IoT System Design and Development	3	0	0	3	3	S/EM	CIT2500
4	CIT3407	IoT Data Analytics and Machine Learning	3	0	0	3	3	S/EM	CSE2264
5	CIT2504	AI and Deep Learning for IoT	3	0	0	3	3	S/EM	CSE2264
6	CIT3408	Digital Twins and Simulation in IoT	3	0	0	3	3	S/EM	CSE3078
7	CIT3409	Autonomous Systems and Robotics with IoT	3	0	0	3	3	S/EM	CSE2506
Track 04:Special Basket									
1	CAI3427	Language Models for Text Mining+	2	0	2	3	4	S/EM	CSE3001
2	CAI3428	Practical Deep Learning with TensorFlow+	2	0	2	3	4	S/EM	CSE3001
3	CAI3429	Deep Learning Techniques for Computer Vision+	2	0	2	3	4	S/EM	MAT1003
4	CSE3426	Front End Full Stack Development *	2	0	2	3	3	S/ EM	CSE2258
5	CSE3427	Java Full Stack Development *	2	0	2	3	3	S/ EM	CSE2258
6	CSE3428	.Net Full Stack Development *	2	0	2	3	3	S/ EM	CSE2258

Track -5 Mandatory Non-Credited Course (** Offered for Lateral Entry students in higher semester wherever applicable in MOOC mode)									
1	LAW7601	Indian Constitution **	0	0	0	0	-	F	Nil
2	CHE1018	Environmental Science **	0	0	0	0	-	F	Nil
3	CIV7601	Universal Human Values and Ethics **	0	0	0	0	-	F	Nil
Total # of credits to be earned from DE						**18**			
*Mandatory for Students selected for Tech Mahindra and Capgemini									
** Offered for Lateral Entry students in higher semester wherever applicable in MOOC mode									
+Mandatory for Students Selected for Samsung Innovation Campus									

20. List of Open Electives to be offered by the School / Department (Separately for ODD and EVEN Semesters.

Type of Skill
F - Foundation
S - Skill Development
EM – Employability
EN – Entrepreneurship

Course Caters to
GS - Gender Sensitization
ES - Environment and sustainability
HP - Human values and Professional Ethics

Table 3.4: Open Elective Courses Baskets: Minimum Credits to be earned from this Basket is 9											
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Type of Skill/ Focus**	**Course Caters to**	**Prerequisites/ Corequisites**	**Antirequisites**	**Future Courses that need this as a Prerequisite**
Chemistry Basket											
1	CHE1003	Fundamentals of Sensors	3	0	0	3	S	ES	-	-	-
2	CHE1004	Smart materials for IOT	3	0	0	3	S	ES	-	-	-

3	CHE1005	Computational Chemistry	2	0	0	2	S	ES	-	-	-
4	CHE1006	Introduction to Nano technology	3	0	0	3	S	ES	-	-	-
5	CHE1007	Biodegradable electronics	2	0	0	2	S	ES	-	-	-
6	CHE1008	Energy and Sustainability	2	0	0	2	S	ES	-	-	-
7	CHE1009	3D printing with Polymers	2	0	0	2	S	ES	-	-	-
8	CHE1010	Bioinformatics and Healthcare IT	2	0	0	2	S	ES	-	-	-
9	CHE1011	Chemical and Petrochemical catalysts	3	0	0	3	S	ES	-	-	-
10	CHE1012	Introduction to Composite materials	2	0	0	2	S	ES	-	-	-
11	CHE1013	Chemistry for Engineers	3	0	0	3	S	ES	-	-	-
12	CHE1014	Surface and Coatings technology	3	0	0	3	S	ES	-	-	-
13	CHE1015	Waste to Fuels	2	0	0	2	S	ES	-	-	-
14	CHE1016	Forensic Science	3	0	0	3	S	ES	-	-	-
Civil Engineering Basket											
1	CIV1001	Disaster mitigation and management	3	0	0	3	S	-	-	-	-
2	CIV1002	Environment Science and Disaster Management	3	0	0	3	FC	-	-	-	-
3	CIV2001	Sustainability Concepts in Engineering	3	0	0	3	S	-	-	-	-

4	CIV2002	Occupational Health and Safety	3	0	0	3	S	-	-	-	-
5	CIV2003	Sustainable Materials and Green Buildings	3	0	0	3	EM	-	-	-	-
6	CIV2004	Integrated Project Management	3	0	0	3	EN	-	-	-	-
7	CIV2005	Environmental Impact Assessment	3	0	0	3	EN	-	-	-	-
8	CIV2006	Infrastructure Systems for Smart Cities	3	0	0	3	EN	-	-	-	-
9	CIV2044	Geospatial Applications for Engineers	2	0	2	3	EM	-	-	-	-
10	CIV2045	Environmental Meteorology	3	0	0	3	S	-	-	-	-
11	CIV3046	Project Problem Based Learning	3	0	0	3	S	-	-	-	-
12	CIV3059	Sustainability for Professional Practice	3	0	0	3	EN	-	-	-	-
Commerce Basket											
1	COM2001	Introduction to Human Resource Management	2	0	0	2	F	HP/GS	-	-	-
2	COM2002	Finance for Non Finance	2	0	0	2	S	-	-	-	-
3	COM2003	Contemporary Management	2	0	0	2	F	-	-	-	-
4	COM2004	Introduction to Banking	2	0	0	2	F	-	-	-	-
5	COM2005	Introduction to Insurance	2	0	0	2	F	-	-	-	-
6	COM2006	Fundamentals of Management	2	0	0	2	F	-	-	-	-

7	COM2007	Basics of Accounting	3	0	0	3	F	-	-	-	-
Computer Science Basket (not to be offered for Computer Science and Engineering students)											
1	CSE2002	Programming in Java	2	0	2	3	S/EM	-	-	-	-
2	CSE2003	Social Network Analytics	3	0	0	3	S	GS	-	-	-
3	CSE2004	Python Application Programming	2	0	2	3	S/EM	-	-	-	-
4	CSE2005	Web design fundamentals	2	0	2	3	S/EM/EN	-	-	-	-
Design Basket											
1	DES1001	Sketching and Painting	0	0	2	1	S	-	-	-	-
2	DES1002	Innovation and Creativity	2	0	0	2	F	-	-	-	-
3	DES1121	Introduction to UX design	1	0	2	2	S	-	-	-	-
4	DES1122	Introduction to Jewellery Making	1	0	2	2	S	-	-	-	-
5	DES1124	Spatial Stories	1	0	2	2	S	-	-	-	-
6	DES1125	Polymer Clay	1	0	2	2	S	-	-	-	-
7	DES2001	Design Thinking	3	0	0	3	S	-	-	-	-
8	DES1003	Serviceability of Fashion Products	1	0	2	2	F	ES	-	-	-
9	DES1004	Choices in Virtual Fashion	1	0	2	2	F	ES, GS, HP	-	-	-

10	DES1005	Fashion Lifestyle and Product Diversity	1	0	2	2	F	ES, GS, HP	-	-	-
11	DES1006	Colour in Everyday Life	1	0	2	2	F	ES	-	-	-
12	DES2080	Art of Design Language	3	0	0	3	S	-	-	-	-
13	DES2081	Brand Building in Design	3	0	0	3	S	-	-	-	-
14	DES2085	Web Design Techniques	3	0	0	3	S	-	-	-	-
15	DES2089	3D Modelling for Professionals	1	0	4	3	S	-	-	-	-
16	DES2090	Creative Thinking for Professionals	3	0	0	3	S	-	-	-	-
17	DES2091	Idea Formulation	3	0	0	3	S	-	-	-	-
Electrical and Electronics Basket											
1	EEE1002	IoT based Smart Building Technology	3	0	0	3	S	-	-	-	-
2	EEE1003	Basic Circuit Analysis	3	0	0	3	S	-	-	-	-
3	EEE1004	Fundamentals of Industrial Automation	3	0	0	3	S	-	-	-	-
4	EEE1005	Electric Vehicles & Battery Technology	3	0	0	3	S	-	-	-	-
5	EEE1006	Smart Sensors for Engineering Applications	3	0	0	3	S	-	-	-	-
Electronics and Communication Basket											
1	ECE1003	Fundamentals of Electronics	3	0	0	3	F	-	-	-	-

2	ECE1004	Microprocessor based systems	3	0	0	3	F	-	-	-	-
3	ECE3089	Artificial Neural Networks	3	0	0	3	S	-	-	-	-
4	ECE3097	Smart Electronics in Agriculture	3	0	0	3	F/EM	-	-	-	-
5	ECE3098	Environment Monitoring Systems	3	0	0	3	F/EM	-	-	-	-
6	ECE3102	Consumer Electronics	3	0	0	3	F/EM	-	-	-	-
7	ECE3103	Product Design of Electronic Equipment	3	0	0	3	S/F/EM / EN	-	-	-	-
8	ECE3106	Introduction to Data Analytics	3	0	0	3	F/EM	-	-	-	-
9	ECE3107	Machine Vision for Robotics	3	0	0	3	F/EM	-	-	-	-
English Basket											
1	ENG1008	Indian Literature	2	0	0	2	-	GS/ HP	-	-	-
2	ENG1009	Reading Advertisement	3	0	0	3	S	-	-	-	-
3	ENG1010	Verbal Aptitude for Placement	2	0	2	3	S	-	-	-	-
4	ENG1011	English for Career Development	3	0	0	3	S	-	-	-	-
5	ENG1012	Gender and Society in India	2	0	0	2	-	GS/ HP	-	-	-
6	ENG1013	Indian English Drama	3	0	0	3	-	-	-	-	-
7	ENG1014	Logic and Art of Negotiation	2	0	2	3	-	-	-	-	-

8	ENG1015	Professional Communication Skills for Engineers	1	0	0	1	-	-	-	-	-
DSA Basket											
1	DSA2001	Spirituality for Health	2	0	0	2	F	HP	-	-	-
2	DSA2002	Yoga for Health	2	0	0	2	S	HP	-	-	-
3	DSA2003	Stress Management and Well Being	2	0	0	2	F	-	-	-	-
Kannada Basket											
1	KAN1001	Kali Kannada	1	0	0	1	S	-	-	-	-
2	KAN1003	Kannada Kaipidi	3	0	0	3	S	-	-	-	-
3	KAN2001	Thili Kannada	1	0	0	1	S	-	-	-	-
4	KAN2003	Pradharshana Kale	1	0	2	2	S	-	-	-	-
5	KAN2004	Sahithya Vimarshe	2	0	0	2	S	-	-	-	-
6	KAN2005	Anuvadha Kala Sahithya	3	0	0	3	S	-	-	-	-
7	KAN2006	Vichara Manthana	3	0	0	3	S	-	-	-	-
8	KAN2007	Katha Sahithya Sampada	3	0	0	3	S	-	-	-	-
9	KAN2008	Ranga Pradarshana Kala	3	0	0	3	S	-	-	-	-
Foreign Language Basket											
1	FRL1004	Introduction of French Language	2	0	0	2	S	S	-	-	-

2	FRL1005	Fundamentals of French	2	0	0	2	S	S	-	-	-
3	FRL1009	Mandarin Chinese for Beginners	3	0	0	3	S	S	-	-	-
Law Basket											
1	LAW1001	Introduction to Sociology	2	0	0	2	F	HP		-	-
2	LAW2001	Indian Heritage and Culture	2	0	0	2	F	HP/GS		-	-
3	LAW2002	Introduction to Law of Succession	2	0	0	2	F	HP/GS		-	-
4	LAW2003	Introduction to Company Law	2	0	0	2	F	HP		-	-
5	LAW2004	Introduction to Contracts	2	0	0	2	F	HP	-	-	-
6	LAW2005	Introduction to Copy Rights Law	2	0	0	2	F	HP	-	-	-
7	LAW2006	Introduction to Criminal Law	2	0	0	2	F	HP	-	-	-
8	LAW2007	Introduction to Insurance Law	2	0	0	2	F	HP	-	-	-
9	LAW2008	Introduction to Labour Law	2	0	0	2	F	HP	-	-	-
10	LAW2009	Introduction to Law of Marriages	2	0	0	2	F	HP/GS	-	-	-
11	LAW2010	Introduction to Patent Law	2	0	0	2	F	HP	-	-	-
12	LAW2011	Introduction to Personal Income Tax	2	0	0	2	F	HP	-	-	-
13	LAW2012	Introduction to Real Estate Law	2	0	0	2	F	HP	-	-	-

14	LAW2013	Introduction to Trademark Law	2	0	0	2	F	HP	-	-	-
15	LAW2014	Introduction to Competition Law	3	0	0	3	F	HP	-	-	-
16	LAW2015	Cyber Law	3	0	0	3	F	HP	-	-	-
17	LAW2016	Law on Sexual Harrassment	2	0	0	2	F	HP/GS	-	-	-
18	LAW2017	Media Laws and Ethics	2	0	0	2	F	HP/GS	-	-	-
Mathematics Basket											
1	MAT2008	Mathematical Reasoning	3	0	0	3	S	-	-	-	-
2	MAT2014	Advanced Business Mathematics	3	0	0	3	S	-	-	-	-
3	MAT2041	Functions of Complex Variables	3	0	0	3	S	-	-	-	-
4	MAT2042	Probability and Random Processes	3	0	0	3	S	-	-	-	-
5	MAT2043	Elements of Number Theory	3	0	0	3	S	-	-	-	-
6	MAT2044	Mathematical Modelling and Applications	3	0	0	3	S	-	-	-	-
Mechanical Basket											
1	MEC1001	Fundamentals of Automobile Engineering	3	0	0	3	F	-	-	-	-
2	MEC1002	Introduction to Matlab and Simulink	3	0	0	3	S/EM	-	-	-	-
3	MEC1003	Engineering Drawing	1	0	4	3	S	-	-	-	-
4	MEC2001	Renewable Energy Systems	3	0	0	3	F	ES	-	-	-

5	MEC2002	Operations Research & Management	3	0	0	3	F	-	-	-	-
6	MEC2003	Supply Chain Management	3	0	0	3	S/EM/EN	-	-	-	-
7	MEC2004	Six Sigma for Professionals	3	0	0	3	S/EM	-	-	MEC2008	-
8	MEC2005	Fundamentals of Aerospace Engineering	3	0	0	3	F	-	-	-	-
9	MEC2006	Safety Engineering	3	0	0	3	S/EM	ES	-	-	-
10	MEC2007	Additive Manufacturing	3	0	0	3	F/EM	-	-	-	-
11	MEC3069	Engineering Optimisation	3	0	0	3	S/EM	-	-	-	-
12	MEC3070	Electronics Waste Management	3	0	0	3	F/S	ES	-	-	-
13	MEC3071	Hybrid Electric Vehicle Design	3	0	0	3	S/EM	ES	-	-	-
14	MEC3072	Thermal Management of Electronic Appliances	3	0	0	3	S/EM	-	-	-	-
15	MEC3200	Sustainable Technologies and Practices	3	0	0	3	S/EM	-	-	-	-
16	MEC3201	Industry 4.0	3	0	0	3	S/EM	-	-	-	-
Petroleum Basket											
1	PET1011	Energy Industry Dynamics	3	0	0	3	FC	ES	-	NIL	-
2	PET1012	Energy Sustainability Practices	3	0	0	3	FC	ES	-	NIL	-
Physics Basket											

1	PHY1003	Mechanics and Physics of Materials	3	0	0	3	FC / SD				
2	PHY1004	Astronomy	3	0	0	3	FC				
3	PHY1005	Game Physics	2	0	2	3	FC / SD				
4	PHY1006	Statistical Mechanics	2	0	0	2	FC				
5	PHY1007	Physics of Nanomaterials	3	0	0	3	FC				
6	PHY1008	Adventures in nanoworld	2	0	0	2	FC				
7	PHY2001	Medical Physics	2	0	0	2	FC	ES			
8	PHY2002	Sensor Physics	1	0	2	2	FC / SD				
9	PHY2003	Computational Physics	1	0	2	2	FC				
10	PHY2004	Laser Physics	3	0	0	3	FC	ES			
11	PHY2005	Science and Technology of Energy	3	0	0	3	FC	ES			
12	PHY2009	Essentials of Physics	2	0	0	2	FC				
Management Basket- I											
1	MGT2007	Digital Entrepreneurship	3	0	0	3	S/EM/EN	-	-	-	-
2	MGT2015	Engineering Economics	3	0	0	3	S	-	-	-	-
3	MGT2023	People Management	3	0	0	3	S/EM/EN	HP	-	-	-

Management Basket- II											
1	MGT1001	Introduction to Psychology	3	0	0	3	F	HP	-	-	-
2	MGT1002	Business Intelligence	3	0	0	3	EN	-	-	-	-
3	MGT1003	NGO Management	3	0	0	3	S	-	-	-	-
4	MGT1004	Essentials of Leadership	3	0	0	3	EM/EN	GS/ HP	-	-	-
5	MGT1005	Cross Cultural Communication	3	0	0	3	S/EM/EN	HP	-	-	-
6	MGT2001	Business Analytics	3	0	0	3	S/EM/EN	-	-	-	-
7	MGT2002	Organizational Behaviour	3	0	0	3	F	HP	-	-	-
8	MGT2003	Competitive Intelligence	3	0	0	3	S	-	-	-	-
9	MGT2004	Development of Enterprises	3	0	0	3	S/EM/EN	-	-	-	-
10	MGT2005	Economics and Cost Estimation	3	0	0	3	S/EM	-	-	-	-
11	MGT2006	Decision Making Under Uncertainty	3	0	0	3	S	-	-	-	-
12	MGT2008	Econometrics for Managers	3	0	0	3	S	-	-	-	-
13	MGT2009	Management Consulting	3	0	0	3	S/EM/EN	-	-	-	-

14	MGT2010	Managing People and Performance	3	0	0	3	S/EM/EN	HP/GS	-	-	-
15	MGT2011	Personal Finance	3	0	0	3	F	-	-	-	-
16	MGT2012	E Business for Management	3	0	0	3	S/EM	-	-	-	-
17	MGT2013	Project Management	3	0	0	3	EN / EM	GS/HP/ES	-	-	-
18	MGT2014	Project Finance	3	0	0	3	EN / EM	HP	-	-	-
19	MGT2016	Business of Entertainment	3	0	0	3	EM/ EN	-	-	-	-
20	MGT2017	Principles of Management	3	0	0	3	S/EM/ EN	-	-	-	-
21	MGT2018	Professional and Business Ethics	3	0	0	3	S/EM/ EN	HP	-	-	-
22	MGT2019	Sales Techniques	3	0	0	3	S/EM/ EN	HP	-	-	-
23	MGT2020	Marketing for Engineers	3	0	0	3	S/EM/ EN	HP	-	-	-
24	MGT2021	Finance for Engineers	3	0	0	3	S/EM/ EN	HP	-	-	-
25	MGT2022	Customer Relationship Management	3	0	0	3	S/EM/ EN	HP	-	-	-
Media Studies Basket											
1	BAJ3050	Corporate Filmmaking and Film Business	0	0	4	2	EM	HP	-	-	-

2	BAJ3051	Digital Photography	2	0	2	3	EM	HP	-	-	-
3	BAJ3055	Introduction to News Anchoring and News Management	0	0	2	1	EM	-	-	-	-

21. List of MOOC Courses for Computer Science and Engineering (Internet of Things) Program of 12 weeks

21.1 Presidency University students are given the opportunity to study abroad in International Universities through a selection process coordinated by the Office of International Affairs (OIA). Such selected students need to complete their credits for the semester that they are abroad in the following way:

21.1.1 The student needs to study and complete School Core and Program Core Courses in offline mode only.

21.1.2 Massive Open Online Course (MOOC) courses maybe given for Open Elective and Discipline Elective Courses. These courses need to be approved by the concerned BOS and Academic Council from time to time.

21.1.3 SWAYAM/NPTEL/ other approved MOOCs shall be approved by the concerned Board of Studies and placed in the concerned PRC.

21.1.4 Student shall register for these courses in the ERP of Presidency University.

21.1.5 For these MOOC courses faculty coordinators are identified. These faculty should have undergone similar MOOC courses and therefore should be familiar with the mode of class conduction, types of assessments and evaluation procedures.

21.1.6 Study materials shall be provided to the students as video lectures shared by the MOOCs Coordinator(s), or the students may access the approved MOOCs Portal directly. The mode of class conduction is determined by the MOOCs coordinator(s) as detailed in the Course Catalogue and Course Plan.

21.1.7 The question paper shall be prepared by the MOOCs coordinator(s).

21.1.8 Students write the exams in online mode. These exams are scheduled and conducted by the School.

21.1.9 Results are evaluated by School and given to the Office of the Controller of Examinations (CoE).

21.1.10 The details of the duration, credits and evaluation are given below:

Sl#	Duration	Credits
1.	12 weeks	3
2.	8 weeks	2
3	4 weeks	1

21.2 MOOC – Discipline Elective Courses for B.Tech. Computer Science and Engineering (Internet of Things) Program

Table 3.5 : MOOC Discipline Elective Courses

Sl.No	Course Code	Course Name	Credits	L-T-P-C
1	CSE3111	Artificial Intelligence: Search Methods for Problem Solving	3	3-0-0-3
2	CSE3112	Privacy and Security in Online Social Media	3	3-0-0-3
3	CSE3113	Computational Complexity	3	3-0-0-3
4	CSE3114	Deep Learning for Computer Vision	3	3-0-0-3
5	CSE3115	Learning Analytics Tools	3	3-0-0-3
6	CSE3119	Coding Skills in Python	3	3-0-0-3
7	CSE3121	Parallel Computer Architecture	3	3-0-0-3
8	CSE3124	Games and Information	3	3-0-0-3
9	CSE3140	Introduction to Industry 4.0 and Industrial Internet of Things	3	3-0-0-3
10	CSE3142	Affective Computing	3	3-0-0-3
11	CSE3196	Foundations of Cyber Physical Systems	3	3-0-0-3
12	CSE3197	Getting Started with Competitive Programming	3	3-0-0-3
13	CSE3198	GPU Architectures and Programming	3	3-0-0-3
14	CSE3199	Artificial Intelligence: Knowledge Representation and Reasoning	3	3-0-0-3
15	CSE3200	Programming in Modern C++	3	3-0-0-3
16	CSE3201	Circuit Complexity Theory	3	3-0-0-3
17	CSE3202	Basics of Computational Complexity	3	3-0-0-3
18	CSE3212	Introduction to Computer and Network Performance Analysis using Queuing	1	1-0-0-1
19	CSE3213	C Programming and Assembly Language	1	1-0-0-1
20	CSE3214	Python for Data Science	1	1-0-0-1
21	CSE3215	Software Conceptual Design	1	1-0-0-1
22	CSE3117	Industrial Digital Transformation	3	3-0-0-3

23	CSE3118	Blockchain for Decision Makers	3	3-0-0-3
24	CSE3349	Technology for Lawyers	3	3-0-0-3
25	CSE3430	Deep Learning for Natural Language Processing	3	3-0-0-3
26	CSE3431	Machine Learning for Engineering and Science Applications	3	3-0-0-3
27	CSE3432	Algorithms in Computational Biology and Sequence Analysis	3	3-0-0-3
28	CSE3433	Introduction to Large Language Models (LLMs)	3	3-0-0-3
29	CSE3434	Quantum Algorithms and Cryptography	3	3-0-0-3
30	CAI3430	Responsible & Safe AI Systems	3	3-0-0-3
31	CCS3416	Practical Cyber Security for Cyber Security Practitioners	3	3-0-0-3
32	IST3409	Design & Implementation of Human-Computer Interfaces	3	3-0-0-3

21.3 MOOC - Open Elective Courses for B. Tech. Computer Science and Engineering (Internet of Things) Program

Table 3.10: MOOC Open Elective Courses

Courses duration is 4 weeks (01 credit)/ 8 weeks (02 credits)/ 12 weeks (03 credits)

Sl. No.	Course Code	Course Name	Total Credits	L-T-P-C
1	BBA2022	Supply Chain digitization	3	3-0-0-3
2	BBA2021	E Business	3	3-0-0-3
3	BBB2016	Business Analytics for Management Decisions	3	3-0-0-3
4	BBB2015	Artificial Intelligence for Investments	3	3-0-0-3
5	MEC3001	Design and Development of Product	1	1-0-0-1
6	ENG3004	Perspectives of Neurolinguistics	1	1-0-0-1
7	PPS4009	Working in Contemporary Teams	1	1-0-0-1
8	MGT3001	Data Analysis and Decision Making	3	3-0-0-3
9	MEC3001	Design and Development of Product	1	1-0-0-1
10	EEE3105	Microsensors and Nanosensors	3	3-0-0-3
11	CIV3065	Drone Systems and Cont¯rol	3	3-0-0-3
12	ECE3183	Neural Networks for Signal Processing - I	3	3-0-0-3
13	CIVXXXX	Disaster Management	3	3-0-0-3

Note :
** MEC3001 is offered to the students who had 1 credit shortage because of implementation of CBCS system during their 1st year.*
*** ENG3004 is offered to the students who had 2 credits shortage along with the MEC3001 because of implementation of CBCS System during their 1st year.*
**** PPS4009 is offered to only International students in place of Interview Preparedness course of their batch mates.*

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

Semester Wise Course Grids/ Tables: First year - CYCLE 1

Sl. No.	Course Code	Course Name	L	T	P	Credits	Type of Skill/ Focus	Course Caters to	Basket
Semester 1 - Physics Cycle						**17**			
1	MAT1001	Calculus and Linear Algebra	3	0	2	4	F		SCHOOL CORE
2	PHY1002	Optoelectronics and Device Physics	2	0	2	3	F		SCHOOL CORE
3	ECE1001	Elements of Electronics Engineering	3	0	2	4	F		SCHOOL CORE
4	ENG1002	Technical English	1	0	2	2	S		SCHOOL CORE
5	PPS1001	Introduction to soft skills	0	0	2	1	S	HP	SCHOOL CORE
6	CSE1004	Problem Solving Using C	1	0	4	3	S		SCHOOL CORE
7	CHE1018	Environmental Science	1	0	2	0	F	ES	SCHOOL CORE
8	PPS1011	Introduction to Verbal Ability	0	2	0	0	S/ EM		SCHOOL CORE
Semester 2 - Engineering Science Cycle						**16**			
1	MAT1003	Applied Statistics	1	0	2	2	EM		SCHOOL CORE

2	ECE2007	Digital Design	2	0	2	3	F / S		SCHOOL CORE
3	CIV1008	Basic Engineering Sciences	2	0	0	2	S		SCHOOL CORE
4	MEC1006	Engineering Graphics	2	0	0	2	S		SCHOOL CORE
5	CSE1006	Problem Solving using JAVA	1	0	4	3	S		SCHOOL CORE
6	ENG2001	Advanced English	1	0	2	2	S		SCHOOL CORE
7	PPS1012	Enhancing Personality Through Soft Skills for Engineers	0	0	2	1	S	HP	SCHOOL CORE
8	ECE2010	Innovative Projects Using Arduino	-	-	-	1	S		SCHOOL CORE

First year - CYCLE 2

Sl. No.	Course Code	Course Name	L	T	P	Credits	Type of Skill/ Focus	Course Caters to	Basket
Semester 1 - Engineering Science Cycle						**18**			
1	MAT1001	Calculus and Linear Algebra	3	0	2	4	F		SCHOOL CORE
2	ECE1001	Elements of Electronics Engineering	3	0	2	4	F		SCHOOL CORE
3	ENG1002	Technical English	1	0	2	2	S		SCHOOL CORE
4	PPS1001	Introduction to soft skills	0	0	2	1	S	HP	SCHOOL CORE
5	CSE1004	Problem Solving Using C	1	0	4	3	S		SCHOOL CORE
6	PPS1011	Introduction to Verbal Ability	0	2	0	0	S/ EM		SCHOOL CORE
7	CIV1008	Basic Engineering Sciences	2	0	0	2	S		SCHOOL CORE
8	MEC1006	Engineering Graphics	2	0	0	2	S		SCHOOL CORE
Semester 2 – Physics Cycle						**15**			
1	MAT1003	Applied Statistics	1	0	2	2	EM		SCHOOL CORE
2	ECE2007	Digital Design	2	0	2	3	F / S		SCHOOL CORE
3	CSE1006	Problem Solving using JAVA	1	0	4	3	S		SCHOOL CORE
4	ENG2001	Advanced English	1	0	2	2	S		SCHOOL CORE

5	PPS1012	Enhancing Personality Through Soft Skills	0	0	2	1	S	HP	SCHOOL CORE
6	CHE1018	Environmental Science	1	0	2	0	F	ES	SCHOOL CORE
7	PHY1002	Optoelectronics and Device Physics	2	0	2	3	F		SCHOOL CORE
8	ECE2010	Innovative Projects Using Arduino	-	-	-	1	S		SCHOOL CORE

Sl. No.	Course Code	Course Name	L	T	P	Credits	Type of Skill/ Focus	Course Caters to	Basket
Semester 3						**28**			
1	MAT1002	Transform Techniques, Partial Differential Equations and Their Applications	3	0	0	3	F		SCHOOL CORE
2	CSE2001	Data Structures and Algorithms	3	0	2	4	S		SCHOOL CORE
3	CSE3155	Data Communications and Computer Networks	3	0	2	4	S		PROGRAM CORE
4	CSE2009	Computer Organization and Architecture	3	0	0	3	S		PROGRAM CORE
5	MAT2004	Discrete Mathematical Structures	3	0	0	3	EM		SCHOOL CORE
6	CSE3190	Fundamentals of Data Analytics	2	0	2	3	S		PROGRAM CORE
7	CSE2014	Software Engineering	3	0	0	3	S		PROGRAM CORE
8	ECE2011	Innovative Projects Using Raspberry Pi	-	-	-	1	S		SCHOOL CORE
9	CSE1005	Programming in Python	1	0	4	3	S		PROGRAM CORE
10	PPS4002	Introduction to Aptitude	0	0	2	1	S/EM	HP	SCHOOL CORE
Semester 4						**23**			
1	MAT2003	Numerical Methods for Engineers	1	0	2	2	S		SCHOOL CORE
2	CSE2007	Design and Analysis of Algorithms	3	0	0	3	S		PROGRAM CORE

3	CSE3156	Database Management Systems	3	0	2	4	S		PROGRAM CORE
4	CSE3351	Operating Systems	3	0	0	3	S		PROGRAM CORE
5	CSE3078	Cryptography and Network Security	3	0	0	3	S		PROGRAM CORE
6	CSEXXXX	Professional Elective - I	3	0	0	3			DISCIPLINE ELECTIVE
7	XXXXXXX	Open Elective – I	3	0	0	3			OPEN ELECTIVE
8	PPS4004	Aptitude Training Intermediate	0	0	2	1	S/EM	HP	SCHOOL CORE
9	CSE3216	Mastering Object-Oriented Concepts in Python	0	0	2	1			SCHOOL CORE
Semester 5						**25**			
1	CSE2264	Essentials of AI	3	0	0	3			PROGRAM CORE
2	CIT2500	FoG Computing for IoT	3	0	0	3	S		PROGRAM CORE
3	CIT2503	Mobile Application for IoT	3	0	0	3			PROGRAM CORE
4	CSE2266	Theory of Computation	3	0	0	3	S		PROGRAM CORE
5	CIT2501	Wireless Communication in IoT	3	0	0	3	S		PROGRAM CORE
6	CSE2258	Web Technologies	3	0	0	3	S		PROGRAM CORE
7	CSE2259	Web Technologies Lab	0	0	2	1			PROGRAM CORE
8	CITxxxx	Professional Elective - II	3	0	0	3	S		DISCIPLINE ELECTIVE
9	CIT2502	Privacy and Security in IoT	3	0	0	3	S		PROGRAM CORE
10	CSE2265	Essentials of AI Lab	0	0	2	1			PROGRAM CORE
11	APT4006	Logical and Critical Thinking	0	0	2	0	AT		School Core
12	CSE7000	Internship	-	-	-	2			SCHOOL CORE
Semester 6						**21**			
1	CIT2504	AI and Deep Learning for IoT	3	0	0	3	S		PROGRAM CORE
2	CIT2401	Blockchain for IoT	3	0	0	3	S		PROGRAM CORE
3	CSE2272	Cloud Computing	2	0	0	2	S		PROGRAM CORE

4	CSE2273	Cloud Computing Lab	0	0	2	1	S		PROGRAM CORE
5	CSE2505	Mobile Application Development	2	0	0	2	S		PROGRAM CORE
6	CITXXXX	Professional Elective - III	3	0	0	3	S		DISCIPLINE ELECTIVE
7	XXXXXXX	Open Elective – II	3	0	0	3			OPEN ELECTIVE
8	CSE2506	Mobile Application Development Lab	0	0	4	2	S		PROGRAM CORE
9	CSE2274	Competitive Programming and Problem Solving	0	0	4	2	AT		School Core
10	LAW7601	Indian Constitution	0	0	0	0	S/EM		School Core
11	APT4026	Aptitude for Employability	0	2	0	0			School Core

Semester 7						**17**			
1	XXXXXXX	Open Elective – III	3	0	0	3			OPEN ELECTIVE
2	CITXXXX	Professional Elective -VIII	3	0	0	3			DISCIPLINE ELECTIVE
3	CITXXXX	Professional Elective – IX	3	0	0	3			DISCIPLINE ELECTIVE
4	CITXXXX	Professional Elective - X	3	0	0	3			DISCIPLINE ELECTIVE
5	PPS4027	Preparedness for Interview	0	0	2	0			School Core
6	CSE7101	Mini Project	-	-	-	5	S/ EM/ EN		SCHOOL CORE
Semester 8						**10**			
1	CSE7300	Capstone Project	-	-	-	10	S/ EM/ EN		SCHOOL CORE

23. Course Catalogue

Course Catalogue of all Courses Listed including the Courses Offered by other School / Department and Discipline / Programme Electives – Course Code, Course Name, Prerequisite, Anti-requisite, Course Description, Course Outcome, Course Content (with Blooms Level, CO, No. of Contact Hours), Reference Resources.

Course Code: MAT1001	**Course Title: Calculus and Linear Algebra** **Type of Course: School Core Lab Integrated**	**L-T- P- C**	**3**	**0**	**2**	**4**
Version No.	3.0					
Course Pre-requisites	Basic Concepts of Limits, Differentiation, Integration					
Anti-requisites	**NIL**					
Course Description	The course focuses on the concepts of calculus and linear algebra with reference to specific engineering problems. The course is of both conceptual and analytical type in nature. The lab sessions associated with the course are concerned with acquiring an ability to use the MATLAB software.					
Course Objective	The objective of the course is **Skill Development** of student by using **Problem Solving Techniques.**					
Course Out Comes	On successful completion of the course the students shall be able to: 1) Comprehend the knowledge of applications of matrix principles. 2) Understand the concept of partial derivatives and their applications. 3) Apply the principles of integral calculus to evaluate integrals. 4) Adopt the various analytical methods to solve differential equations. 5) Demonstrate the use of MATLAB software to deal with a variety of mathematical problems.					
Course Content:						
Module 1	**Linear Algebra**				**10 Classes**	
Review: Types of matrices, elementary transformations, rank of a matrix, normal form, Solution of systems of linear equations: (Homogenous and non-homogenous system) AX = O and AX = B using rank method. **Linear Algebra:** Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms. Engineering Applications of Linear Algebra.					
Module 2	**Partial Derivatives**				**10 CLASSES**	
Review: Differential calculus with single variable.						

Partial Derivatives:
Homogeneous functions and Euler's theorem, Total derivative, Change of variables, Jacobians, Partial differentiation of implicit functions, Taylor's series for functions of two variables, Maxima and minima of functions of two variables, Lagrange's method of undetermined multipliers.
Engineering Applications of partial derivatives.

Module 3	**Advanced Integral calculus**			**12 Classes**

Review: Integral calculus for single integrals.

Advanced Integral calculus:
Beta and Gamma functions–interrelation-evaluation of integrals using gamma and beta functions; error function-properties. Multiple Integrals- Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves, evaluation of triple integrals-change of variables between Cartesian and cylindrical and spherical polar co-ordinates.
Engineering applications of partial derivatives.

Module 4	**Ordinary Differential Equations**	**Assignment**	**Programming**	**12 Classes**

Review: First order and first-degree Ordinary Differential Equations, Method of separation of variables, Homogeneous and Non- Homogeneous Equations reducible to Homogeneous form.

Linear Differential Equations, Bernoulli's Differential Equation, Exact and Non- Exact Differential Equations, Higher order Differential Equation with constant coefficients and with right hand side of the form e^{ax}, sinax, cosax, $e^{ax}f(x)$, $x^nf(x)$ etc., Linear equations with variable coefficients such as Cauchy Equation and Lagrange's Equation, D-operators and Inverse D- operators, Method of Variation of Parameters.
Engineering applications of differential equations.

List of Laboratory Tasks:
Introductory Task: Introduction to usage of the software and simple programming tasks. [3 Sessions]
Experiment N0 1: Solution of Simple differentiation with single variable and use of chain Rule.
Experiment No. 2: Solution based on application of Tailors' Series using software
Experiment No. 3: Application of Maxima and Minima condition using software.
Experiment No. 4 Computation of different functions for a specific problem
Experiment No. 5 Computation of Area under a curve.
Experiment No. 6 Solution of a set of simultaneous equations in matrix method
Experiment No. 7 Computation of Eigen Values and Eigen Vectors.

Experiment No. 8 Solution of Partial Differential equation
Experiment No. 9 solution using Cauchy Equation and Lagrange's Equation

Targeted Application & Tools that can be used:
The contents of this course has direct applications in most of the core engineering courses for problem formulations, Problem Solution and system Design.
Tools Used: MatLab, Zylink.

Assignment:

1. List at least 3 sets of Matrix Applications concerning the respective branch of Engineering and obtain the solution using MATLAB.
2. 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. Sankara Rao, Introduction to Partial differential equations, Prentice Hall of India, edition, 2011
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. Lay, Linear Algebra ansd its applications, 3rd Ed., 2002, Pearson Education India.
4. Erwin Kreyzig, Advanced Engineering Mathematics, John Wiley and sons, Inc.10th Edition
5. MatLab usage manual

E-resources/ Web links:

1. https://nptel.ac.in/courses/109104124
2. https://nptel.ac.in/courses/111106051
3. https://nptel.ac.in/courses/111102137
4. https://www.cuemath.com/learn/mathematics/algebra-vs-calculus/
5. https://stanford.edu/~shervine/teaching/cs-229/refresher-algebra-calculus
6. https://math.hmc.edu/calculus/hmc-mathematics-calculus-online-tutorials/linear-algebra/
7. https://www.math.hkust.edu.hk/~maqian/ma006_0607F.html
8. https://www.scu.edu.au/study-at-scu/units/math1005/2022/

Topics relevant to the development of Foundation Skills: **All solution methods**

Topics relevant to development of Employability skills: **Use of Matlab software.**

Course Code: **ECE1001**	**Course Title: Elements of Electronics Engineering** **Type of Course: School Core Theory & Integrated Laboratory**	**L-T-P-C**	3	0	2	4
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	Nil					
Course Description	The purpose of this course is to enable the students to learn the fundamental concepts of electronic devices and circuits. The course aims at nurturing the students with the fundamental principles of electronics engineering, prevailing in various engineering applications. The nature of the course is conceptual and analytical which imparts knowledge of electronic components and their behavior under various operating conditions. The course develops thinking skills of the students, encouraging their quest for knowledge about electronic devices and their usage in higher semester courses. The associated laboratory provides an opportunity to validate the concepts taught in theory classes and enable the students to work with basic electronic circuits using electronics components.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Elements of Electronics Engineering and attain SKILL DEVELOPMENT through EXPERIENTIAL LEARNING .					
Course Outcomes	On successful completion of this course the students shall be able to: Identify various electrical and electronic components and basic electrical laws. Explainapplications of Diodes and BJTs. Summarize the concepts of Digital Electronics and Communication Systems. Discuss the basic concepts of microprocessorand computer organization. Perform experiments to familiarizevarious Electrical & Electronic components and equipment. Verify Basic Electrical Circuit configurations and Laws.					
Course Content:						
Module 1	Basic Electrical and Electronic Components	Assignment / Quiz	Identification of Practical electronic and electrical components / Memory Recall based Quizzes			10 Sessions
Topics: ELECTRICAL CIRCUITS AND LAWS:DC Circuits: Classification of Electrical Elements, Ohm's law, Series and Parallel Circuits, Kirchhoff's Voltage and Current laws, Power and Energy, Transformers and their types.						

ELECTRONIC MATERIALS AND COMPONENTS: Conductors, Insulators, Semi-Conductor Material, P-N Junction diode, Characteristics and Parameters, Ideal Diode approximations, DC load line.

Module 2	Applications of Diodes and Introduction to BJT	Assignment / Quiz		Simulation Task/ Memory Recall based Quizzes	12 Sessions

Topics:

RECTIFIERS: Half-wave rectifier, Two-diode Full-wave rectifier, Bridge rectifier, Capacitor filter circuit (only qualitative approach).

ZENER DIODE: Zener diode, Zener Characteristics, Zener diode as a voltage regulator.

BIPOLAR JUNCTION TRANSISTORS: BJT Construction and Operation, BJT Voltages and Currents, Common Base, Common Emitter Configuration and Characteristics, Current amplification Factor alpha and beta, DC Load line w.r.t. fixed bias circuit (Q-Point), AC Analysis.

Module 3	Digital Electronics and Communication System	Assignment / Quiz		Simulation Task / Memory Recall based Quizzes	13 Sessions

Topics:

NUMBER SYSTEMS: Decimal Number System, Binary Number System, Hexadecimal Number System, Conversions: Binary to and from Hexadecimal; Hexadecimal to and from Decimal;1's and 2's Complement of Binary Numbers, Binary Addition.

BOOLEAN ALGEBRA: Boolean Laws and Theorems, De Morgan's theorem. Digital Circuits: Logic gates, NOT Gate, AND Gate, OR Gate, XOR Gate, X-NOR Gate, NAND Gate, NOR Gate.

COMMUNICATION SYSTEM: Block diagram of communication system, Modulation: Definition of Modulation, Need of Modulation, Types of Modulation: Amplitude Modulation and Frequency Modulation (Waveforms only).

Module 4	Microprocessors and Computer Organization	Assignment / Quiz	Memory recall based Quizzes	10 Sessions

Topics:

INTEL 8085 MICROPROCESSOR: Basic Architecture and features of 8085 Microprocessor.

COMPUTER ORGANISATION:Basic structure of Computer Organisation describing the various Computer types, Functional Units, Basic Operational concepts, Bus Structures, Memory System: RAM and ROM.

List of Laboratory Tasks:

Experiment No. 1:Study of Resistors, Measuring instruments and DC Power Supply.

Level 1:Identification of resistor values from color bands and verification with Multimeter.

Level 2:Connecting a resistive circuit to a DC Power Supply and observing the input and output values using Voltmeters, Ammeters and hence calculate resistance values.

Experiment No. 2:Study of Reactive components, Multimeter, CRO and Function Generator.

Level 1:Identification of various types of capacitive and inductive components and verification with Multimeter.

Level 2:Connecting a reactive circuit to a function generator and observing the input and output waveform on CRO and calculation of Reactance and Impedance.

Experiment No. 3: Study of Ohm's Law.

Level 1:Rig up the circuit and verify Ohm's Law.

Level 2: Connect a 100Ω Resistor to a Voltage source of 0-5V. Plot a V- I graph by tabulating the Voltage Vs Current Values accordingly. Repeat the experiment for 1KΩ resistor and compare the results.

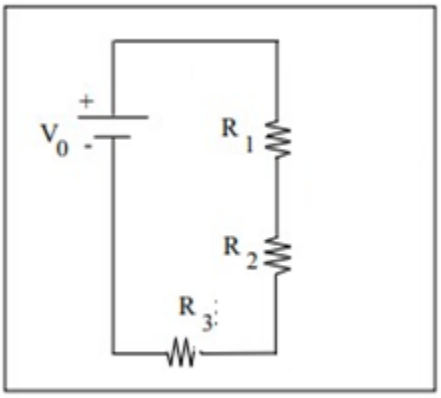
Experiment No. 4:Study of Series and Parallel Resistor Connections.

Level 1:Carry out the equivalent resistance of given four resistors 100Ω each connected in series and parallel combination using breadboard.

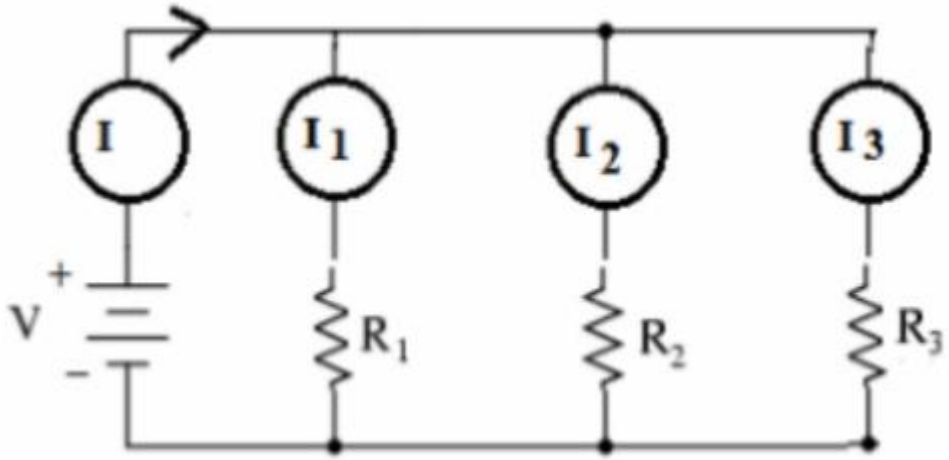
Level 2:Rig up a Current Divider Circuit and a Voltage Divider Circuit and verify the results.

Experiment No. 5:Study of Kirchhoff's Voltage Law and Kirchhoff's Current Law.

Level 1:Verify KVLand KCL with circuit(a) and circuit(b) with #values.

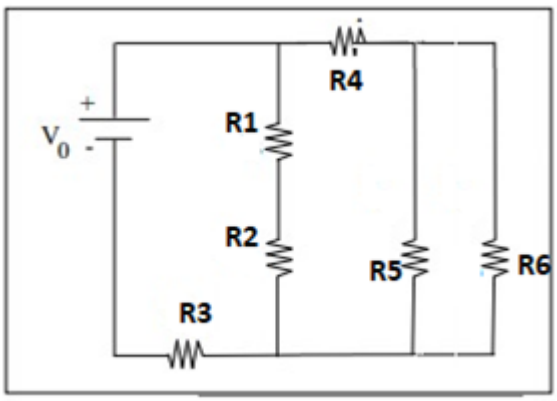


(a)



(b)

Level 2: Verify KCL with the help of given circuit having # values and carry out the equivalent resistance of the circuit by experimental and analytical methods.



Experiment No. 6: Study of PN-Junction Diode Characteristics in Forward and Reverse Bias Conditions.

Level 1:Carry out the experiment to find cut-in voltage on forward characteristics for Silicon P-N Junction diode.

Level 2: Carry out experiment to plot VI Characteristics of Silicon P-N Junction Diode in both forward and reverse biased conditions for Si P-N Junction diode.

Experiment No. 7: Study of Bipolar Junction Transistor in different regions of operation.

Level 1:Carry out the experiment to understand the importance of active, cut off and saturation regions.

Level 2: Carry out the experiment to design and analyze the operation of transistor as switch.

Experiment No. 8: Study of basic Digital Logic Gates using Integrated Chips IC's: NOT, AND, OR, XOR, NAND and NOR Gates

Level 1:Carry out the experiment to study and verify the truth table of logic gates using Digital ICs.

Level 2:Implementation of operation of a basic Boolean expression using basic gates.

Experiment No. 9: Study of Computer Organization: Identification of Components on Motherboard: CPU: Processor Chips (Processor Socket), PCI, Parallel Ports, Universal Serial Bus: USB, I/O Connectors, RAM Slots.

Level 1:Carry out the experiment to familiarize a computer system layout and mark the positions of SMPS, Motherboard, FDD, HDD, CD / DVD drive and add on cards.

Level 2:Study of a Desktop PC and its assembling.

Targeted Application & Tools that can be used:

Student will be able to find career opportunities in various domains such asAnalog Electronics, Digital Electronics, Microprocessors, VLSI Design, Telecommunication, Computers andWireless Communication. The students will be able to join a profession which involves basics to high level of electronic circuit design.

Professionally Used Software: MultiSim/ PSpice

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.

Textbook(s):

T1. John Hiley, Keith Brown and Ian McKenzie Smith, *"Hughes Electrical and Electronic Technology",* Pearson,12th Edition

T2.William Stallings,"Computer Organization and Architecture Designing for Performance", Pearson Education, 10th Edition.

Reference(s):

Reference Book(s):

R1. Smarajit Ghosh, *"Fundamentals of Electrical and Electronics Engineering*", PHI, 2nd Edition

R2. D.P. Kothari, I. J. Nagrath, *"Basic Electronics",* McGraw Hill Education, 1st Edition

R3. Rajendra Prasad, *"Fundamentals of Electronics Engineering",* Cengane Learning, 3rd Edition

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

Video lectures on "BASIC ELECTRONICS" by Prof. Dr. Chitralekha Mahanta, Department of Electronics and communication Engineering, IIT Guwahati": https://nptel.ac.in/courses/117/103/117103063/

Lecture Series on " Useful Laws in Basic Electronics" by Prof. T.S.Natarajan, Department of physics, IIT Madras: https://www.youtube.com/watch?v=vfVVF58FtCc

Lecture Series on "Introduction to Bipolar Junction Transistors BJT " by All About Electronics Youtube Channel: https://www.youtube.com/watch?v=-VwPSDQmdjM&list=PLwjK_iyK4LLDoFG8FeiKAr3IStRkPSxqq

Lecture Series on " PN Junction Diode " by All About Electronics Youtube Channel: https://www.youtube.com/watch?v=USrY0JspDEg

Lecture Series on "Introduction to Digital Electronics" by All About Electronics Youtube Channel: https://www.youtube.com/watch?v=DBTna2ydmC0&list=PLwjK_iyK4LLBC_so3odA64E2MLgIRKafl

Lecture Series on "Introduction to Microprocessors" by Bharat Acharya Education :https://www.youtube.com/watch?v=0M74z5jEAyA

Lecture Notes on : "Electronic Devices", Bipolar Junction Transistors, 2nd Chapter, by Shree Krishna Khadka (PDF) Bipolar Junction Transistor (researchgate.net)https://www.researchgate.net/publication/323384291_Bipolar_Junction_Transistor

E-content:

V. Milovanovic, R. van der Toorn, P. Humphries, D. P. Vidal and A. Vafanejad, "Compact model of Zener tunneling current in bipolar transistors featuring a smooth transition to zero forward bias current," *2009 IEEE Bipolar/BiCMOS Circuits and Technology Meeting*, 2009, pp. 99-102, doi: 10.1109/BIPOL.2009.5314134. https://ieeexplore.ieee.org/document/5314134

M. Oueslati, H. Garrab, A. Jedidi and K. Besbes, "The advantage of silicon carbide material in designing of power bipolar junction transistors," 2015 IEEE 12th International Multi-Conference on Systems, Signals & Devices (SSD15), 2015, pp. 1-6. https://ieeexplore.ieee.org/document/7348149

H. Luo, F. Iannuzzo, F. Blaabjerg, X. Wang, W. Li and X. He, "Elimination of bus voltage impact on temperature sensitive electrical parameter during turn-on transition for junction temperature estimation of high-power IGBT modules," *2017 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2017, pp. 5892-5898 https://ieeexplore.ieee.org/document/8096974

	F. Bauer, I. Nistor, A. Mihaila, M. Antoniou and F. Udrea, "Super junction IGBT Filling the Gap Between SJ MOSFET and Ultrafast IGBT," in *IEEE Electron Device Letters*, vol. 33, no. 9, pp. 1288-1290, Sept. 2012 https://ieeexplore.ieee.org/document/6246672 https://presiuniv.knimbus.com/user#/home
Topics relevant to "SKILL DEVELOPMENT": Electrical & Electronic component and laws, Fundamentals of Digital Electronics, Communication Systems, Microprocessors and Computer Organization for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.	

Course Code: **PHY1002**	**Course Title: Optoelectronics and Device Physics** **Type of Course: 1] School Core & Laboratory integrated**	L-T-P-C	2-0-2-3
Version No.	1.0		
Course Pre-requisites	**NIL**		
Anti-requisites	**NIL**		
Course Description	The purpose of this course is to enable the students to understand 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, experimental and analytical skills. The associated 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: Describe the concepts of semiconductors, magnetic materials and superconductors. CO2: Apply the concept of materials in the working of optoelectronic and magnetic devices. CO3: Discuss the quantum concepts used in advanced microscopy and quantum computers. CO4: Explain the applications of lasers and optical fibers in various technological fields. CO5: Interpret the results of various experiments to verify the concepts used in optoelectronics and advanced devices. **[Lab oriented].**			
Course Objective	The objective of the course is to familiarize the learners with the concepts of "Optoelectronics and device physics "and attain **Skill Development** through **Experiential Learning** techniques			
Course Content:				
Module 1	**Fundamentals of Materials.**	Assignment	Plotting of magnetization (M) v/s Magnetic field (H) for diamagnetic, paramagnetic and ferromagnetic materials using excel/ origin software.	**No. of Classes: 07**
	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	Data collection on efficiency of solar cells.	**No. of Classes: 8**
	Topics: p-n junctions, Zener diode, transistor characteristics, Optoelectronic devices:, Solar cells, I-V characteristics, and LEDs			
Module 3	**Quantum concepts and Applications**	Term paper	Seminar on quantum computers.	**No. of classes: 8**
	Topics: Planck's quantum theory, applications of Quantum theory: de-Broglie hypothesis, matter waves, properties. de-Broglie wavelength associated with an electron. Heisenberg's uncertainty principle. Schrodinger time independent wave equation. Particle in a box			

Module 4	**Lasers and Optical fibers**	Term paper	Case study on medical applications of Lasers.	**No. of classes :07**
	Topics: Interactions of radiations with matter, Characteristics of laser, conditions and requisites of laser, Modern day applications of laser: LIDAR, LASIK, Cutting, Welding and Drilling. Principle of optical fibers, Numerical aperture and acceptance angle (Qualitative), Attenuation, Applications: Point to point communication with block diagram, application of optical fibers in endoscopy.			
	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: 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. 12: 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.
	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,2018.
	References: 1. Elementary Solid state Physics: Principles and Applications by M.A. Omar, 1st Edition, Pearson Publications, 2002. 2. Principles of Quantum Mechanics by R Shankar, 2nd edition, springer Publications, 2011. 3. Optoelectronics: An Introduction by John Wilson and John Hawkes, 3rd edition, Pearson Publications, 2017. 4. Engineering Physics by Gaur and Gupta, Dhanpat Rai Publications, 2012. 5. Introduction to Quantum Mechanics, David J Griffiths, Cambridge University Press, 2019
	E-Resourses: 1. https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=553045&site=ehost-live 2. https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=833068&site=ehost-live 3. https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=323988&site=ehost-live 4. https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1530910&site=ehost-live 5. https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=486032&site=ehost-live
	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:	Course Title: Elements of Electronics Engineering	L-T-P-C				

ECE1001	**Type of Course: School Core Theory & Integrated Laboratory**		3	0	2	4
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	Nil					
Course Description	The purpose of this course is to enable the students to learn the fundamental concepts of electronic devices and circuits. The course aims at nurturing the students with the fundamental principles of electronics engineering, prevailing in various engineering applications. The nature of the course is conceptual and analytical which imparts knowledge of electronic components and their behavior under various operating conditions. The course develops thinking skills of the students, encouraging their quest for knowledge about electronic devices and their usage in higher semester courses. The associated laboratory provides an opportunity to validate the concepts taught in theory classes and enable the students to work with basic electronic circuits using electronics components.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Elements of Electronics Engineering and attain SKILL DEVELOPMENT through EXPERIENTIAL LEARNING .					
Course Outcomes	On successful completion of this course the students shall be able to: Identify various electrical and electronic components and basic electrical laws. Explainapplications of Diodes and BJTs. Summarize the concepts of Digital Electronics and Communication Systems. Discuss the basic concepts of microprocessorand computer organization. Perform experiments to familiarizevarious Electrical & Electronic components and equipment. Verify Basic Electrical Circuit configurations and Laws.					
Course Content:						
Module 1	Basic Electrical and Electronic Components	Assignment / Quiz	Identification of Practical electronic and electrical components / Memory Recall based Quizzes			10 Sessions

Topics:

ELECTRICAL CIRCUITS AND LAWS:DC Circuits: Classification of Electrical Elements, Ohm's law, Series and Parallel Circuits, Kirchhoff's Voltage and Current laws, Power and Energy, Transformers and their types.

ELECTRONIC MATERIALS AND COMPONENTS: Conductors, Insulators, Semi-Conductor Material, P-N Junction diode, Characteristics and Parameters, Ideal Diode approximations, DC load line.

Module 2	Applications of Diodes and Introduction to BJT	Assignment / Quiz		Simulation Task/ Memory Recall based Quizzes	12 Sessions
Topics: RECTIFIERS: Half-wave rectifier, Two-diode Full-wave rectifier, Bridge rectifier, Capacitor filter circuit (only qualitative approach). ZENER DIODE: Zener diode, Zener Characteristics, Zener diode as a voltage regulator. BIPOLAR JUNCTION TRANSISTORS: BJT Construction and Operation, BJT Voltages and Currents, Common Base, Common Emitter Configuration and Characteristics, Current amplification Factor alpha and beta, DC Load line w.r.t. fixed bias circuit (Q-Point), AC Analysis.					
Module 3	Digital Electronics and Communication System	Assignment / Quiz		Simulation Task / Memory Recall based Quizzes	13 Sessions
Topics: NUMBER SYSTEMS: Decimal Number System, Binary Number System, Hexadecimal Number System, Conversions: Binary to and from Hexadecimal; Hexadecimal to and from Decimal;1's and 2's Complement of Binary Numbers, Binary Addition. BOOLEAN ALGEBRA: Boolean Laws and Theorems, De Morgan's theorem. Digital Circuits: Logic gates, NOT Gate, AND Gate, OR Gate, XOR Gate, X-NOR Gate, NAND Gate, NOR Gate. COMMUNICATION SYSTEM: Block diagram of communication system, Modulation: Definition of Modulation, Need of Modulation, Types of Modulation: Amplitude Modulation and Frequency Modulation (Waveforms only).					
Module 4	Microprocessors and Computer Organization	Assignment / Quiz	Memory recall based Quizzes		10 Sessions
Topics: INTEL 8085 MICROPROCESSOR: Basic Architecture and features of 8085 Microprocessor. COMPUTER ORGANISATION:Basic structure of Computer Organisation describing the various Computer types, Functional Units, Basic Operational concepts, Bus Structures, Memory System: RAM and ROM.					
List of Laboratory Tasks: Experiment No. 1:Study of Resistors, Measuring instruments and DC Power Supply. Level 1:Identification of resistor values from color bands and verification with Multimeter. Level 2:Connecting a resistive circuit to a DC Power Supply and observing the input and output values using Voltmeters, Ammeters and hence calculate resistance values. Experiment No. 2:Study of Reactive components, Multimeter, CRO and Function Generator. Level 1:Identification of various types of capacitive and inductive components and verification with Multimeter.					

Level 2:Connecting a reactive circuit to a function generator and observing the input and output waveform on CRO and calculation of Reactance and Impedance.

Experiment No. 3: Study of Ohm's Law.

Level 1:Rig up the circuit and verify Ohm's Law.

Level 2: Connect a 100Ω Resistor to a Voltage source of 0-5V. Plot a V- I graph by tabulating the Voltage Vs Current Values accordingly. Repeat the experiment for 1KΩ resistor and compare the results.

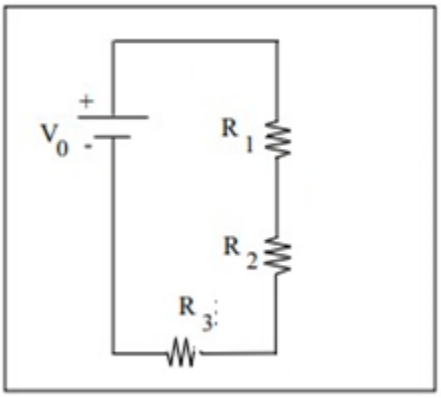
Experiment No. 4:Study of Series and Parallel Resistor Connections.

Level 1:Carry out the equivalent resistance of given four resistors 100Ω each connected in series and parallel combination using breadboard.

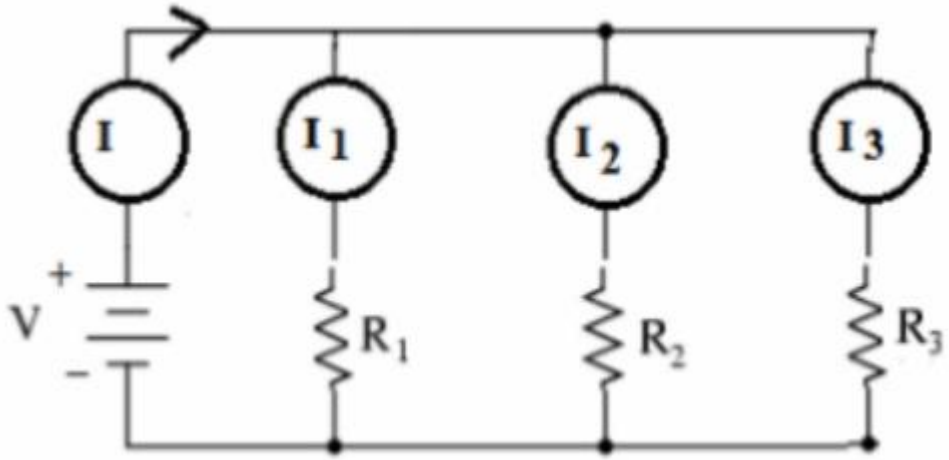
Level 2:Rig up a Current Divider Circuit and a Voltage Divider Circuit and verify the results.

Experiment No. 5:Study of Kirchhoff's Voltage Law and Kirchhoff's Current Law.

Level 1:Verify KVLand KCL with circuit(a) and circuit(b) with #values.

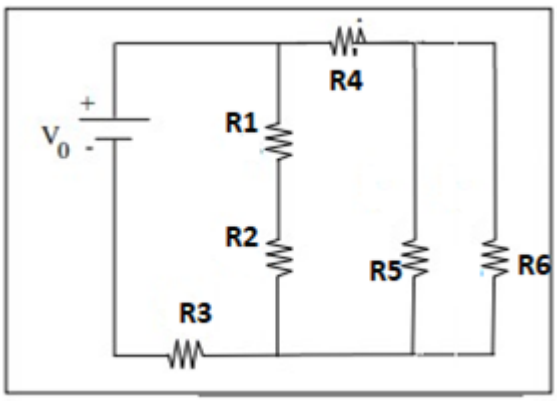


(a)



(b)

Level 2: Verify KCL with the help of given circuit having # values and carry out the equivalent resistance of the circuit by experimental and analytical methods.



Experiment No. 6: Study of PN-Junction Diode Characteristics in Forward and Reverse Bias Conditions.

Level 1:Carry out the experiment to find cut-in voltage on forward characteristics for Silicon P-N Junction diode.

Level 2: Carry out experiment to plot VI Characteristics of Silicon P-N Junction Diode in both forward and reverse biased conditions for Si P-N Junction diode.

Experiment No. 7: Study of Bipolar Junction Transistor in different regions of operation.

Level 1:Carry out the experiment to understand the importance of active, cut off and saturation regions.

Level 2: Carry out the experiment to design and analyze the operation of transistor as switch.

Experiment No. 8: Study of basic Digital Logic Gates using Integrated Chips IC's: NOT, AND, OR, XOR, NAND and NOR Gates

Level 1:Carry out the experiment to study and verify the truth table of logic gates using Digital ICs.

Level 2:Implementation of operation of a basic Boolean expression using basic gates.

Experiment No. 9: Study of Computer Organization: Identification of Components on Motherboard: CPU: Processor Chips (Processor Socket), PCI, Parallel Ports, Universal Serial Bus: USB, I/O Connectors, RAM Slots.

Level 1:Carry out the experiment to familiarize a computer system layout and mark the positions of SMPS, Motherboard, FDD, HDD, CD / DVD drive and add on cards.

Level 2:Study of a Desktop PC and its assembling.

Targeted Application & Tools that can be used:

Student will be able to find career opportunities in various domains such asAnalog Electronics, Digital Electronics, Microprocessors, VLSI Design, Telecommunication, Computers andWireless Communication. The students will be able to join a profession which involves basics to high level of electronic circuit design.

Professionally Used Software: MultiSim/ PSpice

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.

Textbook(s):

T1. John Hiley, Keith Brown and Ian McKenzie Smith, *"Hughes Electrical and Electronic Technology",* Pearson,12th Edition

T2.William Stallings,"Computer Organization and Architecture Designing for Performance", Pearson Education, 10th Edition.

Reference(s):

Reference Book(s):

R1. Smarajit Ghosh, *"Fundamentals of Electrical and Electronics Engineering*", PHI, 2nd Edition

R2. D.P. Kothari, I. J. Nagrath, *"Basic Electronics",* McGraw Hill Education, 1st Edition

R3. Rajendra Prasad, *"Fundamentals of Electronics Engineering",* Cengane Learning, 3rd Edition

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

Video lectures on "BASIC ELECTRONICS" by Prof. Dr. Chitralekha Mahanta, Department of Electronics and communication Engineering, IIT Guwahati": https://nptel.ac.in/courses/117/103/117103063/

Lecture Series on " Useful Laws in Basic Electronics" by Prof. T.S.Natarajan, Department of physics, IIT Madras: https://www.youtube.com/watch?v=vfVVF58FtCc

Lecture Series on "Introduction to Bipolar Junction Transistors BJT " by All About Electronics Youtube Channel: https://www.youtube.com/watch?v=-VwPSDQmdjM&list=PLwjK_iyK4LLDoFG8FeiKAr3IStRkPSxqq

Lecture Series on " PN Junction Diode " by All About Electronics Youtube Channel: https://www.youtube.com/watch?v=USrY0JspDEg

Lecture Series on "Introduction to Digital Electronics" by All About Electronics Youtube Channel: https://www.youtube.com/watch?v=DBTna2ydmC0&list=PLwjK_iyK4LLBC_so3odA64E2MLgIRKafl

Lecture Series on "Introduction to Microprocessors" by Bharat Acharya Education :https://www.youtube.com/watch?v=0M74z5jEAyA

Lecture Notes on : "Electronic Devices", Bipolar Junction Transistors, 2nd Chapter, by Shree Krishna Khadka (PDF) Bipolar Junction Transistor (researchgate.net)https://www.researchgate.net/publication/323384291_Bipolar_Junction_Transistor

E-content:

V. Milovanovic, R. van der Toorn, P. Humphries, D. P. Vidal and A. Vafanejad, "Compact model of Zener tunneling current in bipolar transistors featuring a smooth transition to zero forward bias current," *2009 IEEE Bipolar/BiCMOS Circuits and Technology Meeting*, 2009, pp. 99-102, doi: 10.1109/BIPOL.2009.5314134. https://ieeexplore.ieee.org/document/5314134

M. Oueslati, H. Garrab, A. Jedidi and K. Besbes, "The advantage of silicon carbide material in designing of power bipolar junction transistors," 2015 IEEE 12th International Multi-Conference on Systems, Signals & Devices (SSD15), 2015, pp. 1-6. https://ieeexplore.ieee.org/document/7348149

H. Luo, F. Iannuzzo, F. Blaabjerg, X. Wang, W. Li and X. He, "Elimination of bus voltage impact on temperature sensitive electrical parameter during turn-on transition for junction temperature estimation of high-power IGBT modules," *2017 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2017, pp. 5892-5898 https://ieeexplore.ieee.org/document/8096974

	F. Bauer, I. Nistor, A. Mihaila, M. Antoniou and F. Udrea, "Super junction IGBT Filling the Gap Between SJ MOSFET and Ultrafast IGBT," in *IEEE Electron Device Letters*, vol. 33, no. 9, pp. 1288-1290, Sept. 2012 https://ieeexplore.ieee.org/document/6246672 https://presiuniv.knimbus.com/user#/home
Topics relevant to "SKILL DEVELOPMENT": Electrical & Electronic component and laws, Fundamentals of Digital Electronics, Communication Systems, Microprocessors and Computer Organization for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.	

Course Code: **ENG1002**	**Course Title:** **Technical English** **Type of Course:** **1] School Core** **2] Laboratory integrated**	**L-T-P-C**	1-0-2-2
Version No.	1.0 V. 3		
Course Pre-requisites	Intermediate Level English		
Course Anti-requisites	NIL		
Course Description	Technical English course is designed to equip students with the language skills necessary for effective communication in technical and scientific contexts. The course focuses on the specialized vocabulary, writing styles, and communication techniques used in various technical fields, including engineering and information technology.		
Course Objectives	The objective of this course is to develop the learners' **EMPLOYABILITY SKILLS** by using **EXPERIENTIAL LEARNING** and **PARTICIPATIVE LEARNING TECHNIQUES.**		

Course Outcomes	**On successful completion of the course, the students shall be able to:** 1. Develop proficiency in using technical vocabulary and terminology. 2. Apply language skills for better speaking skills in technical fields. 3. Write technical descriptions 4. Demonstrate writing skills in writing technical documents such as reports, manuals, and articles.			
Course Content:				
Module 1	**Fundamentals of Technical Communication**	**Worksheets& Quiz**	**Vocabulary building**	**9 Classes**
Introduction to Technical English Differences between Technical English and General English Technical Writing Basics Technical Vocabulary				
Module 2	**Technical Presentation**	**Presentations**	**Speaking Skills**	**12 Classes**
Introduction Planning the Presentation Creating the Presentation Giving the Presentation				
Module 3	**Technical Description**	**Assignment**	**Group Presentation**	**12 Classes**
Product Description Process Description User Manuals Transcoding: Diagrams, charts and images				
Module 4	**Technical Writing**	**Assignment**	**Writing Skills**	**12 Classes**
Email Writing Persuasive and Descriptive Language Professional Email Etiquette Writing clear and concise technical emails				

Communicating technical information effectively

Technical Report Writing

Types of technical reports (Lab reports, research reports, etc.)

Components of technical reports

Writing an abstract and executive summary

Structure and content organization

Transcoding: diagrams, charts and images

List of Laboratory Tasks:

1. Module-1

Level 1: Worksheets
Level 2: Worksheets

2. Module 2

Level 1: Preparing Presentation
Level 2: Giving Presentation (Individual)

3. Module-3

Level 1: Product Description & User Manual
Level 2: Process Description & Transcoding

4. Module 4

Level 1: Email Writing
Level 2: Report Writing

Targeted Applications & Tools that can be used:

1. Flipgrid
2. Quizzes
3. Youtube Videos
4. Podcast

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

1. **Bring out the essence of technical communication with reference to the conventions of technical communication, with examples**
2. **Prepare a technical presentation on the importance of Technical Communication and its relevance in a technical field, with real-life examples.**

The following individual, as well as group Assignments, will be given to the students.

1. **Presentation**
2. **Describing a product/process**
3. **Individual Reports**

Text Books

1. Kumar, Sanjay; Pushpalatha. *English Language and Communication Skills for Engineers.* Oxford University Press. 2018.
2. Brieger, Nick and Alison Paul. *Technical English Vocabulary and Grammar*. https://nmetau.edu.ua/file/technical_english_vocabulary_and_grammar.pdf

Reference Book:

1. Chauhan, Gajendra Singh, and Kashmiramka, Smita, ***Technical Communication.*** Cengage Publication. 2018.

2. Sunder Jain. *Technical Report Writing*. Centrum Press, 2013.

3. John Bowden. "Writing a Report: How to Prepare, Write & Present Really Effective Reports?". 9th Edition 2011

Comfort, Jeremy et. al. 1984. *Business Reports in English*. Cambridge University Press.

4. Sharma, R.C. and K. Mohan. 2011. Business Correspondence and Report Writing, Fourth Edition. Tata McGraw Hill.

Web Resources:

1:https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=JSTOR1_3307.

2;https://puniversity.informaticsglobal.com:2282/ehost/detail/detail?vid=5&sid=3a77d69b-abe5-4681-b39d-32dfdcb8f4a5%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=154223466&db=iih

3: Last,Suzan, et. al. ***Technical Writing Essentials.*** University of Victoria, British Columbia, 2019 (E- Book)

4 Wambui, Tabita Wangare, et al. ***Communication Skills- Volume 1,*** LAP LAMBRET, USA, 2012 (E Book)

Topics Relevant to the Development of Employability Skills:

Speaking Skills, Writing Skills, Critical Thinking and Critical Analysis, and Group Communication.

Course Code: CSE1004	Course Title: Problem Solving Using C Type of Course: School Core Lab Integrated.	L-T-P-C	1	0	4	3
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs and applications in C. ACAlso by learning the basic programming constructs they can easily switch over to any other language in future.					

Course Object	The objective of the course is to familiarize the learners with the concepts of Problem Solving Using C and attain Employability through Problem Solving Methodologies.			
Course Outcomes	On successful completion of this course the students shall be able to: Write algorithms and to draw flowcharts for solving problems Demonstrate knowledge and develop simple applications in C programming constructs Develop and implement applications using arrays and strings Decompose a problem into functions and develop modular reusable code Solve applications in C using structures and Union Design applications using Sequential and Random Access File Processing.			
Course Content:				
Module 1	Introduction to C Language	Quiz	Problem Solving	9 Hrs.
Topics: Introduction to Programming – Algorithms – Pseudo Code - Flow Chart – Compilation – Execution – Preprocessor Directives (#define, #include, #undef) - Overview of C – Constants, Variables and Data types – Operators and Expressions – Managing Input and Output Operations – Decision Making and Branching - Decision Making and Looping.				
Module 2	Introduction to Arrays and Strings	Quiz	Problem Solving	9 Hrs.
Topics: Arrays: Introduction – One Dimensional Array – Initialization of One Dimensional Arrays – Example Programs – Sorting (Bubble Sort, Selection Sort) – Searching (Linear Search) - Two Dimensional Arrays – Initialization of Two Dimensional Arrays. Example Programs – Matrix operations. Strings: Introduction – Declaring and Initializing String Variables – Reading Strings from Terminal – Writing String to Screen – String Handling Functions.				
Module 3	Functions and Pointers	Quiz	Problem Solving	9 Hrs.
Topics: Functions: Introduction – Need for User-defined functions – Elements of User-Defined Functions: declaration, definition and function call–Categories of Functions – Recursion. Pointers: Introduction – Declaring Pointer Variables – Initialization of Variables – Pointer Operators – Pointer Arithmetic – Arrays and Pointers – Parameter Passing: Pass by Value, Pass by Reference.				
Module 4	Structures and Union	Quiz	Problem Solving	9 Hrs.
Topics: Structures: Introduction – Defining a Structure – Declaring Structure Variable – Accessing Structure Members – Array of Structures – Arrays within Structures – Union: Introduction – Defining and Declaring Union – Difference Between Union and Structure.				
Module 5	File handling	Case Study	Problem Solving	9 Hrs.
Topics: Files: Defining and Opening a File – Closing a File – Input / Output Operations on File – Random Access Files				

List of Practical Tasks Lab Sheet 1 (Module I) Programs using IO Statements, Conditional Statements and Looping Statements Lab Sheet 2 (Module II) Programs using Arrays and Strings Lab Sheet 3 (Module III) Programs using Functions and Pointers Lab Sheet 4 (Module IV) Programs using Structures and Unions Lab Sheet 5 (Module V) Programs using Files
Text Book(s): 1. E. Balaguruswamy, "Programming in ANSI C", 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.
Reference Book(s): Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020. ReemaThareja, "Programming in C", Oxford University Press, Second Edition, 2016. Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015 Schildt Herbert, "C: The Complete Reference", Tata McGraw Hill Education, 4th Edition, 2014. Stephen G. Kochan, "Programming in C", Addison-Wesley Professional, 4th Edition, 2014.
Web Links and Video Lectures: 1. https://nptel.ac.in/courses/106/105/106105171/ 2. https://archive.nptel.ac.in/courses/106/104/106104128/

Course Code: CHE1018	**Course Title: Environmental Science** **Type of Course: School Core- Theory and Lab**	**L- T-P- C**	1	0	2	0
Version No.	2.0					
Course Pre-requisites	NIL					
Anti-requisites	**NIL**					
Course Description	This course emphasizes the need to conserve biodiversity and adopt a more sustainable lifestyle by utilizing resources in a responsible way. Topics covered include basic principles of ecosystem functions; biodiversity and its conservation; human population growth; water resources, pollution; climate change; energy resources, and sustainability; Sustaining human societies, policies, and education. **This course is designed to cater to Environment and Sustainability**					
Course Objective	The objective of the course is to **familiarize the learners with the concepts of "Environmental Science" and attain SKILL DEVELOPMENT through EXPERIENTIAL LEARNING techniques.**					

Course Outcomes	On successful completion of this course the students shall be able to: Appreciate the historical context of human interactions with the environment and the need for eco-balance. Describe basic knowledge about global climate change with particular reference to the Indian context. Understand biodiversity and its conservation Develop an understanding on types of pollution and ways to protect the environment Learn about various strategies on Global environmental management systems			
Course Content:				
Module 1	**Humans and the Environment**	Assignment	Data Collection	**01 class**
Topics: The man-environment interaction: Mastery of fire; Origin of agriculture; Emergence of city states; Great ancient civilizations and the environment. ***Self-learning topics:*** Humans as hunter-gatherers; Industrial revolution and its impact on the environment; Environmental Ethics and emergence of environmentalism.				
Module 2	**Natural Resources and Sustainable Development**	Assignment		**03 Classes**
Topics: Overview of natural resources: Definition of resource; Classification of natural resources- biotic and abiotic, renewable and non-renewable. **Water resources**: Types of water resources- fresh water and marine resources; **Soil and mineral resources**: Important minerals; Mineral exploitation Soil as a resource and its degradation. **Energy resources**: Sources of energy and their classification, renewable and non-renewable sources of energy; Advantages and disadvantages. ***Self- learning topics:*** Availability and use of water resources; Environmental impact of over-exploitation, issues and challenges.; Environmental problems due to extraction of minerals and use; Sustainable Development Goals (SDGs)- targets, indicators, and challenges for SDGs.				
Module 3	**Environmental Issues: Local, Regional and Global**	Case study		**02 Classes**
Topics: **Environmental Pollution**: Types of Pollution- air, noise, water, soil, municipal solid waste, hazardous waste; Trans- boundary air pollution; Acid rain; Smog. **Land use and Land cover change**: land degradation, deforestation, desertification, urbanization. Global change: Ozone layer depletion; Climate change ***Self -learning topics:*** Environmental issues and scales				
Module 4	**Conservation of Biodiversity and Ecosystems**	Assignment		**02 Classes**

Topics:

Biodiversity-Introduction, types, Species interactions, Extinct, endemic, endangered and rare species, Threats to biodiversity: Natural and anthropogenic activities.

Self-learning topics: Mega-biodiversity, Hot-spots, Major conservation policies. Biodiversity loss: past and current trends, impact.

	Module 5	**Environmental Pollution and Health**	Case study		**03 Classes**

Topics:

Pollution, Definition, point and nonpoint sources of pollution, **Air pollution**- sources, major air pollutants, health impacts of air pollution.

Water pollution– Pollution sources, adverse health impacts on human and aquatic life and mitigation, Water quality parameters and standards.

Soil pollution and solid waste- Soil pollutants and their sources, solid and hazardous waste, Impact on human health.

Self-learning topics: Noise pollution, Thermal and radioactive pollution.

	Module 6	**Climate Change: Impacts, Adaptation and Mitigation**	Assignment/case		**02 Classes**

Topics:

Understanding climate change: Natural variations in climate; Projections of global climate change with special reference to temperature, rainfall and extreme events; Importance of 1.5 °C and 2.0 °C limits to global warming; Impacts

Vulnerability and adaptation to climate change: Observed impacts of climate change on ocean and land systems; Sea level rise, changes in marine and coastal ecosystems; Impacts on forests and natural ecosystems; Indigenous knowledge for adaptation to climate change.

Self-learning topics: Mitigation of climate change: Synergies between adaptation and mitigation measures; National and international policy instruments for mitigation.

	Module 7	**Environmental Management**	Case study	Data analysis	**02 Classes**

Topics:

Environmental management system: ISO 14001; Environmental risk assessment Pollution control and management; Waste Management- Concept of 3R (Reduce, Recycle and Reuse) and sustainability.

Self-learning topics: Environmental audit and impact assessment; Eco labeling /Eco mark scheme

	Module 8	**Environmental Treaties and Legislation**	Case study	Data analysis	**01 Classes**

Topics:

Major International Environmental Agreements: Convention on Biological Diversity (CBD), Major Indian Environmental Legislations: Environmental Protection Act, Forest Conservation Act, Public awareness.

Self-learning topics: Paris Agreement, Conference of the Parties (COP), India's status as a party to major conventions: Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act.

List of laboratory tasks : Any eight experiments will be conducted

ermination of total alkalinity of a water sample (knowledge)

Estimation of water hardness by EDTA method and its removal (by zeolite/ ion exchange method) (Comprehensive)

mation of copper from industrial effluents by colorimetric method (Comprehensive)

mation of iron from industrial effluents by titrimetric method/potentiometric method (Comprehensive)

mation of nickel from industrial effluents by titrimetric method (Comprehensive)

mation of chloride in drinking water by titrimetric method (Comprehensive)

mation of fluoride in ground water by colorimetric method (Comprehensive)

ermination of calcium in aqueous solution (Comprehensive)

ermination of Total Dissolved Salts, conductivity and pH of a water samples (Knowledge)

Determination of Chemical oxygen demand in the industrial effluent. (Comprehensive)

Biological oxygen demand of waste water sample (Comprehensive)

Determination of dissolved oxygen of an industrial effluent (Comprehensive)

Quality monitoring analysis of a soil sample (knowledge)

Flame photometric estimation of Sodium and potassium (Application)

Gas Chromatographic analysis of volatile organic compounds (Application)

Targeted Application & Tools that can be used:

Application areas are Energy, Environment and sustainability

Tools: Statistical analysis of environmental pollutants using excel, origin etc.

Project work/Assignment:

Assessment Type

term exam

Assignment (review of digital/ e-resource from PU link given in references section - mandatory to submit screenshot accessing the digital resource.)

evaluation/Assignment

Term Exam

-learning

Assignment 1: Write a Statement of Environment report of your town/city/state/country

Assignment 2: Individual students will carry out the analyses of polluted solid, liquid, and gaseous samples and propose suitable mitigation measures. A detailed and in-depth report needs to be submitted for each case. This may include preparation of reagents, sample preparation (extraction), chemical analysis carried out, instruments and tools used, data collected and processed, inferences made and conclusions arrived at. Necessary support is given in the form of lab manual and reference links to e-books.

Text Book

yler Miller and Scott Spoolman (2020), Living in the Environment, 20th Edition, Cengage Learning, USA

nnamurthy, K.V. (2003) Text book of Biodiversity, Science Publishers, Plymouth, UK.

Jackson, A.R. & Jackson, J.M. (2000), Environmental Science: The natural environment and human impact, Pearson Education.

Reference Books

Fisher, Michael H. (2018) An Environmental History of India- From Earliest Times to the Twenty-First Century, Cambridge University Press.

William P. Cunningham and Mary Ann Cunningham (2017), Principles of Environmental Science: Inquiry & Applications, 8th Edition, McGraw-Hill Education, USA.

a N., (2020) Wild and Wilful. Harper Collins, India.

www.ipcc.org; https://www.ipcc.ch/report/sixth-assessment-report-cycle/

Theodore, M. K. and Theodore, Louis (2021) Introduction to Environmental Management, 2nd Edition. CRC Press.

Richard A. Marcantonio, Marc Lame (2022). Environmental Management: Concepts and Practical Skills. Cambridge University Press.

E-resources:

https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DOAB_1_06082022_18126
https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DOAB_1_06082022_8761
https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DOAJ_1_02082022_3333
https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DOAB_1_06082022_3063
https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DOAB_1_06082022_20719
https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DOAB_1_06082022_16824
https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DOAB_1_06082022_3954
https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DOAB_1_06082022_491
https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=CUSTOM_PACKAGE_16012023_WORLD_BUSINESS_COUNCIL_SUSTAINABLE_488
https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=CUSTOM_PACKAGE_16012023_WORLD_BUSINESS_COUNCIL_SUSTAINABLE_583
https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=SPRINGER_INDEST_1_171
https://presiuniv.knimbus.com/user#/searchresult?searchId=3R%20principle&_t=1687427221129
https://presiuniv.knimbus.com/user#/searchresult?searchId=eco%20labelling&_t=1687427279979
https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=TEXTBOOK_LIBRARY01_06082022_395&xIndex=4
https://www.ugc.gov.in/oldpdf/modelcurriculum/env.pdf

Topics relevant to Skill Development:

Industrial revolution and its impact on the environment, Environmental impact of over-exploitation of water resources, pollution and ill effects, lab experiments for Skills development through Problem solving Techniques. This is attained through assessment component mentioned in course handout.

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

Course Code: PPS 1001	**Course Title: Introduction to Soft Skills** **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 understand soft skills concepts and improve confidence, communication and professional skills to give the students a competitive advantage and increase chances of success in the professional world. The course will benefit learners in presenting themselves effectively through various activities and learning methodologies.		
Course Objective	The objective of the course is to **familiarize the learners with the concepts of "Soft Skills" and attain SKILL DEVELOPMENT through PARTICIPATIVE LEARNING techniques**		
Course Out Comes	**On successful completion of this course the students shall be able to:** CO1: **Recognize** significance of soft skills CO2: **Illustrate** effective communication while introducing oneself and others CO3: **List** techniques of forming healthy habits CO4: **Apply** SMART technique to achieve goals and increase productivity		
Course Content:			
Module 1	INTRODUCTION TO SOFT SKILLS	**Classroom activity**	**04 Hours**
Topics: Setting Expectations, Ice Breaker, Significance of soft skills, Formal grooming, punctuality			
Module 2	EFFECTIVE COMMUNICATION	**Individual Assessment**	**10 Hours**

Topics: Different styles of communication, Difference between hearing and listening, Effective communication for success, Email etiquette, Self-introduction framework, Video introduction, email- writing, Resume Building- Digital, Video, Traditional.				
Module 3	HABIT FORMATION		**Worksheets & Assignment**	**4 Hours**
Topics: Professional and personal ethics for success, Identity based habits, Domino effect, Habit Loop, Unlearning, standing up for what is right				
Module 4	Goal setting & Time Management		**Goal sheet**	**8 Hours**
A session where students will be introduced to Time management, setting SMART Goals, Introduction to OKR Techniques, Time Management Matrix, steps to managing time through outbound group activity, making a schedule, Daily Plan and calendars (To Do List), Monitoring/charting daily activity				
Targeted Application & Tools that can be used: LMS				
Project work/Assignment: Mention the Type of Project /Assignment proposed for this course				
1) Individual Assessment 2) LMS MCQ				
The topics related to Skill Development: Communication and professional grooming, Goal setting and presentation for skill development through participative learning techniques. This is attained through assessment component mentioned in course handout.				

Course Code: CSE1004	Course Title: Problem Solving Using C Type of Course: School Core Lab Integrated.	L- T-P-C	1	0	4	3
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs and applications in C. AC Also by learning the basic programming constructs they can easily switch over to any other language in future.					

Course Object	The objective of the course is to familiarize the learners with the concepts of Problem Solving Using C and attain Employability through Problem Solving Methodologies.			
Course Outcomes	On successful completion of this course the students shall be able to: 1. Write algorithms and to draw flowcharts for solving problems 2. Demonstrate knowledge and develop simple applications in C programming constructs 3. Develop and implement applications using arrays and strings 4. Decompose a problem into functions and develop modular reusable code 5. Solve applications in C using structures and Union 6. Design applications using Sequential and Random Access File Processing.			
Course Content:				
Module 1	Introduction to C Language	Quiz	Problem Solving	9 Hrs.
Topics: Introduction to Programming – Algorithms – Pseudo Code - Flow Chart – Compilation – Execution – Preprocessor Directives (#define, #include, #undef) - Overview of C – Constants, Variables and Data types – Operators and Expressions – Managing Input and Output Operations – Decision Making and Branching - Decision Making and Looping.				
Module 2	Introduction to Arrays and Strings	Quiz	Problem Solving	9 Hrs.
Topics: Arrays: Introduction – One Dimensional Array – Initialization of One Dimensional Arrays – Example Programs – Sorting (Bubble Sort, Selection Sort) – Searching (Linear Search) - Two Dimensional Arrays – Initialization of Two Dimensional Arrays. Example Programs – Matrix operations. Strings: Introduction – Declaring and Initializing String Variables – Reading Strings from Terminal – Writing String to Screen – String Handling Functions.				
Module 3	Functions and Pointers	Quiz	Problem Solving	9 Hrs.
Topics: Functions: Introduction – Need for User-defined functions – Elements of User-Defined Functions: declaration, definition and function call–Categories of Functions – Recursion. Pointers: Introduction – Declaring Pointer Variables – Initialization of Variables – Pointer Operators – Pointer Arithmetic – Arrays and Pointers – Parameter Passing: Pass by Value, Pass by Reference.				
Module 4	Structures and Union	Quiz	Problem Solving	9 Hrs.
Topics: Structures: Introduction – Defining a Structure – Declaring Structure Variable – Accessing Structure Members – Array of Structures – Arrays within Structures – Union: Introduction – Defining and Declaring Union – Difference Between Union and Structure.				
Module 5	File handling	Case Study	Problem Solving	9 Hrs.
Topics: Files: Defining and Opening a File – Closing a File – Input / Output Operations on File – Random Access Files				

List of Practical Tasks Lab Sheet 1 (Module I) CHE1018 Lab Sheet 2 (Module II) Programs using Arrays and Strings Lab Sheet 3 (Module III) Programs using Functions and Pointers Lab Sheet 4 (Module IV) Programs using Structures and Unions Lab Sheet 5 (Module V) Programs using Files
Text Book(s): 1. E. Balaguruswamy, “Programming in ANSI C”, 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.
Reference Book(s): 1. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020. 2. ReemaThareja, “Programming in C”, Oxford University Press, Second Edition, 2016. 3. Kernighan, B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2015 4. Schildt Herbert, “C: The Complete Reference”, Tata McGraw Hill Education, 4th Edition, 2014. 5. Stephen G. Kochan, “Programming in C”, Addison-Wesley Professional, 4th Edition, 2014.
Web Links and Video Lectures: 1. https://nptel.ac.in/courses/106/105/106105171/ 2. https://archive.nptel.ac.in/courses/106/104/106104128/

Course Code: **PPS 1011**	**Course Title: Introduction to Verbal Ability** **Type of Course: Theory Only Course**	L- T- P- C	0	2	0	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 understand the importance of Verbal Ability and improve confidence, communication and professional skills to give them a competitive advantage and increase chances of success in the professional world. The course will benefit learners in presenting themselves effectively through various worksheets and learning methodologies.		
Course Objective	The objective of the course is to **familiarize the learners with the concepts of "Verbal Ability" and attain SKILL DEVELOPMENT through PARTICIPATIVE LEARNING techniques.**		
Course Out Comes	**On successful completion of this course the students shall be able to:** CO1: **Recognize** significance of verbal ability CO2: **Utilize** the rules of communication CO3: **Apply** techniques of vocabulary building to showcase effective communication		
Course Content:			
Module 1	INTRODUCTION TO VERBAL ABILITY	**Individual Assessment**	**01 Hour**
Topics: Setting Expectations, Ice Breaker, Significance of verbal ability, pre-assessment			
Module 2	EFFECTIVE VERBAL COMMUNICATION	**Practice Worksheets**	**06 Hours**
Topics: Different rules of grammar and application, Subject-Verb Agreement, Tenses			
Module 3	VOCABULARY BUILDING	**Practice Worksheets**	**04 Hours**
Topics: Root words, Synonyms and antonyms, analogies, para-jumbles			
Module 4	READING COMPREHENSION	**Individual Assessment**	**02 Hours**
A session where students will be introduced to speed reading and comprehension, **post-assessment**			
Targeted Application & Tools that can be used: LMS			

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course
Individual Assessment LMS MCQ
The topics related to Skill Development: Communication, grammar rules, vocabulary building, effective presentation for skill development through participative learning techniques. This is attained through **learning and practicing the rules of effective communication through worksheets** as mentioned in the assessment component.

Course Code: **MAT1003**	**Course Title:** **Applied Statistics** **Type of Course:** School Core	**L T P C**	1	0	2	2
Version No.	3.0					
Course Pre-requisites	None					
Anti-requisites	None					
Course Description	The goal of this course is to provide a firm understanding of probability and statistics by means of a thorough treatment of descriptive statistics, probability and probability distributions keeping in mind the future courses having statistical, quantitative and probabilistic components. The course covers topics such as descriptive statistics, probability, rules for probability, random variables and probability distributions, standard discrete and continuous probability distributions.					
Course Objective	The objective of the course is to **familiarize the learners with the concepts of "**Applied Statistics" and attain **Skill Development Through Problem Solving techniques**.					
Expected Outcome:	At the end of this course, students will be in a position to 1. apply the techniques of descriptive statistics effectively 2. interpret the ideas of probability and conditional probability 3. demonstrate the knowledge of probability distributions 4. Compute statistical parameters, correlation and regression, probability and sampling distributions using R software.					

Module 1	**Descriptive Statistics**	Assignment	Coding needed	**10 classes**
Introduction to Statistics, Data and statistical thinking, review of basic statistical parameters, Covariance, Correlation, Types of Measures of Correlation - Karl Pearson's Correlation Coefficient, Spearman Rank Correlation, linear regression, Multi linear regression **.**				
Module 2	**Probability**			**6 classes**
Introduction to Probability, Probability of an event, Addition Principle, Multiplication law, Conditional Probability, Total Probability and Baye's theorem with examples				
Module 3	**Random Variables and Probability Distributions**		Coding needed	**14 classes**
Introduction to Random variables, Discrete Random Variables and Continuous Random Variables, Probability Distributions, Probability Mass Function and Probability Density Function, Various Probability distributions, Binomial, **Negative Binominal (Self Study)**, Poisson, Normal and Exponential distributions				
Module 4	**Sampling Theory**		Coding needed	**15 classes**
Introduction to Sampling Theory, Population, Statistic, Parameter, Sampling Distribution, Standard Error. Testing of Hypothesis, Types of Errors, Critical Region, level of Significance. Difference between Parametric and Non-parametric Tests, Large Sample Tests: Z-Test for Single Mean and **Difference of Means (Self Study)**, Small Sample Tests: Student's t-Test for Single Mean and **Difference of Means,** F-Test, Chi-Square Test.				

Targeted Application & Tools that can be used:

The objective of the course is to familiarize students with the theoretical concepts of probability and statistics and to equip them with basic statistical tools to tackle engineering and real-life problems.

Tools used: R Software / MS-Excel

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, 2016.

References

1. James T. McClave, P. George Benson and Terry Sincich, Statistics for Business and Economics, 2018.
2. David R. Anderson, Dennis J. Sweeney, Thomas A. Williams, Essentials of Modern Business Statistics with Microsoft Excel, 2020.

3. David R. Anderson, Dennis J. Sweeney, Thomas A. Williams, Essentials of Statistics for Business and Economics, 2019.
4. Douglas C. Montgomery and George C. Runger, Applied Statistics and Probability for Engineers, John Wiley and Sons, 2018.
5. Richard A. Johnson, Miller and Freund's Probability and Statistics for Engineers, 2018.
6. Kishor S Trivedi, Probability and Statistics with reliability, Queuing and Computer Science Applications, John Wiley & Sons, 2008.

Topics relevant to SKILL DEVELOPMENT: The goal of this course is to provide a firm understanding of probability and statistics by means of a thorough treatment of descriptive statistics, probability and probability distributions keeping in mind the future courses having statistical, quantitative and probabilistic components. The course covers topics such as descriptive statistics, probability, rules for probability, random variables and probability distributions, standard discrete and continuous probability distributions for **Skill Development through Problem Solving methodologies.** This is attained through assessment component mentioned in course handout.

Course Code: ECE2007	**Course Title:** Digital Design **Type of Course:** Theory &Integrated Laboratory	**L- T-P- C**	**2**	**0**	**2**	**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**					
Course Description	**The purpose of this course is to enable the students to appreciate the fundamentals of digital logic circuits and Boolean algebra focusing on both combinational and sequential logic circuits. The course emphasizes on minimization techniques for making canonical and low-cost digital circuit implementations. This course deals with analysis and design of digital electronic circuits. The course also creates a foundation for future courses which includes Computer Architecture, Microprocessors, Microcontrollers, and Embedded Systems etc.** The course enhances the Design, Implementation and Programming abilities through laboratory tasks. The associated laboratory provides an opportunity to verify the theoretical knowledge.					
Course Objective	**The objective of the course is to familiarize the learners with the concepts of Digital Design and attain the SKILL DEVELOPMENT through** EXPERIENTIAL **LEARNING.**					
Course Outcomes	**On successful completion of this course the students shall be able to:** i. **Describe** 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. Demonstrate the Sequential and programmable logic circuits					

	v. **Implement** various combinational and sequential logic circuits using gates.			
Course Content:				
Module 1	**Fundamentals of Number systems- Boolean algebra and digital logic**	Application Assignment	Data Analysis task	**06 classes**
Topics: Review of Number systems and logic gates, Number base conversions, Overview of Boolean functions and simplifications, two, three, four variable K-Maps- Don't care conditions- Both SOP and POS- Universal Gates (NAND & NOR) Implementations. Introduction to HDL.				
Module 2	**Boolean function simplification**	Application Assignment	Data Analysis task	**08 Classes**
Topics: Introduction to Combinational circuits, Analysis, Design procedure, Binary Adder and Subtractor, Magnitude comparator, Parity generator and checker, Multiplexers-Demultiplexers, Decoders, Encoders and Priority Encoders, HDL Models of combinational circuits.				
Module 3	**Combinational Logic circuits:**	Application Assignment	Programming Task & Data Analysis task	**08 Classes**
Topics: Introduction to sequential circuits, Storage elements: latches and flip flops, Characteristic tables and equations, excitation table, Analysis of clocked sequential circuits, Mealy & Moore Models of finite state machines - Registers & Counters. HDL Models of Sequential circuits.				

List of Laboratory Tasks:

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 sequential 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.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

Targeted Application & Tools that can be used:

Digital electronics is the foundation of all modern electronic devices such as cellular phones, MP3 players, laptop computers, digital cameras, high definition televisions, Home Automation, Communication in systems in industries

Professionally Used Software: HDL/VHDL/Verilog HDL/ OOPS

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.

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.): Book Free Download (studymaterialz.in)

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.

Course Code: CIV1008	**Course Title:** Basic Engineering Sciences **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 basic course on engineering science is designed to introduce students to the fields of civil, mechanical and petroleum engineering. Student will be exposed to various fields in civil engineering and different manufacturing techniques in addition to machinery for power production and consumption. Additionally, students will be getting an overview of various sectors of oil & gas industries. This course acquaints students to basics of Industry 4.0 and Construction 4.0. The course aims to enable students to appreciate the multidisciplinary nature of engineering design and operations in the current era with mechanization and digitization transforming every aspect of engineering.					

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] Recognize the significance of various disciplines in Civil Engineering 2] Discuss the recent evolutions in Civil Engineering 3] Explain various energies, energy generating machineries and energy consumption machineries 4] Describe the fundamental concept and terminology associated with the Petroleum Industry 5] Distinguish between conventional and modern manufacturing techniques.			
Course Content:				
Module 1	**Introduction to various fields in Civil Engineering**	Assignment	Case studies on different Civil Engineering Projects	**6 Sessions**
Topics: Introduction to Civil Engineering: Definition, scope and branches of Civil Engineering, Role of Civil Engineer, Overview of Infrastructure.				
Module 2	**Current Trends and Evolution in Civil Engineering**	Assignment	Article Review	**6 Sessions**
Topics: Mechanization in Construction, Application of Digital Technologies in Planning, Design, execution, monitoring and maintenance of Construction. Overview of Smart Cities.				
Module 3	**Power Production and Consumption Machinery**	Assignment & Quiz	Data Collection	**6 Sessions**
Topics: Energy and its types, Engines and their applications, Pumps-Compressors and their applications.				
Module 4	**Overview of Petroleum Engineering**	Assignment & Quiz	Article Review	**6 Sessions**
Overview of the Petroleum Industry, Importance of Petroleum Engineering, lifecycle of Petroleum products, Classifications of E&P activities: Key difference between Offshore and Onshore, Onshore facilities, offshore platforms, Digitization of petroleum engineering				
Module 5	**Industry 4.0**	Assignment & Quiz	Data Collection	**6 Sessions**

Topics: Conventional manufacturing process: Metal forming, metal removal and metal joining process. Modern Manufacturing process: 3D Printing / Additive Manufacturing.

Targeted Application & Tools that can be used:

Application Areas include design and implementation of Smart City projects, Infrastructure maintenance, Power production, IC engines, Electric vehicles, onshore and offshore exploration and production activities

Project work/Assignment:

Assignment 1: Collect data and prepare report on various Mega Projects in Civil Engineering
Assignment 2: Review Articles on current evolutions in Civil Engineering.
Assignment 3: Collect data related to renewable energy generation (Wind, Solar)
Assignment 4: Prepare an energy consumption chart for a compressor or pumps.
Assignment 5: Prepare a report on role of 3D printing across various industries.
Assignment 6: Prepare an assignment on geopolitical influence on oil and gas industries.

Text Book:

T1. Elements of Civil and Mechanical Engineering, L.S. Jayagopal & R Rudramoorthy, Vikas Publishers
T2. Elements of Mechanical Engineering, by VK Manglik
T3. Fundamentals of Oil & Gas Industry for Beginners by Samir Dalvi, Notion Press; 1st edition

References

1. K.P. Roy, S.K. Hajra Choudhury, Nirjhar Roy, "Elements of Mechanical Engineering", Media Promoters and Publishers Pvt Ltd, Mumbai.
2. Nontechnical Guide to Petroleum Geology, Exploration, Drilling & Production by Norman J. Hyne, PennWell Books; 3rd Revised edition

Web-resources:

1. Basic Civil Engineering
   https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=2706932&site=ehost-live
2. Post-parametric Automation in Design and Construction
   https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1155197&site=ehost-live
3. Smart Cities : Introducing Digital Innovation to Cities
   https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1993146&site=ehost-live
4. 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
5. Mechanical Engineering
   https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO106_REDO_1705
6. Additive Manufacturing: Opportunities, Challenges, Implications
   https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1134464&site=ehost-live
7. Society of Petroleum Engineers (SPE)
   https://www.spe.org/en/
8. PetroWiki: A comprehensive online resource created by the Society of Petroleum Engineers that provides information on various aspects of petroleum engineering.
   https://petrowiki.spe.org/PetroWiki

9. Rigzone: A resource for news and information about the oil and gas industry, including job postings and industry trends. https://www.rigzone.com/
Topics relevant to the development of SKILLS: Engines-Turbines and their applications. Mechanization in Construction. Digitization in Petroleum Industries

Course Code: **MEC1006**	**Course Title:** **Engineering Graphics** **Type of Course:** **School Core & Theory Only**	**L- T-P- C**	2-0-0-2
Version No.	1.2		
Course Pre-requisites	**NIL**		
Anti-requisites	**NIL**		
Course Description	The course is designed with the objective of giving an overview of engineering graphics. It is introductory in nature and acquaints the students with the techniques used to create engineering drawings. The course emphasizes on projection of points, lines, planes and solids and isometric projections.		

Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Engineering Graphics**" and attain **SKILL DEVELOPMENT** through Problem solving methodologies.
Course Outcomes	**On successful completion of this course the students shall be able to:** **(1)** Demonstrate competency of Engineering Graphics as per BIS conventionsand standards. **(2)** Comprehend the theory of projection for drawing projections of Points, Lines and Planes under different conditions. **(3)** Prepare multiview orthographic projections of Solids by visualizing them indifferent positions. **(4)** Prepare pictorial drawings using the principles of isometric projections to visualize objects in three dimensions**.**

Course Content:

Module 1	Introduction to Drawing	Assignment	Standard technical drawing	**02 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 Linesand 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 inall 4 quadrants.

Projections of Straight Lines (located in first quadrant/first angle projection only): True and apparent lengths, true and apparent Inclinations to reference planes. (No application problems). Projection of Plane surfaces (First angle projection): Regular plane surfaces – triangle, square, rectangle, pentagon, hexagon and circle – in different positions inclined to both the planes using change of position method only.

[10 Hours: Application Level]

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

Topics:
Introduction, Projection of right regular prisms, pyramids, cone, hexahedron and tetrahedron indifferent positions (Problems resting on HP only and First angle projection).

[10 Hours: Application Level]

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

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.

Web resources:

https://nptel.ac.in/courses/112103019

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: **CSE1006**	**Course Title:** Problem Solving using JAVA **Type of Course: Lab Integrated**	**L- T-P-C**	1	0	4	3

Version No.	2.0			
Course Pre-requisites	CSE1004			
Anti-requisites	Nil			
Course Description	This course introduces the core concepts of object-oriented programming. This course has theory and lab component which emphasizes understanding the implementation and application of object-oriented programming paradigm. It helps the student to build real-time secure applications by applying these concepts and also for effective problem-solving. The students interpret and understand the need for object-oriented programming to build applications.			
Course Objective	The objective of the course is to familiarize the learners with the concepts of Problem-Solving using JAVA and attain **SKILL DEVELOPMENT** through **EXPERIENTIAL LEARNING** techniques			
Course Out Comes	**On successful completion of the course, the students shall be able to:** **C.O. 1:** Describe the basic programming concepts. [Knowledge] **C.O. 2:** Apply the concept of classes, objects and methods to solve problems. [Application] **C.O. 3:** Apply the concept of arrays and strings. [Application] **C.O. 4:** Implement inheritance and polymorphism in building secure applications. [Application] **C.O. 5:** Apply the concepts of interface and error handling mechanism. [Application]			
Course Content:				
Module 1	**Basic Concepts of Programming and Java**	Assignment	Data Collection/Interpretation	**12 Sessions**
Topics: Introduction to Principles of Programming: Process of Problem Solving, Java program structure, Download Eclipse IDE to run Java programs, Sample program, Data types, Identifiers, Variables, Constants in java, Operators, Assignments and Expression, Basic Input/ Output functions, Control Statements: Branching and Looping.				

Module 2	**Classes, objects, methods and Constructors**	Case studies / Case let	Case studies / Case let	**12 Sessions**
Topics: Classes, Objects and Methods: Introduction to object Oriented Principles, defining a class, adding data members and methods to the class, access specifiers, instantiating objects, reference variable, accessing class members and methods. Static Polymorphism: Method overloading, constructors, constructor overloading, this keyword, static keyword, Nested classes, Accessing members in nested classes.				
Module 3	**Arrays, String and String buffer**	Quiz	Case studies / Case let	**14 Sessions**
Topics: Arrays: Defining an Array, Initializing & Accessing Array, Multi–Dimensional Array, Array of objects. String: Creation & Operation. String builder class, methods in String Buffer.				
Module 4	**Inheritance and Polymorphism**	Quiz	Case studies / Case let	**14 Sessions**
Topics: Inheritance: Defining a subclass, Types of Inheritance, super keyword. Dynamic Polymorphism: Method overriding. Final keyword: with data members, with member functions and with class. Abstract keyword: with data members, with member functions and with class, Exception handling.				
Module 5	**Input & Output Operation in Java**	Quiz	Case studies / Case let	**14 Sessions**
Input/output Operation in Java(java.io Package), Streams and the new I/O Capabilities, Understanding Streams, working with File Objects, File I/O Basics, Reading and Writing to Files, Buffer and Buffer Management, Read/Write Operations with File Channel, Serializing Objects, Observer and Observable Interfaces.				
List of Laboratory Tasks: **P1 - Problem Solving using Basic Concepts.** **P2 - Problem Solving using Basic Concepts and Command Line Arguments.** **P3 - Programming assignment with class, objects, methods and Constructors.** **P4 - Programming assignment with method overloading.** **P5 - Programming assignment with constructor overloading.** **P6 - Programming assignment with Static members and static methods.**				

P7 - Programming assignment with Nested classes.

P8 - Programming assignment using Arrays.

P9 - Programming assignment using Strings.

P10 - Programming assignment using String Builder.

P11 - Programming assignment using Inheritance and super keyword.

P12 - Programming assignment using Method overriding and Dynamic method invocation.

P13 - Programming assignment using Final keywords.

P14 - Programming assignment using Abstract keywords.

P15 - Programming assignment using Interface.

P16 - Programming assignment using Interface.

P17 - Programming assignment CharacterStream Classes

P18 - Programming assignment Read/Write Operations with File Channel

Targeted Application & Tools that can be used : JDK /eclipse IDE/ net Beans IDE.

Text Book

T1 Herbert Schildt, "The Complete Reference Java 2", Tata McGraw Hill Education.

References

R1: Cay S Horstmann and Cary Gornell, "CORE JAVA volume I-Fundamentals", Pearson

R2: James W. Cooper, "Java TM Design Patterns – A Tutorial", Addison-Wesley Publishers.

E book link R1: http://rmi.yaht.net/bookz/core.java/9780134177373-Vol-1.pdf

E book link R2: Java(tm) Design Patterns: A Tutorial([PDF] [7qmsenjl97t0] (vdoc.pub)

Web **resources**

ps://youtube.com/playlist?list=PLu0W_9lII9agS67Uits0UnJyrYiXhDS6q

ps://puniversity.informaticsglobal.com:2229/login.aspx

Topics relevant to the development of "Skill Development":

1. Static Polymorphism
2. Method overloading, constructors
3. constructor overloading
4. this keyword
5. static keyword and Inner classes
6. Inheritance and Polymorphism.

for **Skill Development** through **Experiential Learning** techniques. This is attained through the assessment component mentioned in the course handout.

ENG2001	**Advanced English**	**L- T- P- C**	1	0	2	2
Version No.	1.3					
Course Pre-requisites	ENG1002					
Anti-requisites	**NIL**					
Course Description	The course emphasizes on technical communication at advanced level by exploring critical reading, technical presentation and review writing. The purpose of the course is to enable learners to review literature in any form or any technical article and deliver technical presentations. Extensive activities in practical sessions equip to express themselves in various forms of technical communications. Technical presentations and the module on career setting focus on learners' area of interests and enhance their English language writing skills to communicate effectively.					
Course Out Come	On successful completion of the course the students shall be able to: 1. Develop a critical and informed response reflectively, analytically, discursively, and creatively to their reading. 2. Communicate effectively, creatively, accurately and appropriately in their writing. 3. Deliver technical presentations 4. Design resume and create professional portfolio to find a suitable career					
Course Content: Theory						
Module 1	**Critical Reasoning and Writing**	**Writing Essays**	**Critical Reading**			**4 Classes**

Topics:

- A Catalog of Reading Strategies
- The Myth of Multitasking
- A Guide to Writing Essays Speculating about Causes or Effects
- Is Google Making Us Stupid (Self Study)

Module 2	**Technical Presentation**	**Presentation**	**Oral Skills**	**3 Classes**

Topics:

- Planning the presentation
- Creating the presentation
- Giving the presentation

Module 3	**Writing Reviews**	**Prezi**	**Review Writing**	**4 Classes**

Topics:

- Review Writing
- Short film reviews
- Advanced English Grammar (Self Study)

Module 4	**Starting your Career**	**Online Writing Lab**	**Writing Skills**	**4 Classes**

Topics**:**

- Preparing a Resume
- Writing Effective Application Letter
- Creating a Professional Portfolio

Course Content: Practical Sessions

Module 1	**Critical Reasoning and Writing**	**8 Classes**

1. Reading and Analyzing
   Level 1 – Annotation
   Level 2 - Assumptions
2. Writing Narrative Essays
   Level 1 – Draft 1
   Level 2 – Draft 2

Module 2	**Technical Presentation**	**10 Classes**

3. Fishbowl
   In Fishbowl, students form concentric circles with a small group inside and a larger group outside. Students in the inner circle engage in an in-depth discussion, while students in the outer circle listen and critique content, logic, and group interaction.
   Level 1 – within group
   Level 2 – Among 2 group

4. Technical Group Presentation

Module 3	**Writing Reviews**	**4 Classes**

5. Practice Worksheets
   Level 1 – Eliminating the Passive Voice
   Level 2 – Simple, compound and complex sentences
6. Writing Short Film Reviews

Module 4	**Starting your Career**	**6 Classes**

7. Collaborative Project
   Job search and writing report
   Writing Resume

Module 1-4	**Academic Journal**	**2 Classes**

8. Academic Journal Writing
   Level 1- Mid Term
   Level 2 – End Term

Targeted Application & Tools that can be used: Writing reports, Review writing, Group Discussion, Dyadic interviews, Grammarly.com

Project work/Assignment:

Academic Journal – Assignment

In Academic Journal (CIJ), students compile task and activities completed in each module and submit to the instructor at the middle and end of the semester.

References

1. Hering, Heik. *How to Write Technical Reports: Understanding Structure, Good Design, Convincing Presentation*. Springer.
2. Johnson, Richard. (2010) *Technical Communication Today.* Pearson, 2015
3. Rice B. Adelrod, Charles R. Cooper and Ellen C. Carillo. (2020) *Reading Critically Writing Well: A Reader and Guide*. Beford/St. Martin's Macmillan Learning, New York.
4. The Princeton Review. (2010) *MCAT Verbal Reasoning & Writing.* The Princeton Review, Inc.
5. https://www.hitbullseye.com/Strong-and-Weak-Arguments.php Accessed on 10 Dec 2021
6. https://www.inc.com/guides/how-to-improve-your-presentation-skills.html Accessed on 10 Dec 2021

Topics Relevant to "employability": Critical Reasoning, Presentation, Review Writing and Starting Career **Topics Relevant to "Human Values and Professional Ethics":** Critical reasoning

Course Code: ECE2010	**Course Title: Innovative Projects using Arduino**	**L- T-P- C**	-	-	-	1
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 and their application in various real time projects involving sensors. Throughout the course, students will learn the fundamentals of Arduino programming and gain hands-on experience with a wide range of sensors. Students will explore how to connect and interface sensors with Arduino 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 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 prototype board 2) Demonstrate the hardware interfacing of the peripherals to Arduino system. 3) Understand the types of sensors and its functions 4) Demonstrate the functioning of live projects carried out using Arduino system.					
Course Content:						
Module 1	**Basic concepts of Arduino**	Hands-on	Interfacing Task and Analysis	**4 Sessions**		

Topics:
Introduction to Arduino, 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	**4 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 Tinkercad Simulator.

Topics: Types of Arduino boards, 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 and sensors can be applied. The flexibility and affordability of Arduino, combined with the wide range of sensors available, allow for endless possibilities in creating innovative projects.

Professionally Used Software: students can use open SOURCE Softwares Arduino IDE and Tincker CAD

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):
Monk Simon "Programming Arduino: Getting Started with Sketches", Mc Graw Hill Publications Second 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.

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>

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.

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

Course Code: **PPS1012**	**Course Title: Enhancing Personality through Soft Skills** 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 the desire and enthusiasm to be involved, participate and learn.		
Anti-requisites	NIL		
Course Description	This course is designed to enable students to understand soft skills concepts and improve confidence, communication, and professional skills to give the students a competitive advantage and increase chances of success in the professional world. The course will benefit learners in presenting themselves effectively through various activities and learning methodologies.		
Course Objective	The objective of the course is to **familiarize the learners with the concepts of "Enhancing Personality through Soft Skills" 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 **Identify the stages of** team formation (Remember) CO 2 **Demonstrate** effective presentation skills (Apply) CO3 **Prepare** professional social media profile (Apply)		
Course Content:			
Module 1	Professional Brand Building	Brand Framework Activity	**6 Hours**
Topics: Personal brand definition, Crafting a compelling LinkedIn profile, Networking strategies, Leveraging AI tools for developing content for brand visibility. **Activity:** Create a post and enhancing LinkedIn profile			
Module 2	Art of Questioning	Role plays	**4 Hours**

Topics: Framing Questions, 5W1H Technique, Open-ended and Close-ended questions, Funnel technique, Probing questions, Leading questions			
Module 3	Presentation Skills	Practice and evaluation of individual/group presentation	**12 Hours**
Topics: Content development, Delivery techniques, Audience Analysis, Timing and Pacing, handling questions and challenges. **Activity:** Individual presentations or team presentation			
Module 4	Team Building	Team building activities	**6 Hours**
Topics: Importance of team, stages of Team Formation, Trust and collaboration. **Activity: Team Building Activity**			
Module 5	Recap / Revision /Feedback Session	Discussion, Quiz	**2 Hours**

Targeted Applications & Tools that can be used:

1. TED Talks
2. You Tube Links
3. Activities

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

1) Presentation Evaluation
2) LinkedIn assessment

Targeted Applications & Tools that can be used:

1. TED Talks
2. YouTube Links
3. Videos by L&D Team shared on Edhitch/YouTube.com
4. LMS

Course Code: MAT1002	**Course Title: Transform Techniques, Partial Differential Equations and Their Applications** **Type of Course: School Core**	**L-T- P-C**	**3**	**0**	**0**	**3**
Version No.	2.0					
Course Pre-requisites	**MAT1001**					
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 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.					
Course Objective	The objective of the course is **Skill Development** of student by using **Problem Solving Techniques.**					
Course Outcomes	On successful completion of this course the students shall be able to: CO-1: Express functions in terms of uniformly convergent Fourier series. CO-2: Apply Laplace transform technique to solve differential equations. CO-3: Employ z-transform technique to solve difference equations. CO-4: Solve a variety of partial differential equations analytically.					
Course Content:						
Module 1	**Fourier Series**					**10 CLASSES**
Fourier series: Fourier series - Euler's formulae - Dirichlet's conditions - Change of Interval - half range series – RMS value – Parseval's identity – Computation of harmonics. Engineering Applications of Fourier series.						
Module 2	**Integral Transforms**					**15 Classes**
Laplace Transform: Definition and Laplace transforms of elementary functions. Properties of Laplace transform. Laplace transform of periodic function, unit-step function and impulse function and the related problems. Inverse Laplace transform of standard functions and problems, initial and final value theorems. Convolution theorem, solution of linear ordinary differential equations, LCR circuit problems. **Fourier Transform:** Integral transforms, infinite Fourier transforms, Fourier sine and cosine transforms, inverse Fourier transforms.						

Engineering Applications of Fourier transform.

Module 3	**Z Transform and Difference Equations**			**8 Classes**

Definition of Z-transform, Z transforms of standard functions and the related problems, standard inverse Z transforms and problems, computation of inverse Z-transform by partial fraction and convolution methods, solution of difference equations using Z-transforms.

Business and Engineering Applications of Z transform.

Module 4	**Partial Differential Equations**			**12 Classes**

Partial Differential Equations: Formation of PDEs, solution of non-homogeneous PDEs by direct integration, solution of homogeneous PDEs involving derivatives with respect to only one independent variable, method of separation of variables, solution of the Lagrange's PDE of the type Pp + Qq = R.

Applications of PDEs: Various possible solutions of the one dimensional wave and heat equations by the method of separation of variables, D'Alembert's solution of the wave equation, solution of related boundary value problems.

Targeted Applications & Tools that can be used:

Applications to electrical engineering, vibrational analysis, acoustics, optics, signal processing, image processing, quantum mechanics, econometrics and shell theory by means of Fourier Series and integral transforms.

Opens up new approaches in terms of Z-transform to solving one of the central problems of modern science involving difference equations.

Finding the solutions of boundary value problems involving PDEs with reference to wave, heat, and Laplace equations.

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

Two Assignments based on the applications of the concepts leading to a minimum of 5 engineering problems from a common pool of problems.

Text Book

Erwin Kreyszig, 2017: " Advanced Engineering Mathematics", 10th Edition, John Wiley.

References:

1. B. S. Grewal, 2017: “Higher Engineering Mathematics” 45th Edition, Khanna Publishers.
2. Peter V O'Neil, 2015: “Advanced Engineering Mathematics”, 7th Edition, Cengage Learning.
3. Glyn James, 2016: “Advanced Modern Engineering Mathematics”, 4th Edition, Pearson Education.
4. Michael D. Greenberg, 2018: “Advanced Engineering Mathematics”, 2nd Edition, Pearson Education.

Topics relevant to the development of Foundation Skills: All the solution methods.
Topics relevant to development of Employability skills: Use of relevant scientific application packages.

Course Code: CSE2001	**Course Title:** Data Structures and Algorithms **Type of Course: Integrated**	**L- T-P- C**	3-0-2-4
Version No.	1.0		
Course Pre-requisites	CSE1006		
Anti-requisites	NIL		
Course Description	This course introduces the fundamental concepts of data structures and to emphasize the importance of choosing an appropriate data structure and technique for program development. This course has theory and lab component which emphasizes on understanding the implementation and applications of data structures using Java programming language. With a good knowledge in the fundamental concepts of data structures and practical experience in implementing them, the student can be an effective designer, developer for new software applications.		
Course Objective	The objective of the course is to familiarize the learners with the concepts of Data Structures and Algorithms and attain Skill Development through Experiential Learning techniques.		
Course Out Comes	**On successful completion of the course the students shall be able to:** **CO1:** Implement program for given problems using fundamentals of data structures. [Application] **CO2:** Apply an appropriate linear data structure for a given scenarios. [Application] **CO3:** Apply an appropriate non-linear data structure for a given scenarios. [Application] **CO4:** Explain the performance analysis of given searching and sorting algorithms.		

Course Content:				
Module 1	**Introduction to Data Structure and Linear Data Structure – Stacks and Queues**	Assignment	Program activity	**18 Sessions**
Introduction – Introduction to Data Structures, Types and concept of Arrays. **Stack -** Concepts and representation, Stack operations, stack implementation using array and Applications of Stack. **Queues -** Representation of queue, Queue Operations, Queue implementation using array, Types of Queue and Applications of Queue.				
Module 2	**Linear Data Structure- Linked List**	Assignment	Program activity	**17 Sessions**
Topics: Linked List - Singly Linked List, Operation on linear list using singly linked storage structures, Circular List, Applications of Linked list. **Recursion** - Recursive Definition and Processes, Programming examples.				
Module 3	**Non-linear Data Structures - Trees and Graph**	Assignment	Program activity	**15 Sessions**
Topics: Trees - Introduction to Trees, Binary tree: Terminology and Properties, Use of Doubly Linked List, Binary tree traversals: Pre-Order traversal, In-Order traversal, Post - Order traversal. **Graph** - Basic Concept of Graph Theory and its Properties, Representation of Graphs.				
Module 4	**Searching & Sorting Performance Analysis**	Assignment	Program activity	**14sessions**
Topic: Sorting & Searching - Sequential and Binary Search, Sorting – Selection and Insertion sort. **Performance Analysis** - Time and space analysis of algorithms – Average, best and worst case analysis.				
List of Laboratory Tasks: **Lab sheet -1** **Level 1:** Prompt the user, read input and print messages. Programs using class, methods and objects **Level 2:** Programming Exercises on fundamental Data structure - Arrays based on Scenario. **Lab sheet -2** **Level 1:** Programming Exercises on Stack and its operations **Level 2:** Programming Exercises on Stack and its operations with condition **Lab sheet -3** **Level 1:** Programming on Stack application infix to postfix Conversion **Level 2:** -				

Lab sheet -4

Level 1: Programming Exercises on Queues and its operations with conditions

Level 2: -

Lab sheet -5

Level 1: Programming Exercises on Linked list and its operations.

Level 2: Programming Exercises on Linked list and its operations with various positions

Lab sheet -6

Level 1: -

Level 2: Programming scenario based application using Linked List

Lab sheet -7

Level 1: Programming Exercises on factorial of a number

Level 2: Programming the tower of Hanoi using recursion

Lab sheet -8

Level 1: -

Level 2: Programming the tower of Hanoi using recursion

Lab sheet -9

Level 1: Programming Exercise on Doubly linked list and its operations

Level 2: -

Lab sheet -10

Level 1: Program to Construct Binary Search Tree and Graph

Level 2: Program to traverse the Binary Search Tree in three ways(in-order, pre-order and post-order) and implement BFS and DFS

Lab sheet -11

Level 1: Program to Implement the Linear Search & Binary Search

Level 2: Program to Estimate the Time complexity of Linear Search

Lab sheet -12

Level 1: Program to Implement and Estimate the Time complexity of Insertion Sort

Level 2: Program to Implement and Estimate the Time complexity of Insertion Sort

Lab sheet -13

Level 1: Program to Implement and Estimate the Time complexity of Selection Sort

Level 2: Program to Implement and Estimate the Time complexity of Selection Sort

Targeted Application & Tools that can be used

Use of PowerPoint software for lecture slides and use of Ubuntu for lab programs to execute. Tool is Codetantra tool.

Project work/Assignment:

Assignment: Students should complete the lab programs by end of each practical session and module wise assignments before the deadline.

Text Book

T1 Narasimha Karumanchi: *"Data Structures and Algorithms Made Easy in Java",* 5th Edition, CareerMonk Publications, 2017.

References

R1 Mark Allen Weiss: *"Data Structures and Algorithm Analysis in Java",* 4th Edition, Pearson Educational Limited, 2014.

R2 Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser: *"Data Structures and Algorithms in Java"*, 6th Edition, John Wiley & Sons, Inc., ISBN: 978-1-118-77133-4, 2014.

R3 Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, 2017: *"Introduction to Algorithms",* 3rd Edition, PHI Learning Private Limited.

Web resources:

1. For theory: https://onlinecourses.nptel.ac.in/noc20_cs85/preview
2. For Lab : codetantra tool
3. https://puniversity.informaticsglobal.com/login

Topics relevant to "SKILL DEVELOPMENT": Linked list and its type, Tree traversal and hashing tables for Skill Development through Experiential Learning techniques. This is attained through the assessment component mentioned in the course handout.

Course Code: CSE3155	**Course Title: Data Communications and Computer Networks** **Type of Course: Program Core Theory–Laboratory integrated**	**L-T-P-C 3-0-2-4**	3	0	2	4
Version No.	1.0					
Course Pre-requisites	ECE 2007					
Anti-requisites	NIL					
Course Description	The objective of this course is to provide knowledge in data communications and computer networks, its organization and its implementation, and gain practical experience in the installation, monitoring, and troubleshooting of LAN systems. . The associated laboratory is designed to implement and simulate various networks using Cisco packet tracer, NS2. All the lab exercises will focus on the fundamentals of creating multiple networks, topologies and analyzing the network traffics.					

Course Objective	The objective of the course is to familiarize the learners with the concepts of Data Communications and Computer Networks and attain Employability through Problem Solving Methodologies.			
Course Out Comes	On successful completion of the course, the students shall be able to: 1] I llustrate the Basic Concepts Of Data Communication and Computer Networks. 2] Analyze the functionalities of the Data Link Layer. 3] Apply the Knowledge of IP Addressing and Routing Mechanisms in Computer Networks. 4] Demonstrate the working principles of the Transport layer and Application Layer.			
Course Content:				
Module 1	Introduction and Physical Layer- CO1	Assignment	Problem Solving	07 Classes
Introduction to Computer Networks and Data communications, Network Components – Topologies, Transmission Media –Reference Models -OSI Model – TCP/IP Suite. Physical Layer -Analog and Digital Signals – Digital and Analog Signals – Transmission - Multiplexing and Spread Spectrum.				
Module 2	Reference Models and Data Link Layer – CO2	Assignment	Problem Solving	**7 Classes**
Data Link Layer - Error Detection and Correction – Parity, LRC, CRC, Hamming Code, Flow Control and Error Control, Stop and Wait, ARQ, Sliding Window, Multiple Access Protocols, CSMA/CD,CSMA/CA, IEEE 802.3, IEEE 802.11 Ethernet.				
Module 3	Network Layer – CO 3	Assignment	Problem Solving	**10 Classes**
Network Layer Services - Network Layer Services, Switching Techniques, IP Addressing methods- IPv4 IPV6 – Subnetting. Routing, - Distance Vector Routing – RIP-BGP-Link State Routing –OSPF-Multi cast Routing-MOSPF- DVMRP – Broad Cast Routing. EVPN-VXLAN, VPLS, ELAN.				

Module 4	Transport and Application Layer -CO3	Assignment	Problem Solving	**10 Classes**

Transport Layers - Connection management – Flow control – Retransmission, UDP, TCP, congestion control, – Congestion avoidance (DECbit, RED)
The Application Layer: Domain Name System (DNS), Domain Name Space, SSH, FTP, Electronic Mail (SMTP, POP3, IMAP, MIME) – HTTP – – SNMP, Web Services, Virtual Networking.

List of Laboratory Tasks:

Lab sheet -1, M-1, 3 [2 Hours]
Experiment No 1:
Level 1: Study of basic network commands and network configuration commands.

Lab sheet -2, M-1[2 Hours]
Experiment No 1:
Level 1: Identify and explore Network devices, models and cables. Introduction to Cisco packet tracer.
Experiment No. 2:
Level 2 – Create various network topologies using a cisco packet tracer.

Lab sheet -3, M-2,3 [2 Hours]
Experiment No. 1:
Level 2 - Basic Configuration of switch/router using Cisco packet tracer.
Experiment No. 2:
Level 2 -Configure the privilege level password and user authentication in the switch/router.

Lab sheet – 4, M-3 [2 Hours]
Experiment No. 1:
Level 2 - Configure the DHCP server and wireless router and check the connectivity

Lab sheet – 5, M-3 [2 Hours]
Experiment No. 1:
Level 2 - Configure the static routing in the Cisco packet tracer.
Experiment No. 2:
Level 2 - Configure the dynamic routing protocol in the Cisco packet tracer.

Lab sheet – 6, M-4 [2 Hours]
Experiment No. 1: Configuration of DNS Server with Recursive & Integrative approach in Cisco packet tracer.

Lab sheet – 7, M-4 [2 Hours]
Experiment No. 1:

Configure the telnet protocol in the router using the Cisco packet tracer.
Lab sheet – 8, M-4[2 Hours]
Experiment No. 1:
Level1- Introduction to NS2 and basic TCL program.
Lab sheet – 9, M-4 [2 Hours]
Experiment No. 1:
Level 1: Simulate three node Point to point network using UDP in NS2.
Experiment No. 2:
Simulate transmission of Ping message using NS2.
Lab sheet – 10, M-4[2 Hours]
Experiment No. 1:
Simulate Ethernet LAN using N-node in NS2.
Experiment No. 2:
Simulate Ethernet LAN using N-node using multiple traffic in NS2
Lab sheet –11, M-3,4 [2 Hours]
Experiment No. 1:
Level 1- Introduction to Wire Shark.
Experiment No. 2:
Level 2- Demonstration of packet analysis using wire shark.

Lab sheet –12, M-1,2,3 [2 Hours]
Experiment No. 1:
Level 2- Demonstration of switch and router configuration using real devices

Targeted Application & Tools that can be used: Cisco Packet Tracer, Wireshark, and NS2.

Case Study/Assignment: Choose and analyze a network from any organization/Assignment proposed for this course in CO1-CO4

1. **Problem Solving: Choose and appropriate devices and implement various network concepts.**
2. **Programming: Simulation of any network using NS2.**

Text Book

1. **Behrouz A. Forouzan, "Data Communications and Networking 5E", 5th Edition, Tata McGraw-Hill, 2017.**
2. **Andrew S Tanenbaum, Nick Feamster & David J Wetherall, "Computer Networks" Sixth Edition, Pearson Publication, 2022**

References

1. **"Computer Networking: A Top-Down Approach", Eighth Edition, James F. Kurose, Keith W. Ross, Pearson publication, 2021.**

2. **William Stallings, Data and Computer Communication, 8th Edition, Pearson Education, 2007.** 3. **Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007.** **E-Resources:** **1.https://archive.nptel.ac.in/courses/106/105/106105183/** **2. http://www.nptelvideos.com/course.php?id=393** **3.https://www.youtube.com/watch?v=3DZLItfbqtQ** **4.https://www.youtube.com/watch?v= fIdQ4yfsfM** **5. https://www.digimat.in/keyword/106.html** **https://puniversity.informaticsglobal.com/login**

Course Code: CSE2009	**Course Title: Computer Organization and Architecture**	**L-T- P- C**	3-0-0-3
Version No.	2.0		
Course Pre-requisites	ECE 2007		
Anti-requisites	**NIL**		
Course Description	This course introduces the core principles of computer architecture and organization from basic to intermediate level. This theory based course emphasizes on understanding the interaction between computer hardware and software. It equips the students with the intuition behind assembly-level instruction set architectures. It helps the students to interpret the operational concepts of computer technology as well as performance enhancement.		
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Computer Organization and Architecture** and attain **Skill Development** through **Participative Learning** techniques.		

<table>
<tr><td>Course Outcomes</td><td colspan="4">On successful completion of the course the students shall be able to:
1] Describe the basic components of a computer, their interconnections, and instruction set architecture [Comprehension]
2] Apply appropriate techniques to carry out selected arithmetic operations
3] Explain the organization of memory and processor sub-system</td></tr>
<tr><td>Course Content:</td><td colspan="4"></td></tr>
<tr><td>Module 1</td><td>Basic Structure of computers</td><td>Assignment</td><td>Data Analysis task</td><td>12 Classes</td></tr>
<tr><td colspan="5">Topics:
Computer Types, Functional Units, Basic Operational concepts, Bus Structures, Computer systems RISC & CISC, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement. Arithmetic Operations on Signed numbers. Instructions and Instruction Sequencing, Instruction formats, Memory Instructions.</td></tr>
<tr><td>Module 2</td><td>Instruction Set Architecture and Memory Unit</td><td>Assignment</td><td>Analysis, Data Collection</td><td>12 Classes</td></tr>
<tr><td colspan="5">Topics:
Instruction Set Architecture: Addressing Modes, Stacks and Subroutines.
Memory System: Memory Location and Addresses, Memory Operations, Semiconductor RAM Memories, Internal Organization of Memory chips, Cache memory mapping Techniques.</td></tr>
<tr><td>Module 3</td><td>Arithmetic and Input/output Design</td><td>Case Study</td><td>Data analysis task</td><td>10 Classes</td></tr>
<tr><td colspan="5">Topics:
Arithmetic: Carry lookahead Adder, Signed-Operand Multiplication, Integer Division, and Floating point operations.

Input/output Design: Accessing I/O Devices, I/O communication, Interrupt Hardware, Direct Memory Access, Buses, Interface Circuits</td></tr>
<tr><td>Module 4</td><td>BPU and Pipelining</td><td>Assignment</td><td>Analysis, Data Collection</td><td>11 Classes</td></tr>
<tr><td colspan="5">Topics:
Basic Processing Unit: Fundamental Concepts, Single Bus organization, Control sequence, Execution of a Complete Instruction, Multiple Bus Organization.
Pipelining: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, Hazards.</td></tr>
<tr><td colspan="5">Targeted Application & Tools that can be used:

Targeted employment sector is processor manufacturing and memory chip fabrication vendors like Intel, AMD, Motorola, NVidia, Samsung, Micron Technology, western Digital etc. Targeted job</td></tr>
</table>

profiles include Memory circuit design and verification engineers, Physical system design engineer, System programmer, Fabrication engineer etc.

Tools:

- Virtual Lab, IIT KGP
- Tejas – Java Based Architectural Simulator, IIT Delhi

Text Book

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, "Computer Organization", Fifth Edition, McGraw-Hill Higher Education, 2016 reprint.

References

1. William Stallings, "Computer Organization & Architecture – Designing for Performance", 11th Edition, Pearson Education Inc., 2019

2. David A. Patterson & John L. Hennessy, "Computer Organization and Design MIPS Edition- The Hardware/Software Interface", 6th Edition, Morgan Kaufmann, Elsevier Publications, November 2020.

Web References:

1. NPTEL Course on "Computer architecture and organization" IIT Kharagpur By Prof. Indranil Sengupta, Prof. Kamalika Datta. https://nptel.ac.in/courses/106105163
2. NPTEL Course on "Computer Organization", IIT Madras By Prof. S. Raman. https://nptel.ac.in/courses/106106092
3. https://puniversity.informaticsglobal.com:2229/login.aspx

Topics relevant to "SKILL DEVELOPMENT": Generation of Computers, CISC and RISC processors, Bus Arbitration, Collaboration and Data collection for Term assignments and Case Studies for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code: MAT2004	**Course Title: Discrete Mathematical Structures** **Type of Course: Program Core**	**L-T- P- C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	**Nil**					
Anti-requisites	**Nil**					

Course Description	The course provides insights into the fundamental aspects of mathematical logic and predicate calculus. The course delves deeply into the concepts of algebraic structures, lattices and Boolean algebras which are widely used in computer science and engineering. It also highlights the principles of counting techniques and their applications.			
Course Objective	The objective of the course is **Skill Development** of student by using **Problem Solving Techniques.**			
Course Outcomes	On successful completion of the course the students shall be able to: CO1: Explain logical sentences through predicates, quantifiers and logical connectives. CO2: Comprehend the basic principles of set theory and different types of relations. CO3: Elucidate the concepts of lattices and Boolean algebra. CO4: Deploy the counting techniques to tackle combinatorial problems.			
Course Content:				
Module 1	**Mathematical Logic and Predicate Calculus**			**12 classes**
Propositional Logic, Propositional Logic Equivalences, Normal forms, Inference rules, Introduction to Proofs, Conversion to clausal form, Predicate calculus, The Statement function, Inference theory of the Predicate Calculus.				
Module 2	**Algebraic Structures**			**10 classes**
Sets and set-operations, functions, relations and their properties & representations of relation by matrix, closure of different type of relations, equivalence relations, primitive recursive function.				
Module 3	**Lattices and Boolean Algebra**			**11 classes**
Partial ordering, Posset, Lattices & Algebraic structures, Sub lattice, Basic properties of algebraic systems by lattices, Distributive lattices, complement of an element in a lattice, Boolean lattice & Boolean algebra, cancellation laws and unique complement theorem.				
Module 4	**Principles of Counting Techniques**			**12 classes**
Chinese Remainder Theorem, pigeonhole principle, generalized pigeonhole principle, Generalized Permutations and Combinations, Recurrence Relations.				
Targeted Application & Tools that can be used:				

Discrete mathematics provides the mathematical foundations for many computer science courses including data structures, algorithms, database theory, automata theory, formal languages, compiler theory, computer security, and operating systems.

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

Assignment 1: Logic Equivalences and Predicate calculus.
Assignment 2: Equivalence Relations and Lattices
Assignment 3: Recurrence Relations

Text Books

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", McGraw-Hill's 7th Edition, 2011.
2. Kolman, Bernard; Busby, Robert C; Ross, Sharon Cutler," Discrete mathematical structures", Pearson India, 6th Edition, 2015.
3. Liu, C L Mohapatra, D P.," Elements of Discrete Mathematics a Computer oriented approach", New Delhi McGraw Hill Education, 4th Edition, 2015.
4. Mott, Joe L; Kandel, Abraham; Baker, Theodore P, "Discrete Mathematics for Computer Scientists and Mathematicians", Pearson India, 2nd Edition, 2015.
5. Epp, Susanna S, "Discrete Mathematics with applications", New Delhi Cengage Learing, 4th Edition, 2016.

References:

1. Tremblay, J.P. and Manohar.R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.
2. Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 4th Edition, Pearson Education Asia, Delhi, 2007.
3. Discrete Mathematics, Richard Johnsonbaugh, 8th Edition, Prentice Hall, 2017.

Course Code: CSE3190	**Course Title: Fundamentals of Data Analytics** **Type of Course: Theory-embedded Lab**	**L-T- P- C**	2	0	2	3
Version No.	3.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					

<table>
<tr><td>Course Description</td><td colspan="4">Fundamentals of Data Analytics is designed for inspecting, cleansing, transforming, and modeling data with the goal of discovering useful information, and supports in decision-making. The course begins by covering Data extraction, pre-processing, and transformation. It delivers the basic statistics and taught in an intuitive way to analysis the data. This course will help the students to apply the knowledge on data analysis to a wide range of applications.</td></tr>
<tr><td>Course Objective</td><td colspan="4">The objective of the course is to familiarize the learners with the concepts of Fundamentals of Data Analytics and attain SKILL DEVELOPMENT through PROBLEM SOLVING Methodologies.</td></tr>
<tr><td>Course Out Comes</td><td colspan="4">On successful completion of the course the students shall be able to:
1) Explain different types of data and variables.
2) Interpret data using appropriate statistical methods.
3) Demonstrate the collection, processing and analysis of data for any given application and Illustrate various charts using visualization methods.
4) Apply the Data Analysis techniques by R Programming</td></tr>
<tr><td>Course Content:</td><td colspan="4"></td></tr>
<tr><td>Module 1</td><td>Introduction to Data Analysis</td><td>Assignment</td><td>Data Collection, data analysis, Programming</td><td>8 Sessions</td></tr>
<tr><td colspan="5">Topics: Introducing Data, overview of data analysis: Data in the Real World, Data vs. Information, The Many “Vs” of Data, Structured Data and Unstructured Data, Types of Data, Data Analysis Defined, Types of Variables, Central Tendency of Data, Scales of Data, Sources of Data. Data preparation.

R Studio: Base R-R Studio IDE-Introduction to R Projects and R Markdown. Basic R: R as a Calculator-Scripts and Comments-R Variables. Data I/O: Working Directories-Importing Data Exporting Data-More ways to save-Data I/O in Base R.</td></tr>
<tr><td>Module 2</td><td>Data Analysis and Visualization</td><td>Case studies</td><td>Programming</td><td>8 Sessions</td></tr>
<tr><td colspan="5">Topics: Data Summarization: One Quantitative and Categorical Variable. Data Classes: One Dimensional Data Classes-Data Frames and Matrices-Lists. Data Cleaning: Dealing with Missing Data-Strings and Recoding Variables. Manipulating Data in R: Reshaping Data-Merging Datasets. Data Visualizations: Plotting with ggplot2- Plotting with Base R</td></tr>
<tr><td>Module 3</td><td>Statistical Analysis</td><td>Case studies</td><td>R programming</td><td>7 Sessions</td></tr>
<tr><td colspan="5">Topics: Proportion tests-Chi squared test-Fisher exact test-Correlation-T test-Wilcoxon Rank sum tests-Wilcoxon signed rank test- one-way ANOVA test- Kruskal Wallis test</td></tr>
</table>

Module 4	Predictive Analysis	Case studies	Programming	**8 Sessions**

Topics: Linear least-squares – implementation – the goodness of fit – testing a linear model – weighted resampling. Regression using Stats models – multiple regression – nonlinear relationships – logistic regression – estimating parameters – accuracy. Time series analysis – moving averages – missing values – serial correlation – autocorrelation. Introduction to survival analysis

List of Laboratory Tasks:

Experiment No. 1: Introduction to R and RStudio

Level 1: Getting Started with R and RStudio

- Installing R and RStudio.
- Basic R syntax and commands.

Level 2: Working with RStudio

- Understanding the RStudio interface.
- Creating and managing R scripts.

Experiment No. 2: Basic Data Handling in R

Level 1: Data Types and Structures in R

- Vectors, matrices, and data frames.
- Lists and factors.

Level 2: Data Import and Export

- Reading data from CSV, Excel, and text files.
- Exporting data to different formats.

Level 3: Exploring Datasets

- Using functions like head(), summary(), and str().

Experiment No. 3: Basic Data structure in R

Level 1: a. Demonstrate a program to join columns and rows in a data frame using cbind() and rbind() in R.

b.Implement different data structures in R (Vectors, Lists, Data Frames)

Level 2: R AS CALCULATOR APPLICATION a. Using with and without R objects on console

a. Using mathematical functions on console
b. Write an R script, to create R objects for the calculator application

Experiment No. 4: Data Cleaning and Preprocessing

Level 1: Handling Missing Data in R

- Identifying missing values.

- Imputing missing values using mean, median, or other methods.

Level 2: Data Transformation in R

- Standardizing and normalizing data.
- Log-transformations and scaling.

Experiment No. 5: Exploratory Data Analysis (EDA) with R

Level 1: Descriptive Statistics

- Calculating mean, median, and standard deviation.
- Visualizing data using histograms, box plots, and scatter plots.

Experiment No. 6: Data Visualization with ggplot2

Level 1: Demonstrate various graphs that can be made and altered using the ggplot2 package.

Level 2: Create 500 random temperature readings for six cities over a season and then plot the generated data using ggplot2 packages in R

Experiment No. 7: Perform Tests of Hypotheses hypothesis test (parametric)

Level 1: How to perform tests of hypotheses about the mean when the variance is known. How to compute the p-value. Explore the connection between the critical region, the test statistic, and the p-value.

Level 2: A teacher claims that people who work for only five hours per week will score significantly lower than people who work for ten hours per week on a quantitative abilities test. He brings twenty people and randomly assigned them to one or two groups. In one group he has participants who work for ten hours and in another group, he has participants who work for five hours. He conducts the test for all participants. Scores on the test range from one to ten with higher scores representing better performance. Test if there is any significant difference between those who work for five hours per week versus those who work for ten hours per week based on the test performance.

Experiment No 8: Hypothesis – Non-Parametric Test

Level 1: A car manufacturing company like to find the sales of three types of cars produced by them in three regions and is given. Test if there is an association between the regions and types of cars purchased.

Experiment No 9: Correlation and Covariance

Level 1: Using the iris data set in R

a. Find the correlation matrix.
b. Plot the correlation plot on dataset and visualize giving an overview of relationships among data on iris data.
c. Analysis of covariance: variance (ANOVA), if data have categorical variables on iris data.

Level 2 : Ramesh is doing a statistics paper in his post-graduation course. He met his friend Amal who is a textile engineer. Ramesh, who is doing his internship at ABC Researchers, is interested in a

question. He poses this question to Amal and tries to find if he can answer. The question is as follows: The data regarding sales of soft- drinks and sales of cotton clothes in a place during the last 12 months are given. Find if there is any association between sales of soft drinks and sales of cotton clothes. Also explain the reason if there is any relationship.

Experiment No 11: Regression Model

Level 1: Import data from web storage (http://www.ats.ucla.edu/stat/data/binary.csv). Name the dataset and now do Logistic Regression to find out the relation between variables that are affecting the admission of a student in an institute based on his or her GRE score, GPA obtained, and rank of the student. Also check the model is fit or not. Require (foreign), require (MASS).

Level 2: Demonstrate multiple regressions, if data have a continuous Independent variable. Apply on the above dataset

Experiment No. 12: Time Series Analysis in R

Level 1: Demonstrate Time series analysis using Time Series Data Library at http://robjhyndman.com/TSDL/.

Targeted Application & Tools that can be used:

Application Area are Decision making in business, health care, financial sector, Medical diagnosis etc.

Text Books

2. Glenn J. Myatt and Wayne P. Johnson, "Making Sense of Data I: A Practical Guide to Exploratory Data Analysis and Data Mining Paperback", Import, 22 July 2014.
3. Introduction to statistics and Data analytics, Christian H, Michael S, Springer,2016
4. Introduction to R- Robert Parker, John Mushcelli and Andrew Jaffe, Johns Hopkins University, 2020 (E-resource)
5. Introduction to Time Series and Forecasting (Springer Texts in Statistics), Peter Brockwell, Richard A. Davis, Springer, 2016.

References

1. Making Sense of Data I: A Practical Guide to Exploratory Data Analysis and Data Mining Paperback, Glenn J. Myatt and Wayne P. Johnson, Import, 22 July 2014.
2. The R Software-Fundamentals of Programming and Statistical Analysis -Pierre Lafaye de Micheaux, Remy Drouilhet, Benoit Liquet, Springer 2013.

Online resources:

http://www.modernstatisticswithr.com/solutions.html#solutionsch3

https://johnmuschelli.com/intro_to_r/

https://users.phhp.ufl.edu/rlp176/Courses/PHC6089/R_notes/

Topics relevant to development of "FOUNDATION SKILLS":
1. Statistical Concepts for data, visualization techniques. 2. Data collection for project based assignments. 3. Inferential Statistics (T test, Z test) 4. Probability Calculation **for Skill Development through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.**

Course Code: CSE2014	**Course Title: Software Engineering**		**L-T- P- C**	**3-0-0-3**
Version No.	1.0			
Course Pre-requisites	**NIL**			
Anti-requisites	**NIL**			
Course Description	The objective of this course is to provide the fundamentals concepts of Software Engineering process and principles. The course covers software requirement engineering processes, system analysis, design, implementation and testing aspects of software system development. The course covers software quality, configuration management and maintenance.			
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Software Engineering and attain Skill Development through Participative Learning techniques.			
Course Out Comes	On successful completion of this course the students shall be able to: 1] Describe the Software Engineering principles, ethics and process models(Knowledge) 2] Identify the requirements, analysis and appropriate design models for a given application(Comprehension) 3] Understand the Agile Principles(Knowledge) 4] Apply an appropriate planning, scheduling, evaluation and maintenance principles involved in software(Application)			
Module 1	**Introduction to Software Engineering and Process Models (Knowledge level)**	Quiz		**09 Hours**
Introduction: Need for Software Engineering, Professional Software Development, Software Engineering Ethics, Software Engineering Practice-Essence of Practice, General Principles Software Development Life Cycle **Models:** Waterfall Model – Classical Waterfall Model, Iterative Waterfall Model, Evolutionary model-Spiral, Prototype.				

Module 2	**Software Requirements, Analysis and Design (Comprehension level)**	Assignment	Development of SRS documents for a given scenario	**11 Hours**
Requirements Engineering: Eliciting requirements, Functional and non- Functional requirements, Software Requirements Specification (SRS), Requirement Analysis and validation. Requirements modelling- Introduction to Use Cases, Activity diagram and Swim lane diagram. CASE support in Software Life Cycle, Characteristics of CASE Tools, Architecture of a CASE Environment. **Design:** Design concepts, Architectural design, Component based design, User interface design.				
Module 3	**Agile Principles & Devops (Knowledge level)**	Quiz		**09 Hours**
Agile: Scrum Roles and activities, Sprint Agile software development methods - Scaling, User Stories, Agile estimation techniques, Product backlogs, Stake holder roles, Dynamic System Development Method. **Devops:** Introduction, definition, history, tools.				
Module 4	**Software Testing and Maintenance (Application Level)**	Assignment	Apply the testing concepts using Programing	**12 Hours**
Software Testing-verification and validation, Test Strategies - White Box Testing, Black box Testing. Automation Tools for Testing. **Software Quality Assurance**-Elements of software quality assurance, SQA Tasks, Goals and Metrics, Software configuration management- SCM process, SCM Tools (GitHub). **Maintenance-** Characteristics of Software Maintenance, Software Reverse Engineering, Software Maintenance Process Models.				
Targeted Application & Tools that can be used: Selenium, GitHub, CASE Tools				
Text Book 1] Roger S. Pressman, "Software Engineering – A Practitioner's Approach", VII Edition, McGraw-Hill, 2017. 2] Bob Hughes, Mike Cotterell, Rajib Mall, "Software Project Management", VI Edition, McGraw-Hill, 2018.				
References Rajib Mall, "Fundamentals of Software Engineering", VI Edition, PHI learning private limited, 2015. Ian Sommerville, "Software Engineering", IX Edition, Pearson Education Asia, 2011. Agile Software Development Principles, Patterns and Practices.1st Edition, Wiley, 2002				
Topics Relevant to "Skill Development: Balck box Testing, White box Testing, Automated Testing for Skill development through Participative Learning Techniques. This is attained through assessment mentioned in the course handout				

Course Code: **ECE2001**	**Course Title: Innovation Project-Raspberry Pi Using Python** **Type of Course: School Core & Practical Only.**	**L- T-P- C**	0	4 This includes few lecture sessions	2
Version No.	1.0				

Course Pre-requisites	**NIL**			
Anti-requisites	**NIL**			
Course Description	The Raspberry Pi is an amazing single board computer (SBC) capable of running Linus and a whole host of applications. Python is a beginner-friendly programming language that is used in schools, web development, scientific research, and in many other industries. This course will enable students in writing own programs with Python to blink lights, respond to button pushes, read sensors, log data on the Raspberry Pi and many more. The course also offers in-depth knowledge of designing, developing, coding and implementing projects using Raspberry Pi.			
Course Outcomes	**On successful completion of this course the students shall be able to:** 1. Write a program in Python. 2. Explain the main features of the Raspberry Pi board 3. Demonstrate the hardware interfacing of the peripherals to Raspberry Pi system. 4. Demonstrate the functioning of live various projects carried out using Raspberry Pi system.			
Course Content:				
Module 1	Basics of Python, functions	Quiz	Problem Solving	**4 Lab Sessions**
Topics: Introduction, Structure of Python Program, Data Types and Variables, Input and Output, Operators, Importing libraries, Functions, Development Tool. **Concepts will be taught by solving problems through programs.**				
Module 2	**Python Programming**	Quiz	Problem Solving	**4 Lab Sessions**
Control statements, Lists and Dictionaries, Problem solving using Python. **Concepts will be taught by solving problems through programs.**				
Module 3	**Overview of Raspberry Pi**	Project Development	System Design Task and Analysis	**4 Lab Sessions**
Topics: An exploration of GPIO pins, LED and switch control. Installation of libraries, PuTTY SSH. Raspberry Pi to interface with more complicated sensors and actuators like Pi Camera, servo motor ADS51115 through PIP libraries. Arduino with Raspberry-pi				
Module 4	**Interaction with API Services**	Project Development	Modeling and Simulation task	**3 Lab Sessions**
Topics: Raspberry Pi interact with online API services through the use of public APIs and SDKs using Firebase, Gspread API. Node-RED – a programming tool for wiring together hardware devices, MQTT. Android/Case study.				
Targeted Application & Tools that can be used: Making it a reality (Raspberry Pi Projects) : Projects will include but not limited to : 1) Intelligent home locking system.				

2) Intelligent water level management system. 3) Home automation using RFID. 4) Real time clock-based home automation. 5) Intelligent Automatic Irrigation System **Professionally Used Software: Raspberry Pi.**
Project work/Python Lab Test:
Project work **Python test.**
Text Book(s): **1) Ashok Namdev Kamthane, Amit Ashok Kamthane, *"Problem Solving and Python Programming"*, Mc Graw Hill Education, 2018.**
Reference(s): 1. **https://github.com/thibmaek/awesome-raspberry-pi** 2. MagPi magazine
Topics relevant to development of "Foundation Skills": Basic Concepts of Python-Programming, and Raspberry Pi. Topics related to development of "Employability Skills": Problem solving, Creative Thinking, Team work, Prototype Development. Topics related to development of "Entrepreneurship": Effective Communication, Strategic Thinking, Creative Thinking.

Evaluation:	Review-1-20%, Review-2-25%, Python test-25%, Project Expo-30%

Course Code: CSE1005	**Course Title:** Programming in Python **Type of Course:** School Core Lab Integrated	**L- T-P- C**	1	0	4	3
Version No.	1.0					
Course Pre-requisites	Basic knowledge of Computers and Mathematics					
Anti-requisites	**NIL**					
Course Description	The purpose of this course is to enable the students to develop python scripts using its basic programming features and also to familiarize the Python IDLE and other software's. This course develops analytical skills to enhance the programming abilities. The associated laboratory provides an opportunity to validate the concepts taught and enhances the ability to build real time applications.					
Course Object	The objective of the course is to familiarize the learners with the concepts of Programming in Python and attain Employability through Problem Solving Methodologies.					

<table>
<tr><td>Course Outcomes</td><td colspan="4">On successful completion of this course the students shall be able to:
1. Summarize the basic Concepts of python.
2. Demonstrate proficiency in using data structures.
3. Illustrate user-defined functions and exception handling.
4. Identify the various python libraries.</td></tr>
<tr><td>Course Content:</td><td colspan="4"></td></tr>
<tr><td>Module 1</td><td>Basics of Python programming</td><td>Assignment</td><td>Programming</td><td>14 Classes</td></tr>
<tr><td colspan="5">Topics: Data types, operators and Expressions, Input and Output Statements. Control Structures – Selective and Repetitive structures</td></tr>
<tr><td>Module 2</td><td>Indexed and Associative Data Structures</td><td>Simple applications</td><td>Programming</td><td>20 Classes</td></tr>
<tr><td colspan="5">Topics: Strings, Lists, Sets, Tuples, Dictionaries</td></tr>
<tr><td>Module 3</td><td>Functions, Exception handling and libraries</td><td>Case study</td><td>Programming</td><td>10 Classes</td></tr>
<tr><td colspan="5">Topics: User defined functions, exception handling, Introduction to python built-in libraries</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td colspan="5">Targeted Application & Tools that can be used:
Targeted Application : Web application development, AI, Operating systems
Tools: Python IDLE, ANACONDA

• Application Areas:
• Web Development
• Game Development
• Scientific and Numeric Applications
• Artificial Intelligence and Machine Learning
• Software Development
• Enterprise-level/Business Applications
• Education programs and training courses
• Language Development
• Operating Systems
• Web Scrapping Applications
• Image Processing and Graphic Design Applications

Professionally Used Software: Python IDLE, Spyder, Jupyter Notebook, Google Colab</td></tr>
<tr><td colspan="5">Project work/Assignment:</td></tr>
<tr><td colspan="5">Project Assignment: Developing python scripts using built in methods and functions</td></tr>
<tr><td colspan="5">Text Books:</td></tr>
</table>

- Martin C. Brown, “Python: The Complete Reference”, McGraw Hill Education, Forth edition (20 March 2018).
- Alex Campbell, “Python for Beginners: Comprehensive Guide to the Basics of Programming, Machine Learning, Data Science and Analysis with Python”, August 29, 2021.
- Charles Dierbach, “Introduction to Computer Science Using Python”, Wiley India Edition,2015.

References:

1. E. Balagurusamy, “Introduction to Computing and Problem Solving Using Python”, Tata McGraw-Hill, 2016
2. Y. Daniel Liang, “Introduction to Programming Using Python”, Pearson, 2017
3. Brady Ellison, “Python for Beginners: A crash course to learn Python Programming in 1 Week (Programming Languages for Beginners)”, August 25, 2021.
4. Python Tutor - Visualize Python, Java, C, C++, JavaScript, TypeScript, and Ruby code execution
5. https://practice.geeksforgeeks.org/courses/Python-Foundation

Topics relevant to development of “FOUNDATIONS SKILLS”- Solve the real time problems by analyzing and visualizing the data.

Topics relevant to “HUMAN VALUES & PROFESSIONAL ETHICS”- Data collection and its arrangement

Course Code: PPS4002	**Course Title: Introduction to Aptitude Type of Course: Practical Only Course**	**L- P- C**	0	2	1
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.				

<table>
<tr><td>Course Outcomes</td><td colspan="4">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</td></tr>
<tr><td>Course Content:</td><td colspan="4"></td></tr>
<tr><td>Module 1</td><td>Quantitative Ability</td><td>Assignment</td><td>Bloom’s Level : Application</td><td>02 Hours</td></tr>
<tr><td colspan="5">Topics:
Introduction to Aptitude, working of Tables, Squares, Cubes</td></tr>
<tr><td>Module 2</td><td>Logical Reasoning</td><td>Assignment</td><td>Bloom’s Level : Application</td><td>18 Hours</td></tr>
<tr><td colspan="5">Topics:
Linear & Circular Arrangement Puzzle, Coding & Decoding, Blood Relations, Directions, Ordering and Ranking, Clocks and Calendars, Number Series, Wrong number series, Visual Reasoning</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td colspan="5"></td></tr>
<tr><td colspan="5">Targeted Application & Tools that can be used:
Application area: Placement activities and Competitive examinations. Tools: LMS</td></tr>
<tr><td colspan="5">Text Book
Quantitative Aptitude by R S Aggarwal
Verbal & Non-Verbal Reasoning by R S Aggarwal</td></tr>
<tr><td colspan="5">References
www.indiabix.com
www.youtube.com/c/TheAptitudeGuy/videos</td></tr>
<tr><td colspan="5">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.</td></tr>
</table>

Course Code: **MAT2003**	**Course Title:** **NUMERICAL METHODS FOR ENGINEERS** **Type of Course:** **School Core**	**L-T- P-C**	1	0	2	2
Version No.	1.0					
Course Pre-requisites	MAT1002					
Anti-requisites	**Nil**					
Course Description	The course focuses on formulating and solving problems concerning real-world engineering applications numerically as well as statistically. This course provides an introduction to basic numerical methods to deal with algebraic and transcendental equations, system of equations, interpolation, differentiation and integration. This course also deals with numerical solution of ordinary differential equations by means of Taylor's series method, modified Euler's method and Runge-Kutta methods.					
Course Objective	The objective of the course is to **familiarize the learners with the concepts of " NUMERICAL METHODS FOR ENGINEERS" and attain Skill Development Through Problem Solving.**					
Course Outcomes	On successful completion of the course the students shall be able to: 1] Solve algebraic and transcendental equations numerically. 2] Adopt numerical techniques to differentiate and integrate functions. 3] Apply numerical methods to solve ordinary differential equations.					
Course Content:						
Module 1	**Numerical solution of Algebraic and Transcendental Equations**					**15 Classes**
Algebraic and Transcendental Equations, Regula - Falsi method, Bisection method (Self study), Secant method, Newton-Raphson method, and NR method for non-linear Equations, Fixed-point iteration method. System of Linear Equations: Introduction, LU decomposition method, Gauss-Jacobi method, Gauss-Seidel iteration method, Largest Eigen value and corresponding Eigen vector by Power method & Jacobi Method.						
Module 2	**Numerical Interpolation, differentiation and Integration**					**15 Classes**
Numerical Interpolation: Newton's forward and backward interpolation method, Newton's divided difference method, Lagrange's method, numerical differentiation. Numerical integration: Trapezoidal rule, Simpson's one-third rule, Simpson's three-eighth rule, Weddle's Rule. Area between the two curves.						

Module 3	Numerical solution of ODEs and PDEs			15 Classes

Solution of ordinary differential equations: Initial Value problems: Taylor's series method, Picard's method, Euler's Method, Modified Euler's method, Runge-Kutta method, Milne's predictor-corrector formula. Adams -Bashforth method**,** Boundary value problems - Finite difference methods for ODE. Numerical solution for LCR & damped forced oscillatory equations.

Solution of partial differential equations: Schmidt Explicit Formula for Heat Equation, Crank-Nicolson method. Numerical solution to Wave, Laplace & Heat Equation.

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:

1. Gauss-Jacobi iteration method.
2. Numerical differentiation.
3. Gaussian quadrature rule for numerical integration.
4. Taylor series method for ODEs.
5. Implicit and explicit schemes for PDEs.

Text Books

T1: 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.

T2: Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, John Wiley& Sons (India), 2014.

References:

R1: B.S. Grewal, Numerical methods in engineering and science, 10th Edition, Khanna publishers, 2016.

R2: B.S. Grewal, "Higher Engineering Mathematics", 44th edition, Khanna Publishers.

R3: Steven C Chapra and Raymond P Canale, "Numerical Methods for Engineers," 7th Ed., McGraw-Hill Edition, 2015.

R4: C. Ray Wylie and Louis C Barrett, "Advanced Engineering Mathematics", 6th Edition, McGraw-Hill, 2012.

Topics relevant to SKILL DEVELOPMENT: This course focuses on formulating and solving problems concerning real-world engineering applications numerically as well as statistically. This course provides an introduction to basic numerical methods to deal with algebraic and transcendental equations, system of equations, interpolation, differentiation and integration with numerical solution of ordinary differential equations by means of Taylor's series method, modified Euler's method and Runge-Kutta methods for **Skill Development through Problem Solving methodologies**. This is attained through assessment component mentioned in course handout.

Course Code: CSE2007	**Course Title:** Design and Analysis of Algorithms **Type of Course:** Program Core & Theory only	**L- T- P- C**	3	0	0	3

Version No.		2.1
Course Pre-requisites		CSE 2001
Anti-requisites		**NIL**
Course Description		This intermediate course enables students to design and analyze efficient algorithms to solve problems. This course covers typical design methods such as divide-and-conquer, dynamic programming and greedy method to solve problems. The students shall develop strong analytical skills as part of this course.
Course Objectives		This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies.
Course Outcomes		**On successful completion of the course the students shall be able to:** **1] Identify the efficiency of a given algorithm. [Comprehension]** **2] Employ divide and conquer approach to solve a problem. [Application]** **3] Illustrate dynamic programming approach to solve a given problem. [Application]** **4] Solve a problem using the greedy method. [Application]** **5] Discuss the techniques to solve a real-world problem based on its complexity classes. [Comprehension]**
Course Content:		

Module 1	Introduction to Algorithms	Assignment		Problem Solving	**06 Sessions**
	Topics: Algorithm Design and efficiency, measuring of running time of algorithms. Insertion sort and merge sort, Asymptotic Growth and Notations. Recurrences--Masters method. **Assignment:** Comparatively evaluate bubble sort, insertion sort and mergesort.				

Module 2	Review of Searching and Sorting techniques	Assignment		Programming/ Problem Solving	**12 Sessions**
	Topics: **Divide and Conquer:** Examples. Strassen's Matrix multiplication. **Sorting:** Quicksort, Heapsort, Lower bound of comparison-based sorting, non-comparison-based sorting: Radix sort. **Search:** Review of Linear Search and Binary Search, Hashing and hash tables. **Assignment:** Design and develop an algorithm using Divide and Conquer technique for a given scenario.				
Module 3	Greedy Algorithms	Assignment		Programming/ Problem Solving	**09 Sessions**
	Topics: Introduction, Fractional Knapsack Problem, Minimal Spanning Tree: Prim's Algorithm and Kruskal's Algorithm, Single-source Shortest Path: Dijkstra's Algorithm. Huffman Codes. **Assignment:** Design and Develop a solution to a given scenario using greedy method.				
Module 4	Dynamic Programming	Assignment		Programming/ Problem Solving	**09 Sessions**
	Topics: Introduction with examples, Principles of Memoization, 0-1 Knapsack Problem, Bellman-Ford algorithm, Floyd-Warshall's Algorithms. Optimal Binary Search Trees, Chain Matrix Multiplication. **Assignment:** For a given scenario, attempt the three design paradigms learned so far and argue the best approach to solve the problem				
Module 5	Complexity Classes and Heuristics	Assignment		Programming/ Problem Solving	**09 Hours**
	Topics: plexity classes: P, NP, and NP-Complete Problems. Backtracking: n-Queens. Branch and bound: Travelling Salesman Problem. **Assignment:** Apply backtracking algorithmic designing technique for solving queen's problems for 4, 8 and 16 inputs.				
	Targeted Application & Tools that can be used: **Application Area is to Design and Analyzing the efficiency of Algorithms. This fundamental course is used by all application developers.** **Professionally Used Software: GCC compiler.**				

	Project work/Assignment:
1.	**2. Problem Solving: Design of Algorithms and implementation of programs.** **3. Programming: Implementation of given scenario using Java.**
	Text Book: T1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, *'Introduction to Algorithms'*, MIT Press, 2022. T2. J. Kleinberg and E. Tardos, *'Algorithm Design'*, Addison-Wesley, 2005.
	References R1. Anany Levitin, *'Introduction to the Design and Analysis of Algorithms'*, Pearson Education, 2003. R2. Tim Roughgarden, *'Algorithms Illuminated'* (books 1 through 3), Soundlikeyourself Publishing, 2017,18,19 respectively. R3. AV Aho, J Hopcroft, JD Ullman, *'The Design and Analysis of Algorithms'*, Addison-Wesley, 1974.

Course Code: CSE3156	**Course Title: Database Management Systems**	**L-T-P-C**	3	0	2	4
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course introduces the core principles and techniques required in the design and implementation of database systems. It covers concepts of relational database systems (RDBMS). More emphasis is set on how to design, develop, organize, maintain and retrieve information efficiently. It helps the students to learn and practice data modeling anddatabase designs. The course also introduces the concept of object oriented and object relational databases. The associated laboratory is designed to implement database design using MySQL DATABASEin information technology applications. All the exercises will focus on the fundamentals for creating, populating, sophisticated, interactive way of querying, and simultaneous execution of the transactions of database.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of DatabaseManagement Systems and attain **Employability** through **Problem Solving** Methodologies.					

<table>
<tr><td>Course Out Comes</td><td colspan="4">On successful completion of the course the students shall be able to:
1] Demonstrate a database system using ER model and relational algebra. [Understanding]2] Build databases using SQL queries query processing. [Applying]
3] Apply the functional dependencies and design the database using normalization.[Applying]
4] Interpret the concept of object-oriented databases and object-relational databases.[Understanding]</td></tr>
<tr><td>Course Content:</td><td colspan="4"></td></tr>
<tr><td>Module 1</td><td>Introduction to Database Modelling and Relational Algebra(Understanding)</td><td>Assignment</td><td>Problem Solving</td><td>8 Classes</td></tr>
<tr><td colspan="5">Topics:
Introduction to Database: Schema, Instance, 3-shema architecture, physical and logical data independence, Data isolation problem in traditional file system, advantages of database over traditional file systems. Entity Relationship (ER) Model, ER Model to Relational Model, Examples on ER model.
Relational Algebra with selection, projection, rename, set operations, Cartesian product, joins (inner and outer joins), and division operator. Examples on Relational Algebra Operations.</td></tr>
<tr><td>Module 2</td><td>Fundamentals of SQL and Query Optimization (Applying)</td><td>Assignment</td><td>Programming</td><td>8 Classes</td></tr>
<tr><td colspan="5">Topics:
SQL Database Querying, DDL, DML, Constraints, Operators, Set Operators, Aggregate Functions, Joins, Views, Procedures, Functions and Triggers.
Database programming issues and techniques: Embedded SQL, Dynamic SQL; SQL / PSM and NoSQL.
Query Optimization: Purpose, transformation of relational expressions, estimating cost and statistics ofexpression, choosing evaluation plans, linear and bushy plans, dynamic programming algorithms.</td></tr>
<tr><td>Module 3</td><td>Relational Database Design & Transaction Management (Applying)</td><td>Assignment</td><td>Problem Solving</td><td>12 Classes</td></tr>
<tr><td colspan="5">Topics:
Relational database design: Problems in schema design, redundancy and anomalies, Normal Forms based on Primary Keys-(1NF,2NF, 3NF), Boyce-Codd Normal Form, Multi valued Dependency (Fourth Normal Form), JoinDependencies (Fifth Normal Form), lossy and lossless decompositions, Database De-normalization.
Transaction Management: The ACID Properties; Transactions and Schedules; Concurrent Execution of Transactions; Lock- Based Concurrency Control; Performance of locking; Transaction support in SQL; Introduction to crash recovery; 2PL, Serializability and Recoverability; Lock Management; The write-ahead log protocol; Check pointing; Recovering from a System Crash; Media Recovery; Other approaches and interactionwith concurrency control.</td></tr>
<tr><td>Module 4</td><td>Advanced DBMS Topics (Understanding)</td><td>Assignment</td><td>Case Study</td><td>8 Classes</td></tr>
</table>

Topics:

Advanced topics: Object oriented database management systems, Deductive database management systems, Spatial database management systems, Temporal database management systems,Constraint database management systems.

New database applications and architectures such as Data warehousing, Multimedia, Mobility, NoSQL, NativeXML databases (NXD), Document-oriented databases, Statistical databases.

List of Laboratory Tasks:

Create Employee, Student, Banking and Library databases and populate them with required data. Do thefollowing experiments of different lab sheets on those databases.

Labsheet-1 [3 Practical Sessions]Experiment No 1: [1 Session]

1. **To study and implement the different language of Structured Query Language.**

Level 1: Perform operations using Data Definition Language and Data Manipulation Language commands including different variants of SELECT on Student DB.

Level 2: Identify the given requirements; valid attributes and data types and Perform DDL and DML operationson a given scenario. [Banking Databases]

Experiment No. 2: [2 Sessions]

2. **To study and implement the concept of integrity constraints in SQL.**

Level 1: Create tables on Banking database using PRIMARY KEY, NOT NULL, UNIQUE, FOREIGN KEY and demonstrate the working of relational, logical, pattern matching, BETWEEN, IS NULL, IN and NOT IN Special Operators on Student Database.

Level 2: Enforce different types of data and referential integrity constraints. Then try queries with special operators based on the student database. [Banking Database].

Labsheet-2 [3 Practical Sessions]Experiment No. 3: [1 Session]

3. **Implement complex queries in SQL.**

Level 1: Implement the conjugate of GROUP BY, ORDER BY and aggregate functions on Banking Database**. Level 2:** Implement MySQL DB queries on library database using appropriate clauses and aggregate functions**.**Also order the data either in ascending and descending order using corresponding clause. [Library databases].

Experiment No. 4: [2 Session]

4. **To study and implement different types of Set and Join Operations [2 Slots]**

Level 1: Demonstrate different types of Set Operations (UNION, UNION ALL, INTERSECT, MINUS) and Join Operations (INNER JOINs, OUTER JOINS, CROSS JOIN, NATURAL JOIN) on two or more tables of Airline Database. **Level 2:** Use Set and Join operations to retrieve the data from two or more relations(tables) as per the given scenario. [Airline Database]

Labsheet-3 [2 Practical Sessions]Experiment No. 5: [2 sessions]

5. **To study and implement Views, and Procedures in MySQL DB.**

Level 1: Implement MySQL Views, and Procedures in ORACLE DB on Employee database.
Level 2: Analyze the requirement and construct views, and Procedures on Mini Project Domain. [BankingDatabase]

Labsheet-4 [2 Practical Sessions]Experiment No. 6: [2 Sessions]

6. **To study and implement Functions, and Triggers in MySQL DB.**

Level 1: Implement Oracle Functions and Triggers in Oracle on Employee database.
Level 2: Analyze the requirement and construct Functions and Triggers. [Supply chain Database]

Labsheet-5 [2 Practical Sessions]Experiment No. 7: [2 Sessions]

To implement the concept of forms and reports. Level 1: Implement the concept of forms and reports.**Level 2:** Analyze the schema relationship.

Labsheet-6 [2 Practical Sessions]Experiment No. 8: [2 Sessions]

Design a mini project based on the databases such as Inventory Management System, UniversityManagement System, Hospital Management System, etc.
Level 1: Implement the real time database.
Level 2: Analyze the working of database in real time.

Targeted Application & Tools that can be used:
Application Area: Relational database systems for Business, Scientific and Engineering Applications.Tools/Simulator used: MySQL DB for student practice.
Also demonstration of ORACLE DB on object-relational database creation and JDBC connection.

Percentage of changes in this version: 50% of changes from earlier version. New topics are highlighted initalic.

1. Problem Solving: Constructing ER-Diagrams for a given real time requirements, Normalizing the databases, querying the databases using relational algebra.
2. Programming: Implementation of any given scenario using MySQL.

Text Book

1] RamaKrishna & Gehrke, “Database Management Systems” 3rd Edition, 2018, McGraw-Hill Education.
2] Avi Silberschatz, Henry F. Korth, S. Sudarshan, “Database System Concepts”, McGraw-Hill ,7th Edition, 2019.3] W. Lemahieu, S. vanden Broucke and B. Baesens, “Principles of Database Management: Practical Guide to Storing, Managing and Analyzing Big and Small Data”, Cambridge University Press, 2018.

References

1] Elmasri R and Navathe S B, “Fundamentals of Database System”, Pearson Publication, 7th Edition, 2018.
2] M. Kleppmann, “Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems”, O’Reilly, 2017.

Topics relevant to development of “FOUNDATION SKILLS”: S - Skill Development: Relational database designusing ER- Relational mapping, Implementation of given database scenario using MYSQLDB. Topics relevant to development of Employability: Develop, test and implement computer databases, creatingsophisticated, interactive and secure database applications Topics relevant to “HUMAN VALUES &PROFESSIONAL ETHICS”: Nil

Course Code: CSE3351	**Course Title: Operating Systems** **Type of Course: Program Core and Theory Only**	**L-T- P- C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CSE 2009					
Anti-requisites	**NIL**					
Course Description	This course introduces the concepts of operating system operations, operating system structure and its design and implementation. It covers the classical operating systems internal algorithms such as process scheduling, synchronization, deadlocks detection and recovery and memory management. The course also enhances the problem solving, systems programming ability and case studies.					
Course Object	The objective of the course is to familiarize the learners with the concepts of Operating Systems and attain Employability through Problem Solving Methodologies.					
Course Out Comes	On successful completion of the course the students shall be able to: 1] Describe the fundamental concepts of operating Systems and case studies. [**Knowledge**] 2] Demonstrate various CPU scheduling algorithms. .[**Application**] 3] Apply various tools to handle synchronization problems.[**Application**] 4] Demonstrate deadlock detection and recovery methods **[Application]** 5] Illustrate various memory management techniques.[**Application**]					
Course Content:						
Module 1	Introduction to Operating System	Assignment	Programming			**9 Hours**
Topics: Introduction to OS , Operating-System Operations, Operating System Services, , System Calls and its types, Operating System Structure, System Program and its types, Linkers and Loaders, Overview of OS design and implementation, Open-source operating system						
Module 2	Process Management	Assignment/Case Study	Programming/Simulation			**11 Hours**
Topics:						

Process Concept, Operations on Processes, Inter Process Communication, Communication in client-server systems (sockets, RPC, Pipes), Introduction to threads - Multithreading Models, Thread Libraries, Threading Issues, Process Scheduling– Basic concepts, Scheduling Criteria, Scheduling Algorithms: FCFS, SJF, SRTF, RR and Priority.

Module 3	Process Synchronization and Deadlocks	Assignment	Programming	**11 Hours**

Topics:
The Critical-Section Problem- Peterson's Solution, Synchronization hardware, Semaphores, Classic Problems of Synchronization with Semaphore Solution- Producer-Consumer Problem, Reader-Writer problems, Dining Philosopher's Problem, . Introduction to Deadlocks, Necessary conditions for deadlock, Resource allocation Graph, Methods for handling deadlock: Deadlock Prevention and Implementation, Deadlock Avoidance and Implementation, Deadlock detection & Recovery from Deadlock.

Module 4	Memory Management	Assignment	Programming/Simulation	**10 Hours**

Topics:
Introduction to Memory Management, Basic hardware-Base and Limit Registers, Memory Management Unit(MMU), Dynamic loading and linking, Swapping, Contiguous and Non-Contiguous Memory Allocation, Segmentation, Paging - Structure of the Page Table – Virtual Memory and Demand Paging – Page Faults and Page Replacement Algorithms, Copy-on-write, Allocation of Frames, Thrashing
Introduction to File system management: File System Interface (access methods, directory structures), File system implementation.

Targeted Application:

Application area is traffic management system, banking system, health care and many more systems where in there are resources and entities that use and manage the resources.

Software Tools:

1. Oracle Virtual Box/VMWare Virtualization software [Virtual Machine Managers]. Used to install and work on multiple guest Operating Systems on top of a host OS.

2. Intel Processor identification utility: This software is used to explain about multi-core processors. It helps to identify the specifications of your Intel processor, like no of cores, Chipset information, technologies supported by the processor etc.

Project work/Assignment

1. **Demonstrate process concepts in LINUX OS.**
2. **Simulation of CPU scheduling algorithms.**
3. **Develop program to demonstrate use of Semaphores in threads.**
4. **Develop program to demonstrate use of deadlock avoidance algorithms.**
5. **Develop program to demonstrate use of page replacement algorithms.**
6. **Simulation of memory allocation strategies [first fit, best fit and worst fit].**

Text Book

1. Silberschatz A, Galvin P B and Gagne G , "Silberschatz's Operating System Concepts", Paperback, Global Edition Wiley, 2019

References

1. Silberschatz A, Galvin P B and Gagne G, "Operating System Concepts", 10th edition Wiley, 2018.

2. William Stallings, “Operating Systems”,Ninth Edition, By Pearson Paperback ,1 March 2018.
3. Sundaram RMD, Shriram K V, Abhishek S N, B Chella Prabha, “ Cracking the Operating System skills”, Dreamtech, paperback, 2020
4. Remzi H. Arpaci-Dusseau Andrea C. Arpaci-dusseau , “Operating Systems: Three Easy Pieces, Amazon digital Services”, September 2018.

E-resources/Weblinks

5. https://www.os-book.com/OS9/
6. https://pages.cs.wisc.edu/~remzi/OSTEP/
7. https://codex.cs.yale.edu/avi/os-book/OS10/index.html

Course Code: **CSE 3078**	**Course Title: Cryptography and Network Security** **Type of Course: Program Core & Theory only**	**L- T-P- C**	3	0	0	3
Version No.	1					
Course Pre-requisites	CSE 3155					
Anti-requisites	**NIL**					
Course Description	The Course covers the principles and practice of cryptography and network security, focusing in particular on the security aspects of the web and Internet. **Topics**: The cryptographic tools such as shared key encryption, public key encryption, key exchange, and digital signature are explored. The use and utilization of the internet protocols and applications such as SSL/ TLS, IPSEC, Kerberos, PGP, and S/ MIME, SET are reviewed. System security issues such as viruses, intrusion and firewalls are also explored.					
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: **CO1:** Identifies the basic concept of Cryptography **(Knowledge)** **CO2:** Express the different types of Cryptographic Algorithms. **(Comprehension)** **CO3:** Recognize the Public key Cryptographic Techniques for various applications. **(Comprehension)** **CO4:** Apply the network security concepts during their implementation of network security application developments. **(Application)**					
Course Content:						

Module 1	**Introduction to Cryptography**	Assignment	Identify the Concepts	08 Sessions
Topics: Introduction to Cryptography, Model of Network Security, OSI Security architecture, Security Attacks: active attacks, passive attacks, services: Authentication, Access Control, Data Confidentiality, Data Integrity, Nonrepudiation, Substitution Ciphers : Caesar, Mono alphabetic, Polyalphabetic, Play-fair and Hill Cipher, Introduction to Block Cipher and Stream Cipher, Festal Structure.				
Module 2	**Private Key Cryptography and Number Theory**	Assignment	Analysis of requirement of complexity in cryptography	13 Sessions
Topics: Symmetric Encryption Algorithms : Data Encryption Standard, Introduction to Galois Field, Advanced Encryption Standard, Modular Arithmetic, Prime numbers, Fermat's little theorem, brief about primality testing and factorization, Discrete Logarithmic Problem, Euclidean and Extended Euclidean Algorithm, Euler Totient Function, Chinese Remainder Theorem				
Module 3	**Public Key Cryptography and its Applications**	Assignment	Recognize the importance of various security concepts to achieve sufficient solutions	10 Sessions
	Topics: Overview of Public Key Cryptography, RSA, Diffie - Helman Key exchange, Man in the middle attack, Cryptographic Hash functions, Secure Hash Algorithm, Message Authentication Codes – HMAC, Digital Signature, Discussion on real time practices of Cryptography.			
Module 4	**Network Security**	Assignment	Implement the advanced network security algorithms in recent applications.	07 Sessions
Topics: Network Security fundamentals, Network Security applications: Authentication: Kerberos, PKI, Network Security applications: e-mail security: PGP, MIME, Network Security applications: IP Security: IP Sec architecture, Network Security applications: Web Security.				
Targeted Application & Tools that can be used: Students get the knowledge about cryptography techniques followed, the algorithms used for encryption and decryptions & the techniques for authentication and confidentiality of messages.				
Assignment:				
Assignment 1: Solve the problems of basic encryption techniques. **Assignment 2:** Solve and analyze the problems on symmetric and asymmetric encryption.				
Textbooks: 1.William Stallings, "Cryptography and Network Security - Principles and Practices", Prentice Hall, 8th Edition, 2019. 2. Wade Trappe and Lawrence C Washington, "Introduction to Cryptography with Coding Theory", Pearson, 2020. **Reference Books:**				

1.Behrouz A Forouzan, Debdeep Mukhopadhyay, “Cryptography and Network Security”, McGraw Hill, third edition, 2010.

2. R.Rajaram, “Network Security and Cryptography” SciTech Publication.3rd Edition, 2014.

3. AtulKahate, "Cryptography and Network Security", Tata McGraw-Hill, 2nd Edition, 2019.

4. BruceSchneier, “Applied Cryptography", John Wiley and Sons Inc. Second Edition, 2015.

Web references:

1.https://onlinecourses.nptel.ac.in/noc22_cs90/preview

2.e-pgpathshala UGC lecture series : E-Series and Self learning Materials.

https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=fBYckQKJvP3a/8Vd3L08tQ==

3. http://182.72.188.195/cgi-bin/koha/opac-detail.pl?biblionumber=10133&query_desc=kw%2Cwrdl%3A%20Cryptography%20and%20Network%20Security

4.http://182.72.188.195/cgi-bin/koha/opac-detail.pl?biblionumber=5875&query_desc=kw%2Cwrdl%3A%20Cryptography%20and%20Network%20Security.

Topics relevant to “Skill Development”: Symmetric and Asymmetric Encryption Algorithms and its problems.

Course Code: PPS4004	**Course Title: Aptitude Training- Intermediate** **Type of Course: Practical Only Course**	**L-T P- C**	0	0	2	1
Version No.	1.0					
Course Pre-requisites	Students should have the basic concepts of Quantitative aptitude along with its applications in real life problems.					
Anti-requisites	Nil					
Course Description	This is a skill-based training program for the students (Undergraduate). This course is designed to enable the students to enhance their skills in Quantitative Aptitude.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Aptitude and attain Skill Development through Problem Solving techniques.					

Course Outcomes	On successful completion of the course the students shall be able to: CO1] **Understand** all the concepts. CO2] **Apply** the concepts in problem solving (Bloom's taxonomy Level 3)			
Course Content:				
Module 1	Quantitative Ability	Assignment		**24 Hours**
Topics: Number System, Percentage, Ratio and Proportion, Average, Mixture and Allegation, Time and Work, Profit and Loss, Time Speed and Distance, Boats and Streams, Simple Interest and Compound Interest, Probability, Permutation and Combination.				
Targeted Areas Application area: Placement activities and Competitive examinations. Tools: LMS				
Text Book Fast Track Objective by Rajesh Verma R S Aggarwal Rakesh Yadav				
References www.indiabix.com www.testbook.com www.youtube.com/c/TheAptitudeGuy/videos				
Topics relevant to Skill development: Quantitative aptitude for Skill Development through Problem solving Techniques. This is attained through assessment component mentioned in course handout.				
Evaluation – Continuous Evaluation (Topic wise evaluation Mid-Term & End term)				

Course Code: **CSE3216**	**Course Title:** Mastering Object- Oriented Concepts in Python	**L- T-P-C**	0-0-2-1

	Type of Course: Lab			
Version No.	1			
Course Pre-requisites	CSE1005			
Anti-requisites	NIL			
Course Description	This course covers mastering object-oriented concepts in Python, including classes, inheritance, polymorphism, and encapsulation. Students will learn to design and implement robust, reusable code using real-world examples. Ideal for those with basic Python knowledge, it enhances problem-solving skills and software development proficiency.			
Course Objective	**The objective of the course is to familiarize the learners with the concepts of Mastering Object Oriented Concepts in Python and attain Skill Development through Experiential Learning.**			
Course Out Comes	**CO1:** Explain features of Oops along with creation of Python classes and objects to represent real world Objects. **[Understand]** **CO2:** Demonstrate inheritance, polymorphism, and abstraction in Python to build maintainable and extendable software systems.**[Apply]** **CO3:** Demonstrate exception handling in Python to build robust error-handling mechanisms and debugging tool and Assess various file handling techniques in Python. **[Apply]**			
Course Content:				
Module 1	**Introduction to OOPS, Classes and Objects**	MCQ	Assignment	**10 Sessions**
Topics: **Introduction to OOPs:** Problems in Procedure Oriented Approach, Specialty of Python Language, Features of OOPS - Classes and Objects, Encapsulation, Abstraction, Inheritance and Polymorphism. **Classes and Objects:** Creating a Class, The Self Variable, Constructor, Destructors, Types of Variables, Namespaces, Types of Methods - Instance Methods, Class Methods, Static Methods, Passing Members of One Class to Another Class, Inner Classes.				
Module 2	**Inheritance and Polymorphism**	MCQ	Assignment	**10 Sessions**

Constructors in Inheritance, Overriding Super Class Constructors and Methods, The Super() Method, Types of Inheritance – Single Inheritance, Multiple Inheritance, Method Resolution Order(MRO), Polymorphism, Duck Typing Philosophy of Python, Operator Overloading, Method Overloading, Method Overriding.

Abstract Classes and Interfaces: Abstract Method and Abstract Class, Interfaces in Python, Abstract Classes vs. Interfaces.

Module 3	**Exceptions and Files in Python**	MCQ	Assignment	**10 Sessions**

Exceptions: Errors in a Python Program – Compile-Time Errors, Runtime Errors, Logical Errors. Exceptions, Exception Handling, Types of Exceptions, The Except Block, The assert Statement, User-Defined Exceptions, Logging the Exceptions.

Files in Python: Files, Types of Files in Python, Opening a File, Closing a File, Working with Text Files Containing Strings, Knowing whether a File Exists or Not, Working with Binary Files, The with Statement, Pickle in Python, The seek() and tell() Methods.

Targeted Application & Tools that can be used:

Python, PyCharm

Project work/Assignment:

Assignment:

Module 1 Assignment: Design and implement a Python application that simulates a banking system using classes and methods for customers and accounts.

Module 2 Assignment: Develop a Python application that simulates Library management system that demonstrates inheritance, polymorphism and abstraction concepts.

Module 3 Assignment: Develop a Python program that handles different types of exceptions while processing user input for a movie ticket booking system showcasing exception handling and File handling concepts.

Text Book

1. Dr. R Nageshwara Rao, “Core Python Programming”, Dreamtech Press, 3rd Edition, 2021.

References

1. Alex Martelli, Anna Ravenscroft & Steve Holden, “Python in a Nutshell The Definitive Reference”, O'Reilly Media, 3rd edition, 2017.
2. Luciano Ramalho, “Fluent Python Clear, Concise, and Effective Programming”, O'Reilly Media, 2nd edition, 2022.
3. Mark Lutz, “Learning Python: Powerful Object-Oriented Programming”, O'Reilly Media, 5th edition, 2013.
4. David Beazley, Brian K. Jones, “Python Cookbook: Recipes for Mastering Python 3”, O'Reilly Media, 3rd edition, 2013.

Weblinks: 1. www.learnpython.org 2. https://realpython.com/python3-object-oriented 3. https://www.tutorialspoint.com/python/python_oops_concepts.htm
Topics relevant to "SKILL DEVELOPMENT": Building Real-World Applications Using OOPS Concepts, Error Handling and Debugging Techniques, Concurrency in Python, Advanced File Handling Techniques, Creating and Managing Python Packages and Modules, Designing and Implementing Python Interfaces **This is attained through assessment component mentioned in course handout.**

Course Code: CSE2264	**Course Title:** Essentials of AI **Type of Course:** Theory	**L- T-P- C**	3	**0**	0	**3**
Version No.	2.0					
Course Pre-requisites						
Anti-requisites	**NIL**					
Course Description	This course is a comprehensive introductory course designed to equip learners with the fundamental Python programming skills necessary to work with artificial intelligence (AI) technologies. This course is aimed at individuals who are new to AI but have a basic understanding of programming concepts. It combines Python programming fundamentals with hands-on experience in implementing AI techniques such as machine learning, neural networks, and natural language processing.					
Course Objective	The objective of the course is to Understand Python Programming Fundamentals, Manipulate and Process Data with Python, Implement Machine Learning Algorithms and Build and Train Neural Networks for AI Applications.					
Course Outcomes	On successful completion of the course the students shall be able to: CO 1: Apply Python Programming to AI Projects CO 2: Build and Train Machine Learning Models CO 3: Develop Deep Learning Models with Neural Networks CO 4: Deploy AI Solutions and Understand Ethical Implications					
Course Content:						

Module 1	Introduction to Python Programming for AI	Assignment	Implementation	**10 Sessions**
Topics: Python Basics: Variables, Data Types, Operators, and Control Flow Functions, Loops, and Conditionals statements, Data Structures: Lists, Tuples, Dictionaries, Sets ,Introduction to Libraries: NumPy and Pandas for data manipulation, Basic Input/Output and File Handling Introduction to Python for AI: Libraries and Frameworks Overview				
Module 2	Data Processing, Visualization	Assignment	Implementation	10 Sessions
Topics: cleaning and preprocessing with Pandas,Handling missing data, outliers, and duplicates, Data transformation (Normalization, Encoding), Introduction to Matplotlib and Seaborn for Data Visualization, Exploratory Data Analysis (EDA), Visualizing datasets to understand patterns and relationships.				
Module 3	Introduction to Machine Learning	Mini - Project	Implementation	10 Sessions
Topics: What is Machine Learning? Types of ML algorithms Supervised Learning: Regression, Classification, Unsupervised Learning: Clustering, Key ML Algorithms: Linear Regression, Decision Trees, K-Means ,Introduction to Scikit-learn library Model evaluation (Accuracy, Precision, Recall, Confusion Matrix)				
Module 4	Neural Networks and Deep Learning	Quiz	Implementation	10 Sessions
Topics: Introduction to Neural Networks and Deep Learning, Perceptron Model and Backpropagation Deep Neural Networks and Activation Functions, Introduction to TensorFlow and Keras, Building and Training Neural Networks for Image and Text Classification, Overview of Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs)				

Targeted Application & Tools that can be used:

Applications:

1. **Data Preprocessing**: Clean and manipulate data from various sources such as CSV, Excel, SQL databases, and APIs.
2. **Exploratory Data Analysis (EDA)**: Gain insights into datasets by identifying trends, patterns, and outliers.
3. **Predictive Modeling**: Build models for classification (e.g., spam detection) and regression (e.g., house price prediction).
4. **Clustering**: Group data into clusters for unsupervised learning tasks (e.g., customer segmentation).
5. **Model Evaluation**: Assess model performance using appropriate metrics such as accuracy, precision, recall, and F1-score.

Tools:

- **Pandas**: For data manipulation and cleaning (e.g., handling missing values, merging datasets).
- **NumPy**: For numerical operations and working with arrays and matrices.
- **Matplotlib**: For creating static, animated, and interactive visualizations.
- **Seaborn**: For advanced data visualizations (e.g., heatmaps, pair plots).
- **Plotly**: For creating interactive visualizations, especially useful for large datasets.

- **Scikit-learn**: The go-to library for implementing machine learning algorithms (e.g., linear regression, decision trees, k-means clustering).
- **XGBoost**: For advanced gradient boosting models, particularly for large-scale machine learning tasks.
- **TensorFlow** (for deep learning in Module 4): A powerful open-source library for building machine learning and deep learning models.
- **Keras**: High-level neural network API, built on top of TensorFlow, to easily create deep learning models.
  NLTK: The Natural Language Toolkit for various text processing tasks like tokenization, stemming, and part-of-speech tagging.
  spaCy: A fast NLP library for advanced NLP tasks such as named entity recognition and dependency parsing.
  Transformers (by Hugging Face): A powerful library for using pre-trained Transformer-based models like BERT, GPT, and others for advanced NLP tasks.

Text Book(s):
T1: **Essentials of Python for Artificial Intelligence and Machine Learning** by Pramod Gupta and Anupam Bagchi

Reference(s):
- "Artificial Intelligence with Python" – Prateek Joshi
- "Python Machine Learning" – Sebastian Raschka & Vahid Mirjalili
- "Hands-On Artificial Intelligence with Python" – Teet Straus
- "Deep Learning for Coders with Fastai and PyTorch" – Jeremy Howard & Sylvain Gugger

Course Code: CSE2265	**Course Title:** Essentials of AI Lab **Type of Course:** Lab	**L- T-P- C**	0	0	2	1
Version No.	2.0					
Course Prerequisites						
Anti-requisites	**NIL**					
Course Description	This course introduces students to the essential concepts and techniques of Artificial Intelligence (AI) with a focus on practical implementation using Python. Students will explore core AI topics such as search algorithms, knowledge representation, machine learning, and neural networks, while gaining proficiency in using popular Python libraries like NumPy, pandas, scikit-learn, and TensorFlow. Through a series of lab exercises and projects, students will apply AI principles to solve real-world problems, develop intelligent applications, and understand how AI systems function at a foundational level.					
Course Objective	The primary objectives of the course are to Gain Proficiency in AI Concepts and Python Implementation, Develop and Implement Machine Learning Models, Understand and Build Neural Networks, Apply AI to Real-World Problems					
Course Outcomes	On successful completion of the course the students shall be able to: 1. Proficiency in Implementing AI Algorithms Using Python 2. Ability to Build and Evaluate Machine Learning Models 3. Hands-on Experience with Neural Networks and Deep Learning 4. Practical Application of AI to Solve Real-World Problems					

Course Content:				
Module 1	Introduction to AI and Python for AI	ssignment	mplementation	**8 Sessions**

Lab Assignment 1: Setting Up the Python Environment

- **Objective:** Get familiar with setting up a Python environment for AI projects.
- **Tasks:**
  1. Install Python, Anaconda, and Jupyter Notebook.
  2. Set up a virtual environment for AI development.
  3. Install essential Python libraries: numpy, pandas, matplotlib, and scikit-learn.
  4. Write and execute simple Python code to verify installation (e.g., print a "Hello AI" message).

Lab Assignment 2: Basic Python Programming for AI

- **Objective:** Understand and practice the basic Python syntax and data structures used in AI.
- **Tasks:**
  1. Write Python code to work with basic data types (integer, float, string, boolean).
  2. Implement and manipulate Python lists, tuples, sets, and dictionaries.
  3. Create basic control flow structures: if-else, for loops, while loops.
  4. Use functions and lambda functions to solve small AI-related problems, such as calculating factorial or Fibonacci numbers.

Lab Assignment 3: Data Exploration and Preprocessing

- **Objective:** Learn how to work with data for AI models.
- **Tasks:**
  1. Load a dataset (e.g., Titanic or Iris dataset) using pandas.
  2. Clean the dataset by handling missing values, removing duplicates, and converting data types if needed.
  3. Explore the dataset by visualizing it using matplotlib and seaborn.
  4. Perform basic data preprocessing tasks such as feature scaling, encoding categorical variables, and splitting data into training and testing sets.

Module 2	Data Processing, Visualization	Assignment	Implementation	8 Sessions

Lab Assignment 1: Data Preprocessing with Pandas

Objective:

Learn the fundamentals of data preprocessing, including cleaning, handling missing values, and performing basic transformations using **Pandas**.

Tasks:

1. **Load and Inspect the Dataset:**
   - Load a dataset (e.g., **Iris**, **Titanic**, **Wine Quality** dataset) using pandas.read_csv() or pandas.read_excel().
   - Inspect the first few rows of the dataset using .head() and check basic information using .info().
2. **Handle Missing Values:**
   - Identify missing values in the dataset using .isnull() or .isna().
   - Handle missing data by imputing with mean, median, or mode using SimpleImputer from sklearn, or remove rows with missing data using .dropna().
3. **Data Transformation:**

- Convert categorical variables to numerical values using one-hot encoding or label encoding.
- Normalize/standardize numerical columns using StandardScaler or MinMaxScaler from sklearn.

4. **Subset and Filter Data:**
   - Create subsets based on certain conditions (e.g., select rows where a specific feature value is greater than a threshold).
   - Filter outliers from numerical data using interquartile range (IQR).

Lab Assignment 2: Data Aggregation and Grouping with Pandas

Objective:

Master aggregation and grouping techniques using **Pandas** for summarizing data.

Tasks:

1. **Group Data by Category:**
   - Group data by one or more categorical features (e.g., "class" in the Iris dataset or "embarked" in Titanic dataset).
   - Use .groupby() to calculate aggregate statistics such as mean, median, sum, and count.
2. **Pivot Tables:**
   - Create a pivot table to summarize data (e.g., aggregate the average age of passengers in the Titanic dataset by class and gender).
   - Use .pivot_table() to perform multi-dimensional aggregation.
3. **Data Aggregation and Custom Functions:**
   - Apply custom aggregation functions to the grouped data (e.g., calculate custom metrics or perform complex transformations within each group).
4. **Sorting and Ranking Data:**
   - Sort the dataset by multiple columns (e.g., sorting by "age" or "fare").
   - Rank data based on specific metrics (e.g., assign ranks to passengers by fare in the Titanic dataset).

Lab Assignment 3: Data Visualization with Matplotlib and Seaborn

Objective:

Learn to visualize datasets using **Matplotlib** and **Seaborn** for better understanding and insights.

Tasks:

1. **Basic Plotting with Matplotlib:**
   - Create simple plots like line plots, bar plots, and histograms using **Matplotlib**.
   - Customize the plots by setting titles, labels, and legends.
   - Create scatter plots to visualize relationships between two variables.
2. **Advanced Plotting with Seaborn:**
   - Use **Seaborn** to create advanced visualizations like pair plots, heatmaps, box plots, and violin plots.
   - Customize visualizations with color palettes, styling, and themes.
   - Create a correlation heatmap to visualize correlations between features in the dataset.
3. **Distribution Visualizations:**
   - Plot distributions of continuous variables using **Seaborn's** distplot() or kdeplot().
   - Create bar plots for categorical variables to understand their frequency distribution.
4. **Multi-Plot Grid Layouts:**
   - Use **Matplotlib's** subplots() function to create multiple plots in a grid layout for comparison (e.g., scatter plot and histogram in the same figure).

Lab Assignment 4: Visualizing Relationships and Feature Importance

Objective:

Understand how to visualize relationships between features and evaluate feature importance for predictive models.

Tasks:

1. **Scatter Plot Matrix:**
   - Use **Seaborn's** pairplot() to create a scatter plot matrix to visualize the relationships between multiple features.
   - Analyze the pairwise relationships between features and identify any patterns or correlations.
2. **Heatmap of Correlation Matrix:**
   - Use **Pandas** to calculate the correlation matrix of numeric features.
   - Visualize the correlation matrix using **Seaborn's** heatmap() to understand feature correlations and multicollinearity.
3. **Feature Importance from Models:**
   - Train a decision tree or random forest model using **scikit-learn** on a dataset (e.g., **Iris** or **Titanic**).
   - Visualize feature importance using a bar chart to understand which features have the most impact on the model.
4. **Visualizing Predictions vs. Actual Values:**
   - For regression tasks, visualize the predicted values against the actual values using a scatter plot.
   - For classification tasks, visualize the classification results with a confusion matrix.

Lab Assignment 5: Time Series Data Visualization and Processing

Objective:

Learn how to process and visualize time series data, which is common in AI applications like forecasting and trend analysis.

Tasks:

1. **Load and Preprocess Time Series Data:**
   - Load a time series dataset (e.g., stock market data, weather data).
   - Parse dates properly and set the date column as the index using pd.to_datetime() and .set_index().
2. **Plot Time Series Data:**
   - Plot a time series line chart using **Matplotlib** to visualize trends over time.
   - Create rolling averages (e.g., 7-day, 30-day) to smooth out short-term fluctuations in the time series data.
3. **Seasonal Decomposition of Time Series:**
   - Use **statsmodels** to decompose a time series into seasonal, trend, and residual components.
   - Visualize the decomposed components to understand seasonal variations.
4. **Forecasting with Simple Models:**
   - Use simple forecasting models (e.g., moving average, ARIMA) to predict future values.
   - Visualize the forecasted data along with actual historical data.

Module 3	Introduction to Machine Learning	Assignments	Implementation	8 Sessions

Lab Assignment 3: Implementing Linear Regression

- **Tasks:**

1. Load a real-world dataset (e.g., **Boston Housing Price** dataset).
2. Train a **Linear Regression** model using LinearRegression() from scikit-learn.
3. Evaluate the model using **Mean Squared Error (MSE)** and **R-squared Score**.
4. Visualize the regression line using Matplotlib.

Lab Assignment 4: Logistic Regression for Classification

- **Tasks:**
  1. Load the **Iris** or **Breast Cancer** dataset.
  2. Preprocess the dataset (handle missing values, encode categorical variables, scale data).
  3. Train a **Logistic Regression** model using LogisticRegression().
  4. Evaluate performance using **Accuracy, Precision, Recall, F1-score**.
  5. Plot the **Confusion Matrix** and **ROC Curve**.

Lab Assignment 5: Implementing K-Nearest Neighbors (KNN)

- **Tasks:**
  1. Load the **Iris dataset** and split it into training and testing sets.
  2. Train a **KNN classifier** using KNeighborsClassifier().
  3. Experiment with different values of **K** and evaluate performance.
  4. Visualize decision boundaries using a **scatter plot**.

Lab Assignment 6: Decision Trees and Random Forests

- **Tasks:**
  1. Train a **Decision Tree classifier** on the Titanic dataset.
  2. Visualize the tree structure using plot_tree().
  3. Train a **Random Forest classifier** and compare performance with the decision tree.
  4. Determine the **feature importance** using feature_importances_.

Module 4	Neural Networks and Deep Learning	Quiz	Implementation	6 Sessions

Lab Assignment 7: Introduction to Perceptron and Activation Functions

Tasks:

1. Implement a **single-layer perceptron** using NumPy.
2. Train the perceptron to classify **AND, OR, XOR** gates.
3. Experiment with different **activation functions** (Sigmoid, ReLU, Tanh).
4. Visualize decision boundaries.

Lab Assignment 8: Building a Simple Neural Network with Keras

Tasks:

1. Load the **MNIST dataset** from keras.datasets.
2. Preprocess the data (normalize pixel values, reshape input).
3. Create a **fully connected neural network** using Sequential API.
4. Train and evaluate the model using **categorical cross-entropy loss** and **accuracy**.

Lab Assignment 9: Implementing CNN from Scratch

Tasks:

1. Load the **CIFAR-10 dataset**.
2. Build a CNN with **Conv2D, MaxPooling2D, Flatten, Dense, Dropout** layers.
3. Use **Adam optimizer** and **categorical cross-entropy loss**.
4. Train and visualize loss/accuracy curves.

Lab Assignment 10: Image Augmentation & Regularization

Tasks:

1. Apply **data augmentation** (rotation, zoom, flipping) using ImageDataGenerator.
2. Add **dropout and batch normalization** to prevent overfitting.
3. Compare model performance with and without augmentation.

Lab Assignment 11: Transfer Learning with Pre-trained Models

Tasks:

1. Use **VGG16 or ResNet50** pre-trained on ImageNet.
2. Replace the output layer to classify **new images**.
3. Freeze earlier layers and fine-tune deeper layers.
4. Evaluate the model on a custom **dataset (e.g., Cats vs. Dogs)**.

Lab Assignment 12: Implementing RNN for Text Classification

Tasks:

1. Load **IMDB movie reviews dataset** from keras.datasets.
2. Preprocess text (tokenization, padding sequences).
3. Build an **RNN** with **Embedding, SimpleRNN, Dense** layers.
4. Train and evaluate the model.

Lab Assignment 13: Building an LSTM for Time Series Prediction

Tasks:

1. Load a **time series dataset** (e.g., stock prices, temperature data).
2. Preprocess the data (normalize, reshape).
3. Build an **LSTM-based model**.
4. Predict future values and visualize trends.

Targeted Application & Tools that can be used:

Applications:

1. **Data Preprocessing**: Clean and manipulate data from various sources such as CSV, Excel, SQL databases, and APIs.

- **Exploratory Data Analysis (EDA)**: Gain insights into datasets by identifying trends, patterns, and outliers.
- **Predictive Modeling**: Build models for classification (e.g., spam detection) and regression (e.g., house price prediction).
- **Clustering**: Group data into clusters for unsupervised learning tasks (e.g., customer segmentation).
- **Model Evaluation**: Assess model performance using appropriate metrics such as accuracy, precision,

recall, and F1-score.

Tools:

- **Pandas**: For data manipulation and cleaning (e.g., handling missing values, merging datasets).
- **NumPy**: For numerical operations and working with arrays and matrices.
- **Matplotlib**: For creating static, animated, and interactive visualizations.
- **Seaborn**: For advanced data visualizations (e.g., heatmaps, pair plots).
- **Plotly**: For creating interactive visualizations, especially useful for large datasets.
- **Scikit-learn**: The go-to library for implementing machine learning algorithms (e.g., linear regression, decision trees, k-means clustering).
- **XGBoost**: For advanced gradient boosting models, particularly for large-scale machine learning tasks.
- **TensorFlow** (for deep learning in Module 4): A powerful open-source library for building machine learning and deep learning models.
- **Keras**: High-level neural network API, built on top of TensorFlow, to easily create deep learning models.

NLTK: The Natural Language Toolkit for various text processing tasks like tokenization, stemming, and part-of-speech tagging.

spaCy: A fast NLP library for advanced NLP tasks such as named entity recognition and dependency parsing.

Transformers (by Hugging Face): A powerful library for using pre-trained Transformer-based models like BERT, GPT, and others for advanced NLP tasks.

Text Book(s):

*T1: **Essentials of Python for Artificial Intelligence and Machine Learning** by Pramod Gupta and Anupam Bagchi*

Reference(s):

1. "Artificial Intelligence with Python" – Prateek Joshi
2. "Python Machine Learning" – Sebastian Raschka & Vahid Mirjalili
3. "Hands-On Artificial Intelligence with Python" – Teet Straus
4. "Deep Learning for Coders with Fastai and PyTorch" – Jeremy Howard & Sylvain Gugger

Course Code: CIT2500	Course Title: Fog Computing for IoT Type of Course: **Theory Only Course**	L- T -P- C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	ECE2010					
Anti-requisites	NIL					

Course Description	The course will provide a solid base for understanding the challenges and problems underlying the design and development of fog computing systems and applications. Thus, this course will teach how to specify, design, program, analyze and implement such systems and applications. Fog computing is a decentralized computing infrastructure in which data, compute, storage and applications are located somewhere between the data source and the cloud. Like edge computing, fog computing brings the advantages and power of the cloud closer to where data is created and acted upon. Many people use the terms fog computing and edge computing interchangeably because both involve bringing intelligence and processing closer to where the data is created. This is often done to improve efficiency, though it might also be done for security and compliance reasons.			
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Network Slicing, Big Data Analytics and attain **SKILL DEVELOPMENT** through PARTICIPATIVE LEARNING techniques**.**			
Course Out Comes	On successful completion of this course the students shall be able to: **1]** Describe the basic principles and concepts of fog computing systems and their relation to other models such as Cloud Computing and Near-Far computing. **[Understand]** 2] Identify the challenges of developing fog-based applications and middleware, and the possible solutions. **[Apply]** 3] Solve various issues related to fog computing, programming model and Software Defined Network. **[Apply]** 4] Apply best approach for a particular problem regarding the design and development of a fog computing system.**[Apply]**			
Course Content:				
Module 1	INTRODUCTION TO FOG COMPUTING	Assignment	Programming activity	10 Sessions
Topics: Fog Computing, Characteristics, Application Scenarios, Issues and challenges. Fog Computing, Internet of Things-Pros and Cons-Myths of Fog Computing -Need and Reasons for Fog Computing Fog Computing and Edge Computing-IoT , FOG, Cloud Benefits.				
Module 2	FOG ARCHITECTURE	Assignment	Programming activity	10 Sessions
Topics: Communication and Network Model, Programming Models, Fog Architecture for smart cities, healthcare and vehicles. Fog Computing Communication Technologies: Introduction, IEEE 802.11,4G,5G standards, WPAN, Short-Range Technologies, LPWAN and other medium and Long-Range Technologies.				
Module 3	MANAGEMENT AND ORCHESTRATION	Assignment	Programming activity	10 Sessions

Topics:
Management and Orchestration of Network Slices in 5G, Fog, Edge, and Clouds: Introduction, Background, Network Slicing in 5G, Network Slicing in Software-Defined Clouds, Network Slicing Management in Edge and Fog, Middleware for Fog and Edge Computing, Need for Fog and Edge Computing Middleware, Clusters for Lightweight Edge Clouds.

Module 4	FOG INTEGRATION TECHNOLOGIES WITH IOT	Assignment	Programming activity	10 Sessions

Topics:
IoT Integration, Security Management for Edge Cloud Architectures. Fog Computing Realization for Big Data Analytics: Introduction to Big Data Analytics, Data Analytics in the Fog, Prototypes and Evaluation. Case Study: Intelligent Traffic Lights Management (ITLM) System, Fog Computing for Smart Transportation Applications, Fog-IoT: architectural model, Challenges on IoT Stack Model via TCP/IP Architecture, Data Management, security and privacy issues.

Targeted Application & Tools that can be used: Case Study: Wind Farm - Smart Traffic Light System, Wearable Sensing Devices, Wearable Event Device ,Wearable System, Demonstrations , Post Application Example . . Event Applications Example.

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

1] Problem Solving: Choose an appropriate set of visualization elements and design for a dashboard.
2] Programming: Implementation of the chosen dashboard

Text Book

1. Abbas, Assad, Samee U. Khan, and Albert Y. Zomaya, eds. *Fog Computing: Theory and Practice*. John Wiley & Sons, 2020. https://www.wiley.com/en-us/Fog+Computing%3A+Theory+and+Practice
2. Buyya, Rajkumar, and Satish Narayana Srirama, eds. *Fog and edge computing: principles and paradigms*. John Wiley & Sons, 2019. https://www.wiley.com/en-us/Fog+and+Edge+Computing%3A+Principles+and+Paradigm
3. Misra, Sudip, Subhadeep Sarkar, and Subarna Chatterjee. Sensors, cloud, and fog: the enabling technologies for the Internet of Things. CRC Press, 2019. https://www.routledge.com/Sensors-Cloud-and-Fog-The-Enabling-Technologies-for--the-Internet-of-Things/Misra-Sarkar-Chatterjee

Reference Books:

1. Mahmood, Zaigham, ed. Fog computing: concepts, frameworks and technologies. Springer, 2018. https://link.springer.com/book/10.1007/978-3-319-94890-4
2. Tanwar, Sudeep, and Tanwar. Fog computing for Healthcare 4.0 environments. Springer International Publishing, 2021. https://www.sciencedirect.com/science/article/pii/S0045790618303860
3. Tomar, R., Katal, A., Dahiya, S., Singh, N., & Choudhury, T. (Eds.). (2022). Fog Computing: Concepts, Frameworks, and Applications (1st ed.). Chapman and Hall/CRC. https://www.taylorfrancis.com/books/edit/10.1201/9781003188230/fog-computing-ravi-tomar-avita-katal-susheela-dahiya-niharika-singh-tanupriya-choudhury

Web Based Resources and E-books:

1. https://www.codecademy.com/learn/learn-c-sharp

2. https://dotnet.microsoft.com/en-us/learn/csharp 3. https://www.learncs.org/ 4. https://www.codechef.com/learn/course/c-sharp 5. https://csharp-station.com/
Topics relevant to "SKILL DEVELOPMENT": Network Slices in 5G, Big Data Analytics, Fog, Prototypes and Evaluation for developing Skills through PARTICIPATIVE LEARNING techniques. This is attained through assessment component mentioned in the course handout.

Course Code: **CIT2503**	**Course Title:** **Mobile Application for IOT**	**L-T- P- C**	3	0	0	3
Version No.	1					
Course Pre-requisites	CSE1005					
Anti-requisites	Nil					
Course Description	This is a course on Mobile Application for IoT which provides basics concepts of IoT, and understanding of mobile operating systems, Architecture of Mobile OS, basics of programming for mobile application concepts, IOT Overview and Hardware Platforms, IoT sensors, Integration of IoT sensors with Mobile, Edge and Cloud Platforms.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Mobile Application for IoT and attain **SKILL DEVELOPMENT** through **PARTICIPATIVE LEARNING** techniques					
Course Out Comes	**On successful completion of the course the students shall be able to:** CO1: Discuss the fundamental concepts of Mobile operating systems [Understand] CO2: Illustrate the various mobile app development concepts for different application [Apply] CO3: Outline the uses of IoT devices for mobile application [Understand] CO4: Examine the various applications of IoT that integrates with Mobile technologies .[Apply]					
Course Content:						
Module 1	**Introduction**	Assignment	Knowledge			**10 Sessions**
Topics: Overview of IoT Architecture : Physical Design Of IoT, IoT Protocols: LOGICAL DESIGN of IoT, IoT Communication APIs: IoT Enabling Technologies DOMAIN SPECIFIC IoTs						

Introduction to Android Operating System and its interface: Android: History and features, Architecture, Development Tools, Android Debug Bridge (ADB), and Lifecycle. Views, Layout, Menu, Intent and Fragments				
Module 2	Android Programming Concepts	Assignment	Analysis	**10 Sessions**
Topics: Mobile app development: Android Development environment, Simple UI Layouts and layout properties, GUI objects,Event Driven Programming, opening and closing a Database.				
Module 3	IoT Components	Case Study	Knowledge	**12 Sessions**
Topics:, Characteristics IoT sensor nodes, Edge computer, cloud and peripheral cloud, single board computers, open sourcehardware's, Examples of IoT infrastructure IoT Components**:** Considering the sensor specifications, ADC processing and Actuator specifications, DAC processing				
Module 4	Mobile applications with IOT	Assignment	Analysis,	**13 Sessions**
Topics: SENSOR FOR MOBILE AND HANDHELD DEVICES [Temperature sensors, Proximity sensor, IR sensors, Image sensors, Motion detection sensors, Accelerometer sensors, Gyroscope sensors, Optical sensors][Sensor APIs in Android],Actuators and Protocols of IoT related to smart devices, smart objects connection. Case Study:Edge and Cloud Based IOT Applications Case Study in IoT: Smart Environment				

Text Book

T1. Wei-Meng Lee (Author) "Beginning Android Application Development" Wrox – Wiley India Private Limited, 1st edition, 2011.

T2. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1st Edition, Pearson Education (CiscoPress Indian Reprint). (ISBN: 978- 9386873743),2017

References

R1. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014. (ISBN: 978-8173719547)

R2. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017.(ISBN: 978-9352605224)

Web References:

W1. https://presiuniv.knimbus.com/user#/home (PU Library Link) W2.https://developer.android.com/reference/classes.ml W3. https://www.iotforall.com/mobile-iot
Topics relevant to " SKILL DEVELOPMENT ": Understanding Bluetooth, Zigbee, Wi-Fi **Topics related to " PARTICIPATIVE LEARNING ":** Project implementations in software .

Course Code: **CSE2018**	**Course Title: Theory of Computation** **Type of Course: Theory Only**	**L- T-P- C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites						
Anti-requisites	Nil					
Course Description	The course deals with introduction of formal languages and the correspondence between language classes and the automata that recognize them. Topics include: Formal definitions of grammars and acceptors, Deterministic and Nondeterministic systems, Grammar ambiguity, finite state and push-down automata; normal forms; Turing machines and its relations with algorithms.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Theory of Computation as mentioned above** 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 various components of Automata. (Knowledge) 2. Illustrate Finite Automata for the given Language. (Application) 3. Distinguish between Regular grammar and Context free grammar. (Comprehension) 4. Construct Push down Automata. (Application) 5. Construct Turing machine for a Language. (Application)					
Course Content:						
Module 1	**Introduction to automata theory**	Assignment	Problems on Strings and Language operations	**06 Sessions**		
Topics: Introduction to Automata Theory, Applications of Automata Theory, Alphabets, Strings, Languages & operations on languages, Representation of automata, Language recognizers, Finite State Machines (FSM): Deterministic FSM, Regular languages, Designing FSM, Nondeterministic FSMs						
Module 2	**Finite Automata**	Assignment	Problems on DFA, NFA's	**13 Sessions**		
Topics:						

Basic concepts of Finite automata, DFA- definitions of DFA, Deterministic Accepters Transition Graphs and Languages and DFA's, Regular Languages, NFA- Definition of a Nondeterministic Accepter, Languages and NFA's Why Non-determinism? Equivalence of Deterministic and Nondeterministic Finite Accepters, Reduction of the Number of States in Finite Automata.

Module 3	**Regular Expressions & Context Free Grammar**	Assignment	Problems on RE, CFG, PT, PL and Ambiguity	**12 Sessions**

Topics:
Formal Definition of a Regular Expression, Languages Associated with Regular Expressions, Languages, Regular Languages (RL) and Non-regular Languages: Closure properties of RLs, to show some languages are not RLs, Closure Properties of Regular Context Free Grammars-Examples of Context-Free Languages, Leftmost and Rightmost Derivations, Derivation Trees, Relation Between Sentential Forms and Derivation Trees, Ambiguity in Grammars and Languages: Ambiguous Grammars, Removing Ambiguity, Chomsky Normal Form, Gribiche Normal Form.

Module 4	**Push down Automata**	Assignment	Problems on pushdown Automaton	**08 Sessions**

Topics:
Definition of a Pushdown Automaton, Language Accepted by a Pushdown Automaton, Acceptance by Final State, Acceptance by Empty Stack, From Empty Stack to Final State, From Final State to Empty Stack Equivalence of PDA's and CFG's: From Grammars to Pushdown Automata.

Module 5	**Turing Machine**	Assignment	Problems on Turning Machine	**07 Sessions**

Topics:
Definition of a Turing Machine, Turing Machines as Language Accepters, Example Languages to construct Turing machine, Turing Machines as Transducers, Halting Programming Techniques for Turing Machines

Targeted Application & Tools that can be used:

Targeted Application:

1. Text Processing
2. Compilers
3. Text Editors
4. Robotics Applications
5. Artificial Intelligence

Tools:

1. JFLAP (Java Formal Language and Automata Package) Software simulation tool. It's interactive educational software written in Java to experiment topics in automata theory.
2. Turing machine Online simulators.

Text Book

1. Peter Linz, "An introduction to Formal Languages and Automata", Jones and Bartlett Publications 6th Ed, 2018.

References

1. Aho, Ullman and Hopcroft, "Theory of Computation", Pearson India 3rd Edition 2008.
2. Michael Sipser, "Theory of Computation", Cengage India 3rd Ed, 2014.

E-Resources

NPTEL course – https://onlinecourses.nptel.ac.in/noc21_cs83/preview

Topics relevant to "SKILL DEVELOPMENT": Deterministic and Non-Deterministic Automaton, Regular Expressions, CFGs, Turning Machine and Pushdown automaton for Skill Development through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

Course Code: CIT2501	Course Title: Wireless Communication in IOT	L-T-P-C	3 -0	0	3
Version No.	1.0				
Course Pre-requisites	CSE 3155				
Anti-requisites	NIL				
Course Description	Wireless communication system is the essential part for IoT infrastructure, which acts as the bridge for dual directional communication for data collection and control message delivery. The purpose of this course is to expose the students to understand the fundamentals of wireless network and problems related to real-world scenarios. This course is both conceptual and analytical in nature.				
Course Objective	The objective of the course is to familiarize the learners with the concepts of Wireless communication in IOT and attain Skill Development through Participative Learning techniques.				
Course Out Comes	On successful completion of the course the students shall be able to: • To understand the fundamentals of wireless networks • Analyze the standards of IoT which employed for wireless networks • Explain the use of various wireless technologies in IoT • Design and develop various applications of IoT				
Course Content:					
Module 1	Cellular standards	Assignment	Programming Task		9 Sessions
Topics:					

Cellular carriers and Frequencies, Channel allocation, Cell coverage, Cell Splitting, Microcells, Picocells, Handoff, 1st, 2nd, 3rd and 4th Generation Cellular Systems (GSM, CDMA, GPRS, EDGE,UMTS), Mobile IP, WCDMA				
Assignment: Case study on generation cellular systems.				
Module 2	Radio Frequency (RF) Fundamentals	Assignment	Data Collection/Excel	10 Sessions
Topics: Introduction to RF & Wireless Communications Systems, RF and Microwave Spectral Analysis, Communication Standards, Understanding RF & Microwave Specifications. Spectrum Analysis of RF Environment, Protocol Analysis of RF Environment, Units of RF measurements, Factors affecting network range and speed, Environment, Line-of-sight, Interference, Defining differences between physical layers- OFDM. Assignment: Determination of RF and Microwave spectral Analysis				
Module 3	WLAN: Wi-Fi Organizations and Standards	Assignment	Programming/Data analysis task	9 Sessions
Topics: IEEE, Wi-Fi Alliance, WLAN Connectivity, WLAN QoS & Power-Save, IEEE 802.11 Standards,802.11- 2007,802.11a/b/g, 802.11e/h/I,802.11n Assignment: Protocols on WLAN connectivity				
Module 4	Wi-Fi Hardware & Software	Assignment	Programming/Data analysis task	10 Sessions
Topics: Access Points, WLAN Routers, WLAN Bridges, WLAN Repeaters, Direct-connect Aps, Distributed connect Aps, PoE Infrastructure, Endpoint, Client hardware and software, Wi-Fi Applications				
Targeted Protocols & Tools that can be used: Bluetooth, ZigBee, LoRa, NBIoT, WiFi, and Thread				
Text Book T1: Wireless Communications – Principles and Practice; by Theodore S Rappaport, Pearson Education Pte. Ltd. T2: Wireless Communications and Networking; By: Stallings, William; Pearson Education Pte. Ltd.				

References R1:Bluetooth Revealed; By: Miller, Brent A, Bisdikian, Chatschik; Addison Wesley Longman Pte Ltd., Delhi 4. R2:Wilson , “Sensor Technology hand book,” Elsevier publications 2005. 5. R3: Andrea Goldsmith, “Wireless Communications,” Cambridge University Press, 2005 Weblinks: W1: https://pianalytix.com/wireless-communication-protocols-in-iot/ W2: https://behrtech.com/blog/6-leading-types-of-iot-wireless-tech-and-their-best-use-cases/
Topics relevant to “SKILL DEVELOPMENT”: GSM, CDMA for developing Skill Development through Participative Learning Techniques. This is attained through the assessment component mentioned in the course handout.

Course Code: **CSE2258**	**Course Title: Web Technologies** **Type of Course: Program core** **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 highlights the basic web design using Hypertext Markup Language and Cascading Style Sheets. Students will be trained in planning and designing effective web pages by writing code using current leading trends in the web domain, enhancing web pages with the use of page layout techniques, text formatting, graphics, images, and multimedia. The focus is on popular key technologies that will help students to build Internet- and web-based applications that interact with other applications and with databases.		
Course Objective	**The objective of the course is to familiarize the learners with the concepts of Web Technology and attain Skill Development through Experiential Learning techniques.**		
Course Outcomes	**On successful completion of this course the students shall be able to:** **CO1:** Implement web-based application using client-side scripting languages. **(Application level)** **CO2**: Apply various constructs to enhance the appearance of a website. **(Application level)** **CO3:** Apply server-side scripting languages to develop a web page linked to a database. **(Application level)**		
Course Content:			

Module 1	**Introduction to XHTML**	Quizzes and Assignments	Quizzes on various features of XHTML, simple applications	**8 Sessions**
Topics: Basics: Web, WWW, Web browsers, Web servers, Internet. XHTML: Origins and Evolution of HTML and XHTML: Basic Syntax, Standard XHTML Document Structure, Basic Text Markup, Images, Hypertext Links, Lists, Tables, Forms, Frames, Syntactic Differences between HTML and XHTML.				
Module 2	**Advanced CSS**	Quizzes and assignments	Comprehension based Quizzes and assignments; Application of CSS in designing webpages	**8 Sessions**
Topics: **CSS:** Introduction to CSS, Defining & Applying a style, Creating style sheets, types of style sheet, selectors, CSS font properties, border properties, Box model, opacity, CSS pseudo class and pseudo-elements. **Advanced CSS:** Layout, Normal Flow, Positioning Elements, Floating Elements, Responsive Design, CSS Frameworks **XML:** Basics, demonstration of applications using XML				
Module 3	**PHP – Application Level**	Quizzes and assignments	Application of PHP in web designing	**7 Sessions**
Topics: **PHP:** Introduction to server-side Development with PHP, Arrays, $GET and $ POST, $_Files Array, Reading/Writing Files, PHP Classes and Objects, Working with Databases, SQL, Database APIs, Managing a MySQL Database. Accessing MySQL in PHP.				
Targeted Application & Tools that can be used: **Xampp web server to be used to demonstrate PHP.**				
Project work/Assignment:				
Assignments are given after completion of each module which the student need to submit within the stipulated deadline.				
Textbook(s): 1] Robert. W. Sebesta, "*Programming the World Wide Web*", Pearson Education, 8th Edition, 2015. 2] *CSS Notes for Professionals*, ebook available at https://books.goalkicker.com/CSSBook/ (Retrieved on Jan. 20, 2022) 3] Deitel, Deitel, Goldberg,"*Internet & World Wide Web How to Program*", Fifth Edition, Pearson Education, 2021.				
References 1] Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", Pearson Education India, 1st. Edition.2016. 2] Jeffrey C. Jackson, "Web Technologies: A Computer Science Perspective", Pearson Education, 1st Edition,2016.				
Topics related to development of "FOUNDATION": 1. Web, WWW, Web browsers, Web servers, Internet. 2. CSS, PHP. 3. Designing for healthcare.				

for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

E-References

pu.informatics.global, https://sm-nitk.vlabs.ac.in/

Course Code: CSE2259	**Course Title: Web Technologies Lab** **Type of Course: Program core**	**L-T- P-C**	0	0	2	1
Version No.	1.0					
Course Pre-requisites	CSE 3156					
Anti-requisites	**NIL**					
Course Description	This course highlights the comprehensive introduction to scripting languages that are used for creating web-based applications. The associated laboratory provides an opportunity to implement the concepts and enhance critical thinking and analytical skills.					
Course Objective	**The objective of the course is to familiarize the learners with the concepts of Web Technology and attain Skill Development through Experiential Learning techniques.**					
Course Outcomes	**On successful completion of this course the students shall be able to:** **CO1:** Implement web-based application using client-side scripting languages. **(Apply)** **CO2**: Apply various constructs to enhance the appearance of a website. **(Apply)** **CO3:** Apply server-side scripting languages to develop a web page linked to a database. **(Apply)**					
Course Content:						

List of Laboratory Tasks:

Experiment No. 1: Demonstration of XHTML features

Level 1: Demonstration of various XHTML Tags (Level 1)

Level 2: Design and develop static web pages for an online Book store (Level 2).

Experiment No. 2: Application of CSS in web designing

Level 1: Design a document using XHTML and CSS to create a catalog of items for online electronic shopping.

Level 2: Create and save XML document for students' information and display the same using cascaded style sheet.

Experiment No. 3: Application of PHP in web designing.

Level 1: Write a PHP program to read the personal information of a person such as first name, last name, age, permanent address, and pin code entered by the user into a table created in MySQL. Read the same information from the database and display it on the front end.

Level 2: Using PHP develop a web page that accepts book information such as ISBN number, title, authors, edition, and publisher and store information submitted through the web page in MySQL database.

Experiment No. 4: Building a website.

Build a website for organizing an International Conference. The conference website must be able to collect the author's details and upload a file.

Targeted Application & Tools that can be used: **Xampp web server to be used to demonstrate PHP.**

Project work/Assignment:

Assignments are given after completion of each module which the student need to submit within the stipulated deadline.

Textbook(s):

1. Robert. W. Sebesta, "*Programming the World Wide Web"*, Pearson Education, 9th Edition, 2016.
2]Paul Deitel, Harvey Deitel, Abbey Deital,"Internet & World Wide Web How to Program", Fifth Edition, Pearson Education, 2021.
3]CSS Notes for Professionals, ebook available at https://books.goalkicker.com/CSSBook/ (Retrieved on Jan. 20, 2022)
4]Deitel, Deitel, Goldberg,"*Internet & World Wide Web How to Program*", Fifth Edition, Pearson Education, 2021.

Reference Book(s):

R1. Randy Connolly, Ricardo Hoar,"Fundamentals of Web Development", Pearson Education India, 1st. Edition.2016.

R2. Jeffrey C. Jackson,"Web Technologies: A Computer Science Perspective", Pearson Education, 1st Edition,2016.

Additional web-based resources

W1. W3schools.com
W2. Developer.mozilla.org/en-US/docs/Learn
W3. docs.microsoft.com
W4. informit.com/articles/ The Relationship Between Web 2.0 and Social Networking
https://presiuniv.knimbus.com/user#/home

Topics related to development of "FOUNDATION":

1. Web, WWW, Web browsers, Web servers, Internet.
2. CSS, PHP.
3. Designing the website for healthcare.

The objective of the course is to familiarize the learners with the concepts of Web Technology and attain Skill Development through Experiential Learning techniques.

Course Code: CIT2400	**Course Title: Cyber-Physical Systems** **Type of Course: Theory**	**L- P- T-C**	**3**	**0**	**0**	**3**
Version No.	1.0					
Course Pre-requisites	Nil					

Anti-requisites	NIL
Course Description	This course introduces students to an industrial viewpoint of Cyber-Physical Systems which includes sensors and actuators, computing and communication systems. It will also include networking protocols, security and various CPS/IoT applications. This course helps to make students industry-ready and equip them with the domain knowledge needed to take up projects in Cyber-Physical Systems Topics include Computational foundation of Cyber Physical Systems, Cyber Physical System Design and system requirements Physical System Platforms Embedded Systems vs Internet of Things vs Cyber Physical System and Concurrent Models of computation
Course Outcomes	On successful completion of this course the students shall be able to: 1. Describe the need and purpose of the different components of Cyber Physical Systems. (Understand). 2. Scribe the ability to interact with Cyber Physical System (Understand). 3. Demonstrate a new system and with which a product can be made. (Apply). 4. Classify common methods used to secure cyber-physical systems. (Understand)

Course Content:

Module 1	**Introduction**	Assignment		**12 Sessions**

Topics:

Sensors and Actuators, Embedded Processors and Memory Models, Input/Output and Device Interfaces, Finite State Machines in Hardware, Hybrid Systems: Modal Models, Concurrency Models: Synchronous-Reactive, Timed, Dataflow, Hierarchical State Machines, Multitasking and Threads, Message Passing and Synchronization, Deadlocks and Race Conditions, Timed Automata, Design Case Study

Module 2	**Foundations of CPS**	Assignment		**11 Sessions**

Topics:

Introduction to Cyber-Physical Systems (CPS), CPS Characteristics and Applications, Reactive Systems and Concurrency, Synchronous Models: Components, Inputs/Outputs, Extended State Machines, Finite-State and Nondeterministic Systems, Composition of Components, Modeling Behaviors: Traces and Execution, Continuous-Time Models & Newtonian Mechanics, Linear and Non-linear Dynamics, Overview of Model-Based Design

Module 3	**Scheduling, Real-Time Systems, and Verification**	Assignment		**12 Sessions**

Topics:

Real-Time Constraints and Requirements, Periodic Job Models, Rate Monotonic Scheduling, Earliest Deadline First Scheduling, Multiprocessor Scheduling, Mutual Exclusion and Resource Sharing, Temporal Logic (LTL), Safety and Invariant Properties, Model Checking (Reachability & Liveness), Symbolic Techniques & BDDs, Formal Verification Tools Overview

Module-4	**Applications**	Assignment		**10 Sessions**

Topics:

Hybrid Systems and Zeno Behavior, Stability and Controller Design, Feedback and PID Controllers, Simulation and Numerical Methods, Distributed Coordination and Consensus, Leader Election and Reliable Messaging, CPS Security Principles, Software and Network Security in CPS, Fault Tolerance and Robustness, Case Study: Automotive or Medical CPS

Project work/Assignment:

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

REFERENCE MATERIALS:

TEXTBOOKS

1. Rajeev Alur, "Principles of Cyber Physical Systems", MIT Press, 2023, ISBN: 9780262548922
2. E. A. Lee, Sanjit Seshia , "Introduction to Embedded Systems – A Cyber–Physical Systems Approach", Second Edition, MIT Press, 2017, ISBN: 978-0-262-53381-2

REFERENCES

1. Pedro H. J. Nardelli, "Cyber-physical Systems: Theory, Methodology, and Applications", wiley publications, 2022,
2.

JOURNALS/MAGAZINES

1. IEEE Transactions on Industrial Cyber-Physical Systems
   https://www.ieee-ies.org/pubs/transactions-on-industrial-cyberphysical-systems
2. ACM Transactions on Cyber-Physical Systems
   https://dl.acm.org/journal/tcps
3. IET Cyber-Physical Systems: Theory & Applications
   https://ietresearch.onlinelibrary.wiley.com/journal/23983396

SWAYAM/NPTEL/MOOCs:

1. NPTEL - Foundations of Cyber Physical Systems
2. Coursera – Cyber-Physical Systems: Modelling and Simulation
3. TCS - Cyber-Physical Systems

Course Code: **CIT2504**	**Course Title:** AI and Deep Learning for **IoT** **Type of Course:** **Program Core -Theory**		**L-T-P-C**	3	0	0	3
Version No.						
Course Pre-requisites	CSE 1700					
Anti-requisites	NIL					
Course Description	This course explores the integration of Artificial Intelligence (AI) and Deep Learning (DL) with the Internet of Things (IoT), focusing on AI-driven data processing, decision-making, and automation in smart applications. Students will learn key concepts of machine learning, neural networks, edge AI, federated learning, and TinyML, along with deployment on IoT edge devices like Raspberry Pi and NVIDIA Jetson. The course covers cloud-based AI, real-time inference, energy efficiency, security challenges, and practical applications in smart agriculture, healthcare, and industrial IoT					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Wireless Communication for IoT and attain Skill Development through Participative Learning techniques					
Course Out Comes	On successful completion of the course the students shall be able to: 1 Understand the concepts of AIoT and their significance in modern industries. 2. Apply techniques to connect mobile devices to IoT gateways, bridging the gap between different networks. 3. Analyze sensor technologies in IoT and their academic foundations to showcase practical understanding. 4. Develop and Evaluate AIoT applications to address real-world challenges.					
Course Content						
Module 1	Introduction to Artificial Intelligence and Internet of Things (AIoT)	Assignment	Problem Solving	**12 Classes**		

Introduction to Artificial Intelligence and Internet of Things (AIoT) Overview of Artificial Intelligence (AI) and its applications across various industries. Introduction to the Internet of Things (IoT) and its significance in the modern interconnected world. Understanding the concept of Artificial Intelligence of Things (AIoT) and its potential to revolutionize technology integration.				
Module 2	Connecting Mobile Devices to IoT Gateways	Assignment	Problem Solving	**10 Classes**
Connecting Mobile Devices to IoT Gateways Exploring the role of IoT gateways in bridging the gap between mobile devices and IoT networks. Techniques for establishing seamless connections between mobile devices and IoT gateways. Hands-on exercises demonstrating the setup and configuration of mobileto-IoT connections.				
Module 3	Sensor Technologies and Academic Concepts	Assignment	Problem Solving	**12 Classes**
Sensor Technologies and Academic Concepts Comprehensive overview of sensor technologies commonly employed in IoT applications. In-depth exploration of various types of sensors and their academic underpinnings. Practical demonstrations and experiments showcasing the functionality and applications of sensors in IoT systems.				
Module 4	AIoT Application Development	Assignment	Problem Solving	**11 Classes**
AIoT Application Development Introduction to tools and platforms essential for building AIoT applications. Practical Aspects of AIoT applications, including: Smart Traffic Signal System for Color Blind Individuals Plant Health Analysis Smart Door Access Control System.				
Targeted Application & Tools that can be used:				
Text Book 1. Michael Negnevitsky, "Artificial Intelligence: A Guide to Intelligent Systems", Pearson Education, 2021 2. Rajkumar Buyya, Amir Vahid Dastjerdi, "Internet of Things: Principles and Paradigms", Morgan Kaufmann, 2016 3. Michael J. McGrath, "Sensor Technologies: Healthcare, Wellness and Environmental Applications", Apress, 2013				

References

R1. Chandra Singh, K V S S S S Sairam, Niranjan N Chiplunkar, Rathishchandra R Gatti Create citation, "Self-Powered Aiot Systems":Apple Academic Press 2024

R2. Kashif Naseer Qureshi, Thomas Newe Artificial Intelligence of Things (AIoT): New Standards, Technologies and Communication Systems, CRC Press 2024

Web Based Resources and E-books:

W1.https://www.linkedin.com/learning/ai-in-connected-products-aiot

W2. https://www.coursera.org/learn/iot

W3. https://www.tinkercad.com/things?type=circuits&sort=staff&view_mode=small

Topics relevant to "SKILL DEVELOPMENT":

AI and Deep Learning for IOT for **Skill development** through **Participative Learning** techniques. This is attained through the assessment component mentioned in the course handout.

Course Code: CIT2502	Course Title: Privacy and Security in IoT	L- T-P- C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	Cryptography and Network Security					
Anti-requisites	NIL					
Course Description	The purpose of this course is to enable the students to appreciate the need for cryptography and to identify the applications of cryptography in the Internet of Things (IoT). The course is both conceptual and analytical in nature and needs fair knowledge of mathematics and computing. The course develops critical thinking and analytical skills. The course also enhances programming abilities through assignments.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Privacy and Security in IoT** 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 benefits of modern cryptographic algorithms **[Understand]** (2) **Apply** the Elliptic curve Diffie Hellman and digital signature algorithms to encrypt-decrypt, generate, and verify the signatures **[Apply]** (3) **Estimate** the performance of ECC with other traditional cryptography algorithms. **[Apply]**					
Course Content						

Module 1	Introduction to Elliptic Curves	Quiz	Comprehension based Quizzes and assignments	15 Sessions
Topics: **Elliptic Curve Cryptosystems (ECC):** Introduction to ECC, Method of Diophantus, Elliptic curves in Cryptography, Discrete Logarithms in Finite Fields, Elliptic Curve on a finite set of Integers, Definition of Elliptic curves, General form of an EC, Weierstrass Equation, Points on the Elliptic Curve (EC), The Abelian Group, Operations on ECC- Point addition, Point doubling.				
Module 2	Elliptic Curve Cryptosystems	Quizzes and assignments	Comprehension based Quizzes and assignments	15 Sessions
Topics: E**lliptic Curve Cryptosystems (ECC):** Public-Key Cryptosystems, Public-Key Cryptography, What Is Elliptic Curve Cryptography (ECC)?, Using Elliptic Curves In Cryptography, Generic Procedures of ECC, Example – Elliptic Curve Cryptosystem Analog to El Gamal, Diffie-Hellman (DH) Key Exchange, ECC Diffie-Hellman, Example – Elliptic Curve Diffie-Hellman Exchange, Elliptic Curve Digital Signature Algorithm (ECDSA) Why use ECC?, Security of ECC, Applications of ECC, Benefits of ECC.				
Module 3	IoT Protocols	Assignment	Comprehension based Quizzes and assignments	15 Sessions
Topics: **IoT Communication model and Protocols :** Communication/Transport Protocols: Bluetooth. Data Protocols: Message Queue Telemetry Transport (MQTT), Constrained Application Protocol (COAP), Advanced Message Queuing Protocol (AMQP), Extensible Messaging and Presence Protocol (XMPP), Introduction, Principle of RFID, Components of an RFID system.				
Targeted Applications & Tools that can be used: **Application areas are to secure cryptocurrency- Bitcoin, Ethereum and Ripple using ECC in key agreements, and digital signatures.** **Professionally Used Software:** elliptic2 : https://www.graui.de/code/elliptic2/				
Project work/Assignment:				
Project/Assignment: **Assignment 1: Collect the running time of ECC on different standard NIST curves.** **Assignment 2: Prepare a compressive report on the efficiency of NIST Vs SECP curves.**				
Textbook(s): **T1. I. Blake, G. Seroussi, N. Smart, Elliptic Curves in Cryptography , Cambridge University 2020,** **T2. Arshdeep Bagha, Vijay Madisetti, "Internet of Things - A hands-on approach", Universities Press, 2021., Second Edition**				
References **R1. Joseph H Silver man The Arithmetic of Elliptic Curves: Springer; 2nd Edition April 2016** **R2. Darrel Hankerson, Scott Vanstone, Alfred J. Menezes Guide to Elliptic Curve Cryptography Springer 2018** **R3. Elliptic curve cryptography, Elliptic Curve Cryptography, Debdeep Mukhopadhyay Dept of Computer Sc and Engg, IIT Madras (Lecture Notes)**				

R4. Simoni Cirani, Internet of things, Architecture, Protocols and Standards, Wiley, 1st Edition, 2019
Topics related to the development of "SKILL DEVELOPMENT": IOT Protocols, Elliptic Curve Cryptosystem, for Skill Development through Participative Learning Techniques. This is attained through assessment components as mentioned in the course handout.

Course Code: CIT2401	**Course Title:** Blockchain for IoT **Type of Course:** **Program Core -Theory**	**L-T-P-C**	3	0	0	3
Version No.						
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The rapid expansion of the Internet of Things (IoT) has introduced security and privacy challenges due to the interconnected nature of devices and the vast amounts of data they generate. This course explores how blockchain technology can enhance the security, integrity, and trustworthiness of IoT systems. Students will gain insights into blockchain fundamentals, consensus mechanisms, cryptographic techniques, and smart contracts, as well as their application in securing IoT networks. The course will also cover real-world case studies, research trends, and implementation strategies.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Wireless Communication for IoT and attain Skill Development through Participative Learning techniques					
Course Out Comes	On successful completion of the course the students shall be able to: 1. Understand the fundamentals, various attacks and importance of Security aspects in IoT. 2. Explain blockchain architecture, cryptographic principles, and consensus mechanisms. 3. Understand the operations of Bitcoin blockchain, crypto-currency as application of blockchain technology. 4. Analyze the role of blockchain in securing IoT networks					

Course Content				
Module 1	Introduction to Blockchain and security in IoT	Assignment	Problem Solving	**12 Classes**
Introduction to Blockchain: Blockchain, Trust, Types of Blockchain, Blockchain implementation, Blockchain in practice, Technology use cases: Distributed storage, distributed computing, decentralized communications, financial service use cases				
Module 2	Fundamental of IoT and Security	Assignment	Problem Solving	**10 Classes**
Fundamentals of IoT and Security and its need, Prevent Unauthorized Access to Sensor Data, Block ciphers, Introduction to Blockchain, Introduction of IoT devices, IoT Security Requirements, M2M Security, Message integrity, Modeling faults and adversaries, Difference among IoT devices, computers, and embedded devices.				
Module 3	Basic cryptocurrency system	Assignment	Problem Solving	**12 Classes**
Basic cryptocurrency system, Public and Private Keys in Cryptocurrency Systems, The UTXO Model, Transactions, Signing and Validating Transactions, Bitcoin Transaction Security, Wallet Types: Custodial Versus Noncustodial, Lightweight wallets, Hierarchical deterministic wallets, Permissioned and Permissionless Consensus, Proof-of-Work, Proof-of-Stake, Proof of Burn, Proof of Elapsed Time, Bitcoin Miner, Mining Difficulty				
Module 4	Authentication Techniques	Assignment	Problem Solving	**11 Classes**
Introduction to Authentication Techniques Secure IoT Lower Layers, Bitcoin P2P network, Ethereum and Smart Contracts, Bandwidth efficiency, Data Trustworthiness in IoT Secure IoT Higher Layers, Distributed consensus, Smart Contract Languages and verification challenges data analytics in IoT - simple data analyzing methods.				
Targeted Application & Tools that can be used:				

Text Book

1. Lorne Lantz & Daniel Cawrey, Mastering Blockchain Unlocking the Power of Cryptocurrencies, Smart Contracts, and Decentralized Applications, O'REILLY Publications

2. Narayanan et al., "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction," Princeton University Press, 2016.

References

R1. . B. Russell and D. Van Duren, "Practical Internet of Things Security," Packt Publishing, 2016.

R2. FeiHU, "Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations", CRC Press, 2016.

Web Based Resources and E-books:

W1. https://www.coursera.org/learn/blockchain-basics

W2. https://www.iota.org/

Topics relevant to "SKILL DEVELOPMENT":

AI and Deep Learning for IOT for **Skill development** through **Participative Learning t**echniques. This is attained through the assessment component mentioned in the course handout.

Course Code: CSE2272	**Course Title: Cloud Computing** **Type of Course: Theory**	**L- T-P- C**	2	0	0	2
Version No.	1.0					
Course Pre-requisites	**CSE3155**					
Anti-requisites	Nil					
Course Description	Cloud Computing provides a hands-on comprehensive study of Cloud concepts and capabilities across the various Cloud service models including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). It dives into all of the details that a student needs to know in order to plan for developing applications on the cloud and what to look for when using applications or services hosted on a cloud.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of **CLOUD COMPUTING** and is designed to improve the learners' **SKILL DEVELOPMENT** through **PARTICIPATIVE LEARNING TECHNIQUES.**					

Course Out Comes	On successful completion of the course the students shall be able to: 1. Describe the fundamental components and layers of Cloud Computing Architecture. [Remember] 2. Identify appropriate Virtualization techniques to virtualize infrastructures [Understand] 3. Summarize various Cloud mechanisms to optimize the QoS parameters [Understand] 4. Apply cloud platforms to develop various applications [Apply]				
Course Content:					
Module 1	**Introduction to Cloud services**	Assignment	Theory		**L: 10**
Evolution of cloud computing, Computing Platforms and Technologies, Cloud Computing Architecture, IaaS, PaaS, SaaS, Types of Clouds, Cloud Computing Environments. [Understanding]					
Module 2	**Virtualization Techniques**	Assignment	Theory		**L: 10**
Basics of Virtualization - Types of Virtualizations, Taxonomy of Virtualization Techniques, Implementation Levels of Virtualization. [Understanding]					
Module 3	**Cloud QoS and Management**	Assignment	Theory		**L: 10**
Cloud Infrastructure Mechanisms- Logical Network Perimeter, Virtual Server, Cloud Storage Device, Cloud Usage Monitor, Ready-Made Environment, SLAs, Specialized Cloud Mechanisms- Automated Scaling Listener, Load Balancer, SLA Monitor, Pay-Per-Use Monitor, Audit Monitor, Cloud Security Mechanisms. [Understanding]					
Module 4	**Cloud Application development in Cloud**	Assignment	Theory		**L: 10**
Programming Models for Cloud Computing – MapReduce, CGL Mapreduce, Cloud Haskell, Development environments for service development (Demonstration using AWS Cloud/Saturn Cloud); Dockers and Containers. [Apply]					
Targeted Application & Tools that can be used : **Applications:** Cloud Platform, Use of cloud technology in different applications like healthcare, agriculture etc. **Tools:** 1. Google App Engine 2. AWS, Saturn Cloud etc.					
Project work/Assignment: Mention the Type of Project /Assignment proposed for this course					
• **Students can design and implement dynamic resource allocation for virtual machine using cloud computing environment.** • **Design and Implementation of a Scalable Cloud-Based Data Storage System** • **Development of a Multi-Cloud Management Platform**					

Text Book

1. **Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, "Mastering Cloud Computing", McGraw Hill Education, 2013 edition.**

2. **John Rittinghouse and James Ransome, "Cloud Computing, Implementation, Management and Security", CRC Press, 2010 edition.**

References

1. **Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, "Cloud Computing Concepts, Technology & Architecture", PHI publisher 2013 edition.**

2. **K. Chandrasekaran, "Essentials of CLOUD COMPUTING", CRC Press, 2015 edition.**

3. **David E.Y. Sarna, "Implementing and Developing Cloud Applications", CRC Press, 2018 edition.**

4. **Manvi, Sunilkumar, and Gopal K. Shyam. "Cloud Computing: Concepts and Technologies". CRC Press, 2021.**

Web Based Resources and E-books:

W1. IEEE Transactions on Cloud Computing- https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=6245519

W2. International Journal of Cloud Computing- https://www.inderscience.com/jhome.php?jcode=ijcc

W3. CloudSim Resources

https://javadoc.io/doc/org.cloudsimplus/cloudsim-plus/latest/org/cloudbus/cloudsim/resources/class-use/Resource.html

W4. Journal of Network and Computer Networking- https://www.journals.elsevier.com/journal-of-network-and-computer- applications

Topics relevant to "Skill Development": AWS, Azure, APIs, Aneka Cloud Platform, Virtualization, Cloud Platforms in Industry, EC2, Installation of VM Workstation, Cloud Infrastructure and Challenges for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code: CSE2273	**Course Title: Cloud Computing Lab**	**L- T-P- C**	0	0	2	1
Version No.	1.0					
Course Pre-requisites	**CSE3155**					
Anti-requisites	Nil					

Course Description	Cloud Computing provides a hands-on comprehensive study of Cloud concepts and capabilities across the various Cloud service models including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). It dives into all of the details that a student needs to know in order to plan for developing applications on the cloud and what to look for when using applications or services hosted on a cloud.
Course Objectives	The objective of the course is to familiarize the learners with the concepts of **CLOUD COMPUTING** and is designed to improve the learners' **SKILL DEVELOPMENT** through **PARTICIPATIVE LEARNING TECHNIQUES.**
Course Content:	

Targeted Application & Tools that can be used :

Applications:

Cloud Platform, Use of cloud technology in different applications like healthcare, agriculture etc.

Tools:

1. Google App Engine
2. AWS, Saturn Cloud etc.

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

- **Students can design and implement dynamic resource allocation for virtual machine using cloud computing environment.**
- **Design and Implementation of a Scalable Cloud-Based Data Storage System**
- **Development of a Multi-Cloud Management Platform**

List of Laboratory Tasks:

Experiments:

1. **Create a simple cloud software application and provide it as a service using any Cloud Service Provider to demonstrate Software as a Service (SaaS).**
2. **Create a Virtual Machine with 1 vCPU, 2GB RAM and 15GB storage disk using a Type 2 Virtualization Software**
3. **Create a Virtual Hard Disk and allocate the storage using VM ware Workstation**
4. **Create a Snapshot and Cloning of a VM and Test it by loading the Previous Version/Cloned VM**
5. **Demonstrate Infrastructure as a Service (IaaS) by Creating a Virtual Machine using a Public Cloud Service Provider (Azure/GCP/AWS), configure with minimum CPU, RAM, and Storage and Launch the VM image.**
6. **Create a Simple Web Application using Java or Python and host it in any Public Cloud Service Provider (Azure/GCP/AWS) to demonstrate Platform as a Service (PaaS)**
7. **Create a Storage service using any Public Cloud Service Provider (Azure/GCP/AWS) and check the public accessibility of the stored file to demonstrate Storage as a Service**
8. **Create a SQL storage service and perform a basic query using any Public Cloud Service Provider (Azure/GCP/AWS) to demonstrate Database as a Service (DaaS)**
9. **Perform the basic configuration setup for Installing Hadoop 2.x like Creating the HDUSER and SSH localhost**
10. **Install Hadoop 2.x and configure the Name Node and Data Node.**
11. **Launch the Hadoop 2.x and perform MapReduce Program for a Word Count problem**

Text Book 3. **Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, "Mastering Cloud Computing", McGraw Hill Education, 2013 edition.** 4. **John Rittinghouse and James Ransome, "Cloud Computing, Implementation, Management and Security", CRC Press, 2010 edition.**
References **Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, "Cloud Computing Concepts, Technology & Architecture", PHI publisher 2013 edition.** **K. Chandrasekaran, "Essentials of CLOUD COMPUTING", CRC Press, 2015 edition.** **David E.Y. Sarna, "Implementing and Developing Cloud Applications", CRC Press, 2018 edition.** **Manvi, Sunilkumar, and Gopal K. Shyam. "Cloud Computing: Concepts and Technologies". CRC Press, 2021.** **Web Based Resources and E-books:** **W1. IEEE Transactions on Cloud Computing- https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=6245519** **W2. International Journal of Cloud Computing- https://www.inderscience.com/jhome.php?jcode=ijcc** **W3. CloudSim Resources** **https://javadoc.io/doc/org.cloudsimplus/cloudsim-plus/latest/org/cloudbus/cloudsim/resources/class-use/Resource.html** **W4. Journal of Network and Computer Networking- https://www.journals.elsevier.com/journal-of-network-and-computer- applications**
Topics relevant to "Skill Development": AWS, Azure, APIs, Aneka Cloud Platform, Virtualization, Cloud Platforms in Industry, EC2, Installation of VM Workstation, Cloud Infrastructure and Challenges for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code: **CIT3415**	**Course Title: Internet of Things** **Type of Course: Integrated**	**L- T-P- C**	1	0	4	3
Version No.	2.0					
Course Pre-requisites	CSE1005					
Anti-requisites	NIL					

Course Description	The Internet of Things (IoT) is an emerging paradigm combining heterogeneous devices at an unprecedented scale, thereby enabling individuals and organizations to gain greater value from networked connections among people, processes, data, and things. The Internet of Things (IoT) is a course of objects interacting with people, with information systems, and with other objects. The course will focus on creative thinking, IoT concepts & IoT technologies.			
Course Objective	The objective of the course is to familiarize the learners with the concepts of Internet of Things and attain SKILL DEVELOPMENT through EXPERIENTIAL LEARNING techniques			
Course Out Comes	On successful completion of the course the students shall be able to: 1. Identify the application areas of IoT 2. Understand building blocks of Internet of Things and characteristics 3. Describe IoT Protocols 4. Demonstrate use of IoT devices for simple application			
Course Content:				
Module 1	INTRODUCTION TO INTERNET OF THINGS	Assignment	Simulation/Data Analysis	**18 Sessions**
Introduction, Definition & Characteristics of IOT, Physical Design of IoT- Things in IoT, IoT Protocols, Logical design of IoT- IoT functional blocks, IoT Communication Models, IoT Communication APIs, IoT Enabling Technologies- Wireless sensor networks, Cloud computing, Big data Analytics				
Module 2	IOT COMMUNICATION MODEL AND PROTOCOLS	Assignment	Numerical from E-Resources	**18 Sessions**
Connectivity Protocols: 6LoWPAN, IEEE 802.15.4, Zigbee, Wireless HART, Z-Wave, ISA 100,NFC, RFID. Communication/Transport Protocols: Bluetooth. Data Protocols: Message Queue Telemetry Transport (MQTT), Constrained Application Protocol (CoAP), Advanced Message Queuing Protocol (AMQP), XMPP – Extensible Messaging and Presence Protocol				
Module 3	IOT COMMUNICATION MODEL AND PROTOCOLS	Term paper/Assignment	Simulation/Data Analysis	**19 Sessions**
Communication/Transport Protocols: Bluetooth. Data Protocols: Message Queue Telemetry Transport (MQTT), Constrained Application Protocol (CoAP), Advanced Message Queuing Protocol (AMQP), XMPP – Extensible Messaging and Presence Protocol. RFID: Introduction, Principle of RFID, Components of an RFID system.				
List of Laboratory Tasks 1 Installation of arduino IDE & Arduino program to implement scrolling LED, to glow even/odd LED 2 Arduino program to demonstrate usage of push button to control the LED 3 Arduino program to demonstrates traffic control system 4 Arduino program to demonstrates usage of servo motor with potentio meter. 5.Arduino program to Control an LED using Bluetooth. 6.Arduino program to implement RFID reader for security access. 7. Arduino Program to detect obstacle using IR sensor. 8.Arduino Program to detect motion using PIR sensor. 9.Installation of Raspberry pi software 10. Working basic commands on Raspberry pi & to demonstrate remote logging in raspberry pi 11.Raspberry pi program to implement blinking LED 12. Raspberry pi program to implement camera module for video 13. Raspberry pi program to obtain the temperature using DHT sensors 14.Using a Raspberry Pi with distance sensor (ultrasonic sensor HCSR04)				

15. Raspberry pi program to implement Garage spot light
Targeted Application & Tools that can be used: **Interfacing of ARDUINO and Raspberry pi for developing smart CITIES** **Tools:** Tinker cad Cooja simulator Contiki Thingspeak
Text Book T1 Arshdeep Bagha, Vijay Madisetti, Internet of Things A hands on approach, First Edition, Universities Press, 2018 T2 Hakima Chaouchi, The internet of Things Connecting Objects to web Wiley 2017
References R1 Vinit Kumar Gunjan, MohdDilshad Ansari,Mohammed Usman, ThiDieuLinh Nguyen Internet of Things Technology, Communications and Computing Springer January 2023 R2 Dr. Hassan Internet of Things A to Z: Technologies and Applications IEEE Press 2018 **E-Resources** NPTEL course – a) https://onlinecourses.nptel.ac.in/noc22_cs53/preview b) https://www.udemy.com/course/complete-guide-to-build-iot-things-from-scratch-to-market/ c) https://puniversity.informaticsglobal.com:2229/login.aspx
Topics relevant to "SKILL DEVELOPMENT": Case studies of water supply projects – Design criteria through group discussion. Interpolation of sensors through group presentation for **Skill Development** through **Experiential Learning** techniques. This is attained through assessment component mentioned in course handout.

Course Code: CSE2058	**Course Title: Firewall and Internet security** **Type of Course: Integrated**	**L- T-P- C**	2-0-2-3
Version No.	1		
Course Pre-requisites	CSE3155		
Anti-requisites			
Course Description	This course provides an in-depth study of various network attacks techniques and methods to defend against them. A number of threats and vulnerabilities of the Internet will be covered, including various vulnerabilities of TCP/IP protocols, denial of service (DOS), attacks on routing, attacks on DNS servers, TCP session hijacking, and so on. This course will also cover defending mechanisms, including intrusion detection, firewalls, tracing the source of attacks, anonymous communication, IPsec, virtual private network, and PKI. To make it easy for students to understand these attacks, basics of the TCP/IP protocols will also be covered in the course.		
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Firewall and Internet security** and attain **Skill Development** through **Problem Solving** Methodologies.		

Course Out Comes	**On successful completion of the course the students shall be able to:** • To identify elements of firewall design, types of security threats and responses to security attacks. • Examine security incident postmortem reporting and ongoing network security activities. • Construct code for authentication algorithms. • Develop a signature scheme using Digital signature standard. • Demonstrate the network security system using open source tools			
Course Content:				
Module 1	Introduction to Firewall	Assignment	Data Collection/Interpretation	**12 Sessions**
Introduction of Firewall in computer network,Categories of firewall,How firewall works,Types of firewall, Firewall location and Configuration,Firewall Policies,Firewall Biasing,Network Architecture,Net masks,Packet filters,Stateful firewalls,Resources				
Module 2	**Computer security**	Case studies / Case let	Case studies / Case let	**12 Sessions**
Topics: Attacks on Computers and Computer Security: Need for Security, Security Approaches, Principles of Security Types of Attacks. Transport Level Security: Web Security Considerations, Secure Sockets Layer, Transport Layer Security, HTTPS, Secure Shell (SSH)				
Module 3	**Network Security**	Quiz	Case studies / Case let	**10 Sessions**
Topics: Overview of Network Security:Elements of Network Security , Classification of Network Attacks ,Security Methods ,Symmetric-Key Cryptography :Data Encryption Standard (DES),Advanced Encryption Standard (AES) , Public-Key Cryptography :RSA Algorithm ,Diffie-Hellman Key-Exchange Protocol , Authentication :Hash Function , Secure Hash Algorithm (SHA) , Digital Signatures.				
Module 4	Cyber laws and Compliance Standards	Quiz	Case studies / Case let	**11 Sessions**
Topics: Kerberos:Working ,ASS,TGS,SS-Internet security protocols-AH,ESP,Models-Transport and tunnel-Email security,Public key Infrasturcture,Certificates,certificates authority.Cyber Crime: Introduction,Hacking,Digital forgery,Cyber Stalking,Identify theft and Fraud,Cyber terrorism,Cyber defamation,Crime against individual,Government,Property.				
List of Laboratory Tasks: 1. Perform encryption, decryption using the following substitution techniques (i) Ceaser cipher, (ii) playfair cipher iii) Hill Cipher iv) Vigenere cipher 2. Perform encryption and decryption using following transposition techniques i) Rail fence ii) row & Column Transformation 3. Apply DES algorithm for practical applications. 4. Apply AES algorithm for practical applications. 5. Implement RSA Algorithm using HTML and JavaScript 6. Implement the Diffie-Hellman Key Exchange algorithm for a given problem. 7. Calculate the message digest of a text using the SHA-1 algorithm. 8. Implement the SIGNATURE SCHEME – Digital Signature Standard.				

9. Demonstrate intrusion detection system (ids) using any tool eg. Snort or any other s/w.
10. Automated Attack and Penetration Tools Exploring N-Stalker, a Vulnerability Assessment Tool
11. Defeating Malware
i) Building Trojans ii) Rootkit Hunter

Targeted Application & Tools that can be used

Text Book

T1 : Behrouz A Forouzan, Data and Communications and Networking, Fifth Edition, McGraw Hill, Indian Edition

T2: James F Kurose and Keith W Ross, Computer Networking, A Top-Down Approach, Sixth edition, Pearson,2017

References

R1: Andrew S Tanenbaum, Computer Networks, fifth edition, Pearson Edition

R2: Nader F Mir, Computer and Communication Networks, 2nd Edition, Pearson, 2014.

Web resources:

1. https://networklessons.com/cisco/asa-firewall
2. https://www.udemy.com/course/cisco-asa-firewall-lab-guide
3. https://geekflare.com/learn-network-security

- **Topics relevant to development of "Skill Development": AES, Network Security for Skill Development through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.**

Course Code: CIT3411	**Course Title:** **Big Data Analytics for IoT** **Type of Course: Program Core** **Theory with embedded lab**	**L- P- C**	2 -0	2	3
Version No.	1.0				
Course Pre-requisites	CSE3156				
Anti-requisites	**NIL**				
Course Description	The course covers basic concepts for IOT Analytics, collection of data for IOT, Integration of IOT with Cloud, Big Data Environments. Students can learn about applying geospatial analytics and applying machine learning to the IOT data. The course also covers the organization of the IOT data, cost benefits of using IOT and review of IOT in various sectors.				

Course Objective	The objective of the course is to familiarize the learners with the concepts of Big Data Analytics for IoT and attain SKILL DEVELOPMENT through EXPERIENTIAL LEARNING techniques.			
Course Outcomes	On successful completion of the course the students shall be able to: CO1: Demonstrate IOT Data Analytics and machine learning application in IOT (Apply) CO2: Apply appropriate Hadoop Ecosystem tools to perform data analytics for a given problem (Apply) CO3: Examine concepts of cloud based IOT, Big data and IOT (Apply) CO4: Illustrate techniques and strategies for data collection and Geospatial Analytics to IOT Data (Apply)			
Course Content:				
Module 1	IOT Analytics	Assignment		**5 sessions**
Introduction – IOT Data, Challenges of IOT analytics Applications – IOT analytics Lifecycle and Techniques. IOT Cloud and Big Data Integration – Cloud based IOT platform – Data Analytics for IOT, IOT devices in different domains. IOT Analytics for the Cloud.				
Module 2	Hadoop Ecosystem Tools			**5 sessions**
Introduction – Big Data and Big Data Analytics – Hadoop Ecosystem – Hadoop Distributed File System (HDFS) – MapReduce – YARN Architecture – PIG Architecture – Apache HIVE – Mahout – Apache Spark – Apache HBase –Apache Zookeeper.				
Module 3	Overview of AWS and Thingworx	Assignment		**5 sessions**
AWS overview - AWS key services for IOT analytics. Thingworx overview. Creating an AWS Cloud Analytics environment.				
Module 4	Geospatial Analytics to IOT Data	Case Study	Data Collection and Analysis	
Strategies and Techniques in Data collection: Designing data processing for analytics – Applying big data to storage for Geospatial.				
List of Practical Tasks: **Experiment 1:[Module 1]** Level 1: Installation of Raspbian OS,working basic commands on raspberry pi Level 2: Demonstrate to obtain the temperature using DHT22 sensors . **Experiment 2: [Module 1]** Level 1: Design and Simulate the RADAR SYSTEM Using Arduino and display on the serial monitor using ultrasonic sensor/PIR WITH &WITH OUT BUZZER/Servo motor Level 2: using a raspberry pi to Demonstrate to find the distance using ultrasonic sensor hc-sr04 **Experiment 3: [Module 1]** Level 1 : using a raspberry pi Set the connections of healthcare sensors				

Level 2: using a raspberry pi to Demonstrate to find the ECG, Temperature, etc using Healthcare sensors

Experiment 4: [Module 2]

Level 1: Hadoop Single node cluster installation on ubuntu

Level 2: Hadoop Multiple node cluster installation, windows installation

Experiment 5: [Module 2]

Level 1: Basic hadoop commands and Word count analysis for given dataset

Level 2: Analysis on particular matching word on huge dataset

Experiment 6: [Module 2]

Level 1: Basic hadoop commands and Stock analysis on given dataset

Level 2: Analysis with max, min, average functions on particular field with missing values

Experiment 7: [Module 2]

Level 1: Basic hadoop commands and Temperature analysis on given dataset

Level 2: Analysis with max, min, average functions on particular field with missing values

Experiment 8: [Module 3]

Level 1: Working on hive commands

Level 2: Apply bucketing technique to bring out the difference between partitioning and bucketing

Experiment 9: [Module 3]

Level 1: Working on Hbase commands .

Level 2: Apply Hbase commands on Insurance database/employee dataset.

Experiment 10: [Module 3]

Level 1: Installation of spark and word count analysis

Level 2: Using RDD and FlatMap count how many times each word appears in a file and write out a list of words whose count is strictly greater than 4 using Spark

Experiment 11: [Module 4]

Level 1: Temperature Data stored in cloud through IoT devices

Level 2: Retrieve the data set for cloud and Apply data analytics techniques

Experiment 12: [Module 4]

Level 1: Healthcare Data stored through IoT sensors in Cloud

Level 2: Retrieve the data set for cloud and Apply data analytics techniques

Targeted Application & Tools that can be used:

Hadoop ecosystem tools, Thingworx , AWS Cloud

Project work/Assignment:

Student will be asked to carry out a mini project integrating IoT & data Analytics.

Text Book

T1. Big Data Analytics, Seema Acharya, Subhashini Chellappan, Wiley., 2nd Edition, 2019.
T2. Analytics for the Internet of things,Andrew Minteer. Packt publishing, 1st Edition,2017.
T3. Big Data and the Internet of Things, Robert Stackowiak, Art Licht, Venu Mantha and Louis Nagode, Apress, 2nd Edition, 2020

References

R1. IOT and Analytics in Agriculture.,Prasant Kumar Pattnaik, Raghvendra Kumar, Souvik Pal, S. N. Panda. Springer, First Edition, 2020.
R2. Building blocks for IOT Analytics. Internet-of-Things Analytics. John Soldatos (Editor). River Publisher Series in Signal Image and Speech Processing.2020

(iii) web resources

W1. NPTEL: https://onlinecourses.nptel.ac.in/noc20_cs92/preview W2. Coursera: https://www.coursera.org/learn/big-data-introduction W3. EDX: https://www.edx.org/course/big-data-fundamentals W4. E-book Link : https://www.wiley.com /en-us/Internet+of+Things+and+ Data+ Analytics + Handbook -p-9781119173625 https://presiuniv.knimbus.com/user#/home
Topics relevant to "SKILL DEVELOPMENT": Organize IOT data – Linked analytics datasets – Managing data lakes for **Skill Development** through **Experiential Learning** techniques. This is attained through assessment component mentioned in course handout.

Course Code: **PPS3026**	**Course Title: Industry Readiness Program – VI (Audited Course)**	L- T - P- C	2	0	0	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 develop to train future Design engineers and managers 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 making impactful Portfolio and resumes, prepare for lively, meaningful and productive group discussions and crack interviews.					

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:** CO1: Prepare professional Portfolio and Resumes . CO2: Present Portfolio effectively CO3: Apply skills and knowledge learnt for active and effective Group Discussions. CO4: Show Interview Readiness
Course Content	

Module 1	**Portfolio and Resume Building**	Classroom activities	**10 Hours**
Topics: Preparing Portfolio, Presenting their work, Sharing formats of resumes, keywords to be discussed, tips on making smart video resumes. Creating impressions through resumes, Customization, list of common mistakes, Cover letter. **Activity:** Resume building exercise			
Module 2	**Group Discussion**	Group Activity	**10 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:** Student group activity to build confidence			
Module 3	**Personal Interview**	Mock Interview	**10 Hours**
Topics: Role Play in interviews and constructive feedback, Stress Interviews, guesstimation. Do's and Don'ts'. Grooming as an integral part. Telephonic Interview and Virtual Interview, Mind Calming Interview Techniques. **Activity:** Mock interview and virtual interview			
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: Physical resume submission Assignment 2: Team formation for GD
Continuous Individual Assessment Module 1: Submit physical resume Module 2: Mock GD assessment Module 3: Individual PI Assessment

topics related to skill development: Art Of Presentation and Group Discussion for Skill Development through Participative Learning Techniques. This is attained through assessment Component mentioned in course handout.

Course Code: **CIT3400**	**Course Title:** Architecting Smart IoT Devices **Type of Course:** **Program Core -Theory**	**L-T-P-C**	3	0	0	3
Version No.						
Course Pre-requisites	ECE 2010					
Anti-requisites	NIL					
Course Description	The **Architecting Smart IoT Devices** course, offered by EIT Digital through Coursera, guides learners through the development of embedded systems devices, emphasizing the use of pre-made hardware and software components to expedite time-to-market. Participants will explore processor families, operating systems, boards, and networks, gaining insights into their selection and integration. The curriculum encompasses debugging techniques, device fine-tuning, and strategies for achieving low power consumption. By course completion, students will be equipped to architect and implement their own embedded devices					

Course Objective	The objective of the course is to familiarize the learners with the concepts of Architecting Smart IoT Devices and attain Skill Development through Participative Learning techniques			
Course Out Comes	On successful completion of the course the students shall be able to: 1. Understand how the IoT is different from traditional systems. 2. Demonstrate the revolution of internet in mobile and cloud. 3. Examine the architecture and operation of IoT. 4. Explore various tools and programming paradigms for IoT applications.			
Course Content				
Module 1	Design Principles of IoT and Prototyping the Embedded Devices for IoT	Assignment	Problem Solving	**12 Classes**
Design Principles of IoT: Design principles of connected devices, data acquiring organizing and analytics in IoT, system architecture of loT. **Prototyping the Embedded Devices for IoT:** System hardware and prototyping, sensors and actuators for IoT, Radio module and wireless sensor network, gateways internet and web, software components.				
Module 2	Embedded Programming for IoT	Assignment	Problem Solving	**10 Classes**
Embedded Programming for IoT: Programming connected devices, C and python for IoT, Case study: Temperature controller, Smart irrigation system.				
Module 3	Embedded RTOS	Assignment	Problem Solving	**12 Classes**
Embedded RTOS: Program structure and real time, multitasking and scheduling, RTOS services, signals, semaphores, Nucleus SE, application timers, interrupts in nucleus ES, Nucleus SE initialization and starn1p.				
Module 4	Tools for IoT and loT physical Devices	Assignment	Problem Solving	**11 Classes**

Tools for IoT: Introduction, chef puppet, NETCONF - YANG case studies**. IoT physical Devices:** Basic building blocks of an IoT device and endpoints, family of ploT devices, pcDuino, Beagle bone black, cubie board, domain specific IoTs.
Targeted Application & Tools that can be used:
Text Book 1. Raj Kamal, Internet of Things, Architecture and Design Principles, lst edition, McGraw Hill Education, May 2017. 2. Arsheep Baga and Vijay Madisetti, Internet of Things: A Hands-On Approach, 1st Edition, Universities press, 2015.
References R1. David Etter, IoT (Internet of Things Programming: A simple and fast way of Learning IoT, Kindle edition 2016. R2. Fei HU, Security and Privacy in Internet of Things (loTs): Models, Algorithms, and Implementations, 1st Edition, CRC Press, 2016. R3. Colin Walls, Embedded RTOS Design Insights and Implementation. 1st edition. Elsevier. December 2020. **Web Resources:** W1. https://www.coursera.org/learn/iot-architecture W2. https://www.mooc-list.com/course/architecting-smart-iot-devices-coursera W3. https://www.classcentral.com/course/iot-architecture-6839
Topics relevant to "SKILL DEVELOPMENT": Architecting Smart IoT Devices for **Skill development** through **Participative Learning t**echniques. This is attained through the assessment component mentioned in the course handout.

Course Code: **CIT3401**	**Course Title:** Intelligent Sensor and System	**L-T-P-C**	3	0	0	3

<table>
<tr><td>Version No.</td><td colspan="4"></td></tr>
<tr><td>Course Pre-requisites</td><td colspan="4">CSE3155</td></tr>
<tr><td>Anti-requisites</td><td colspan="4">NIL</td></tr>
<tr><td>Course Description</td><td colspan="4">The Intelligent Sensor and System course explores the design, development, and application of smart sensors and intelligent systems in IoT and automation. It covers sensor principles, signal processing, data acquisition, and wireless communication technologies such as BLE, Zigbee, and LoRa. The course also delves into AI-powered sensor analytics, sensor fusion techniques, edge computing, and real-time decision-making for smart applications in healthcare, industrial automation, and smart cities. By the end, learners will gain expertise in building intelligent sensing systems with enhanced accuracy, efficiency, and autonomy.</td></tr>
<tr><td>Course Objective</td><td colspan="4">The objective of the course is to familiarize the learners with the concepts of Intelligent Sensor and System and attain Skill Development through Participative Learning techniques</td></tr>
<tr><td>Course Out Comes</td><td colspan="4">On successful completion of the course the students shall be able to:
1. Analyze the sensors available in IoT based on application requirements and the Sensing methods.
2. Create a Real-time application by choosing appropriate sensors for temperature monitoring.
3. Interfacing different types of Sensors with MCU.
4. Infer Wireless Sensing, RF Sensing and RF MEMS.</td></tr>
<tr><td>Course Content</td><td colspan="4"></td></tr>
<tr><td>Module 1</td><td>Basics of Sensors and Application Specific Sensors</td><td>Assignment</td><td>Problem Solving</td><td>12 Classes</td></tr>
<tr><td colspan="5">Basics of Sensors: Introduction- Sensor Vs Transducer, Nature of Sensors, Sensor Output Characteristics, Sensing Technologies, Digital Output Sensors.

Application Specific Sensors: Occupancy and motion detectors: ultrasonic – microwave – capacitive detectors- optical presence sensor, Light Detectors: Photo diodes – phototransistor – photoresistorCCD and CMOS image sensors, Temperature Sensors: thermos-resistive sensors – thermoelectric contact sensor.</td></tr>
</table>

Module 2	Sensor with Microcontroller	Assignment	Problem Solving	**11 Classes**
Sensor with Microcontroller: Introduction, Amplification and Signal Conditioning, Integrated Signal Conditioning, Digital Conversion, MCU Control, MCUs for Sensor Interface, Techniques and Systems Considerations, Sensor Integration.				
Module 3	Wireless Sensing	Assignment	Problem Solving	**12 Classes**
Wireless Sensing: Wireless Data and Communications, Wireless Sensing Networks, Industrial Wireless Sensing Networks, RF Sensing, Telemetry, RF MEMS, Complete System Consideration.				
Module 4	Smart Applications and System Requirements	Assignment	Problem Solving	**10 Classes**
Smart Applications and System Requirements: Automotive Applications, Industrial (Robotic) Applications, Consumer Applications, Future Sensor Plus Semiconductor Capabilities, Future System Requirements.				
Targeted Application & Tools that can be used:				
Text Book 1. Frank, Randy, "Understanding smart sensors", Artech House integrated microsystems series, 3rd Edition, 2013. 2. Jacob Fraden, "Handbook of Modern Sensors: Physics, Designs, and Applications", 5th Edition, Springer, 2016.				
References R1. Vlasios Tsiatsis, Stamatis Karnouskos, Jan Holler, David Boyle, Catherine Mulligan, "Internet of Things: Technologies and Applications for a New Age of Intelligence", Academic Press, 16- Nov- 2018. R2. Henry Leung, Subhas Chandra Mukhopadhyay, "Intelligent Environmental Sensing", Springer, 22-Jan-2015. **Web Resources:** W1.https://www.sciencedirect.com/topics/engineering/smart-sensors W2. https://www.azosensors.com/article.aspx?ArticleID=1289				

Topics relevant to "SKILL DEVELOPMENT":
Intelligent Sensor and System for **Skill development** through **Participative Learning** techniques. This is attained through the assessment component mentioned in the course handout.

Course Code: CIT3402	**Course Title:** IoT Architecture and Protocol	**L-T-P-C**	2	0	2	3
Version No.						
Course Pre-requisites	CSE3155					
Anti-requisites	NIL					
Course Description	The IoT Architecture and Protocols course provides a comprehensive understanding of the layered architecture of IoT systems, including perception, network, edge, and application layers. It covers key IoT communication protocols such as UPnP, CoAP, MQTT, XMPP. SCADA, Web Socket, IP-based Protocols: 6LoWPAN, RPL; Authentication Protocols; IEEE 802.15.4. The course also explores IoT data flow, interoperability challenges, security considerations, and real-world use cases in smart cities, healthcare, and industrial automation, equipping learners with the knowledge to design and implement efficient and secure IoT solutions.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of IoT Architecture and Protocol and attain Employability through Problem Solving Methodologies.					
Course Out Comes	On successful completion of the course the students shall be able to: 1. Comprehend the essentials of IoT and its applications 2. Explain the concepts of IoT Architecture Reference model and IoT Reference Architecture 3. Analyse various IoT Application layer Protocols. 4. Apply IP based protocols for IoT based systems.					
Course Content						

Module 1	Introduction and IoT Reference Model	Assignment	Problem Solving	**8 sessions**
Introduction to IOT, Applications of IOT, Use cases of IOT **IoT Reference Model:** Domain, information, functional and communication models. Amazon Web Services for IoT: Amazon EC2, Amazon Auto Scaling, Amazon S3, Amazon RDS, Amazon DynamoDB, Amazon Kinesis, Amazon SQS, Amazon EMR, SkyNet IoT Messaging Platform.				
Module 2	IoT Reference Architecture	Assignment	Problem Solving	**8 sessions**
IoT Reference Architecture: Architecture, Functional, information, deployment and operation views, SOA based Architecture, API-based Architecture, OPENIoT Architecture for IoT/Cloud Convergence.				
Module 3	Application Protocols for IoT	Assignment	Problem Solving	**8 sessions**
Application Protocols for IoT: UPnP, CoAP, MQTT, XMPP. SCADA, Web Socket, IP-based Protocols: 6LoWPAN, RPL; Authentication Protocols; IEEE 802.15.4.				
Module 4	Case study	Assignment	Problem Solving	**06 Sessions**
Case study: Cloud-Based Smart-Facilities Management, Healthcare, Environment Monitoring System				
Targeted Application & Tools that can be used:				
Experiments	1. Execute Hello world in cooja Simulator [15 sessions] 2. Study of 6LoWPAN protocol 3. Analysis of CoAP Mesh Network 4. Study of HTTP Protocol			

	5. Testing MQTT based IoT based Protocol or Experimental study of IoT based topologies on MQTT topologies 6. Simulation of Bluetooth Low Energy and Zigbee Smart Energy

Text Book

1. Bassi, Alessandro, et al, "Enabling things to talk", Springer-Verlag Berlin An, 2016.

2. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", CISCO Press, 2017

3. Vijay Madisetti and Arshdeep Bagha, "Internet of Things (A Hands-on- Approach)", 1st Edition, VPT, 2014.

References

R1. Hersent, Olivier, David Boswarthick, and Omar Elloumi. "The internet of things: Key applications and protocols", John Wiley & Sons, 2011.

R2. Bunya, Rajkumar, and Amir Vahid Dastjerdi, eds "Internet of Things:Principles and paradigms", Elsevier, 2016.

Web Resources:

W1. https://www.slideshare.net/slideshow/unit-vpdf-258200283/258200283

Topics relevant to "SKILL DEVELOPMENT":
IoT Architecture and Protocols for **Employability through Problem Solving Methodologies.** This is attained through the assessment component mentioned in the course handout.

Course Code: **CIT3403**	**Course Title:** **Embedded Systems For IoT** **Type of Course:** **Theory**	**L-T-P-C**	3	0	0	3
Version No.						
Course Pre-requisites	ECE2010					
Anti-requisites	NIL					

Course Description	This course provides an in-depth understanding of embedded systems and the Internet of Things (IoT), focusing on hardware architecture, programming, and real-world applications. Students will learn about microcontrollers, interfacing techniques, and embedded C programming. The course covers IoT concepts, including communication protocols, data acquisition, and cloud integration. Practical lab sessions will enable students to develop and implement IoT-based applications using platforms like Arduino and Raspberry Pi. By the end of the course, students will be able to design, build, and deploy smart embedded systems for applications in home automation, healthcare, agriculture, and industrial IoT.			
Course Objective	The objective of the course is to familiarize the learners with the concepts of Embedded System for IoT and attain Employability through Problem Solving Methodologies.			
Course Out Comes	On successful completion of the course the students shall be able to: 1. To learn the internal architecture and programming of an embedded processor. 2. To introduce interfacing I/O devices to the processor. 3. To introduce the evolution of the Internet of Things (IoT). 4. To build a small low-cost embedded and IoT system using Arduino/RaspberryPi/ openplatform.			
Course Content				
Module 1	8-BIT EMBEDDED PROCESSOR and EMBEDDED C PROGRAMMING	Assignment	Problem Solving	**10 sessions**
Microcontroller – Architecture – Instruction Set and Programming – Programming Parallel Ports – Timers and Serial Port – Interrupt Handling. EMBEDDED C PROGRAMMING: Memory And I/O Devices Interfacing – Programming Embedded Systems in C – Need For RTOS – Multiple Tasks and Processes – Context Switching – Priority Based Scheduling Policies				
Module 2	IOT AND ARDUINO PROGRAMMIN	Assignment	Problem Solving	**10 sessions**
Introduction to the Concept of IoT Devices – IoT Devices Versus Computers – IoT Configurations – Basic Components – Introduction to Arduino – Types of Arduino– Arduino Toolchain – Arduino Programming Structure – Sketches – Pins – Input/Output From Pins Using Sketches – Introduction to Arduino Shields – Integration of Sensors and Actuators with Arduino.				

Module 3	IoT Communication And Open Platforms	Assignment	Problem Solving	**06 sessions**
IoT Communication Models and APIs – IoT Communication Protocols – Bluetooth – WiFi – ZigBee– GPS – GSM modules – Open Platform (like Raspberry Pi) – Architecture – Programming –Interfacing – Accessing GPIO Pins – Sending and Receiving Signals Using GPIO Pins –Connecting to the Cloud.				
Module 4	APPLICATIONS DEVELOPMENT	Assignment	Problem Solving	**04 sessions**
Complete Design of Embedded Systems – Development of IoT Applications – Home Automation –Smart Agriculture – Smart Cities – Smart Healthcare				
Targeted Application & Tools that can be used:				
Text Book 1. **Muhammad Ali Mazidi, Janice Gillispie Mazidi, and Rolin D. McKinlay** – *The 8051 Microcontroller and Embedded Systems Using Assembly and C* (2nd Edition, Pearson) 2. **Raj Kamal** – *Internet of Things: Architecture and Design Principles* (McGraw Hill) 3. **Jonathan Valvano** – *Embedded Systems: Introduction to ARM Cortex-M Microcontrollers* (CreateSpace) 4. **Michael Margolis** – *Arduino Cookbook* (O'Reilly Media) 5. **Simon Monk** – *Programming the Raspberry Pi: Getting Started with Python* (McGraw Hill)				
References R1. David E. Simon – An Embedded Software Primer (Pearson) R2. Frank Vahid and Tony Givargis – Embedded System Design: A Unified Hardware/Software Introduction (Wiley) R3. Adrian McEwen & Hakim Cassimally – Designing the Internet of Things (Wiley) R4. Pethuru Raj & Anupama Raman – The Internet of Things: Enabling Technologies, Platforms, and Use Cases (CRC Press) R5. Daniel Minoli – Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications (Wiley) **Web Based Resources and E-books:** W1. https://archive.nptel.ac.in/courses/108/102/108102169/ W2. https://archive.nptel.ac.in/courses/106/105/106105193/				

W3. https://www.coursera.org/learn/iot W4. https://www.edx.org/course/collaborative-data-science-for-healthcare W4. https://ocw.mit.edu/courses/6-087-practical-programming-in-c-january-iap-2010/
Topics relevant to "SKILL DEVELOPMENT": Embedded System for **Employability through Problem Solving Methodologies.** This is attained through the assessment component mentioned in the course handout.

Course Code: **CIT3404**	**Course Title:** **IoT System Design and Development** **Type of Course:** **Theory**	**L-T-P-C**	3	0	0	3
Version No.						
Course Pre-requisites	ECE2010					
Anti-requisites	NIL					
Course Description	The IoT System Design and Development course provides a comprehensive understanding of IoT architecture, hardware components, communication protocols, data management, and real-world applications. Students will gain hands-on experience with embedded platforms like Arduino, Raspberry Pi, and Jetson Nano, integrating sensors, actuators, and microcontrollers for IoT solutions. The course covers Wi-Fi, Bluetooth, LPWAN, and CoAP protocols, along with IoT data storage, analytics, and visualization. Learners will explore IoT applications in smart homes, healthcare, agriculture, industrial automation, and smart cities, while addressing design challenges, security concerns, and emerging technologies such as AIoT, Blockchain, and 5G integration. Through participative learning and problem-solving activities, students will develop practical skills to design and implement IoT-driven smart applications.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of IoT system Design and Development and attain Employability through Problem Solving Methodologies.					
Course Out Comes	On successful completion of the course the students shall be able to: 1. Understand the basic concepts, principles and challenges in IoT. 2. Describe the functioning of hardware devices and sensors used for IoT. 3. Analyze network communication aspects and protocols used in IoT.					

	4. Apply IoT for developing real life applications using Arduino programming.			
Course Content				
Module 1	Introduction to Internet of Things (IoT) and Hardware for IoT	Assignment	Problem Solving	**11 Classes**
Introduction to Internet of Things (IoT): Vision, Definition, IoT architecture: Layers and protocols, technology behind IoT, Sources of the IoT, M2M Communication, IoT Examples. Sensing, Actuation. IoT communication models: Device-to-device, device-tocloud, device-to-gateway, Challenges and opportunities in IoT **Hardware for IoT:** Sensors, Digital sensors, actuators, radio frequency identification (RFID) technology, microcontrollers, and single-board computers, Embedded Platforms for IoT: Embedded computing basics, Overview of IOT supported Hardware platforms such as Arduino, Raspberry pi, Jetson nano Beagle Bone, and Intel Galileo boards				
Module 2	IoT Protocols and Arduino Programming	Assignment	Problem Solving	**11 Classes**
IoT Protocols and Arduino Programming: Wi-Fi, Bluetooth, CoAP, LPWAN protocol. Sensor Networks: Sensor deployment & Node discovery, Introduction to Arduino Programming: Arduino Platform Boards Anatomy, Arduino IDE, coding, using emulator, using libraries, additions in Arduino, programming the Arduino for IoT, Integration of Sensors and Actuators with Arduino				
Module 3	IoT Data Management and Analytics	Assignment	Problem Solving	**12 Classes**
IoT Data Management and Analytics: Data generation and collection in IoT systems, IoT data storage, Cloud-based and local storage, Data preprocessing and analysis, Basics of analytics for IoT data, IoT dashboards, Visualization and interpretation of data, Role of machine learning and AI in IoT				
Module 4	Challenges in IoT Design challenges	Assignment	Problem Solving	**11 Classes**

Challenges in IoT Design challenges: IoT applications: Smart homes, smart cities, healthcare, agriculture, Smart Metering, City Automation, Automotive Applications, home automation, smart cards, and industry, IoT and automation: Role in industrial IoT (IIoT), Emerging technologies: AIoT, Blockchain for IoT, and 5G integration IoT, Development Challenges, Security Challenges.

Targeted Application & Tools that can be used:

Text Book

1. Olivier Hersent, David Boswarthick, Omar Elloumi "The Internet of Things key applications and protocols", willey.

References

R1. Jeeva Jose, Internet of Things, Khanna Publishing House.

R2. Michael Miller "The Internet of Things" by Pearson.

R3. Raj Kamal "INTERNET OF THINGS", McGraw-Hill, 1ST Edition, 2016.

R4. Arshdeep Bahga, Vijay Madisetti "Internet of Things (A hands on approach)" 1ST edition, VPI publications,2014.

R5. Adrian McEwen, Hakin Cassimally "Designing the Internet of Things" Wiley India.

Web Based Resources and E-books:

W1. https://avigna.ai/what-are-protocols-in-iot-a-guide-to-communication-standards-for-smart-devices/

W2. https://www.arduino.cc/en/Guide

W3. https://www.startertutorials.com/blog/wireless-protocols-for-iot.html

W4. https://www.edx.org/course/collaborative-data-science-for-healthcare

Topics relevant to "SKILL DEVELOPMENT":
IoT System Design and Development for **Employability through Problem Solving Methodologies** . This is attained through the assessment component mentioned in the course handout.

Course Code: CIT3405	**Course Title:** Edge and Fog Computing for IoT	**L-T-P-C**	3	0	0	3
Version No.						

Course Pre-requisites	CIT2500			
Anti-requisites	NIL			
Course Description	This course explores the concepts, architecture, and technologies behind Edge and Fog Computing as essential components of modern Internet of Things (IoT) ecosystems. Students will learn how these paradigms address the limitations of cloud computing by bringing computation closer to data sources, thus enabling low latency, bandwidth efficiency, and real-time decision-making. Topics include distributed processing, resource management, latency optimization, security, and real-world applications across domains such as smart cities, healthcare, industrial IoT (IIoT), and autonomous systems.			
Course Objective	The objective of the course is to familiarize the learners with the concepts of Edge and Fog Computing for IoT and attain Skill Development through Participative Learning techniques			
Course Out Comes	On successful completion of the course the students shall be able to: 1. Explore technologies behind the communication and management of fogs and edge resources. 2. Learn the techniques for storage and computation in fogs, edges, 5G and clouds. 3. Implement Internet of Everything (IoE) applications through fog computing architecture and use optimization techniques for the same. 4. Analyze the performance and issues of the applications developed using fog and edge architecture.			
Course Content				
Module 1	Internet of Things (IoT) and New Computing Paradigms and Challenges in Federating Edge Resources	Assignment	Problem Solving	**12 Classes**
Internet of Things (IoT) and New Computing Paradigms: Introduction – Relevant Technologies – Fog and Edge Computing Completing the Cloud – Hierarchy of Fog and Edge Computing – Business Models – Edge Computing Platforms – Opportunities and Challenges				

<table>
<tr><td colspan="5">Challenges in Federating Edge Resources: Introduction – Methodology – Integrated C2F2T Literature by Modeling Technique – Integrated C2F2T Literature by Use – Case Scenarios – Integrated C2F2T Literature by Metrics – Threads – Standards</td></tr>
<tr><td>Module 2</td><td>Orchestration of Network Slices in Fog, Edge, and Clouds and Optimization Problems in Fog and Edge Computing</td><td>Assignment</td><td>Problem Solving</td><td>12 Classes</td></tr>
<tr><td colspan="5">Orchestration of Network Slices in Fog, Edge, and Clouds: Introduction – Background – Network Slicing – Network Slicing in Software-Defined CloudsNetwork Slicing Management in Edge and Fog – Internet of Vehicles (IoV): Architecture, Protocols and Seven-layer security model architecture for Internet of Vehicles – IoV: Network Models, Challenges and future aspects

Optimization Problems in Fog and Edge Computing: Preliminaries – The Case for Optimization in Fog Computing-Formal Modeling Framework for Fog Computing – Metrics – Further Quality Attributes – Optimization Opportunities along the Fog Architecture – Optimization Opportunities along the Service Life Cycle – Toward a Taxonomy of Optimization Problems in Fog Computing</td></tr>
<tr><td>Module 3</td><td>Middleware for Fog and Edge Computing and Technologies in Fog Computing</td><td>Assignment</td><td>Problem Solving</td><td>8 Classes</td></tr>
<tr><td colspan="5">Middleware for Fog and Edge Computing: Need for Fog and Edge Computing Middleware – Design Goals-State-of-the-Art Middleware Infrastructures – System Model – Case Study.

Technologies in Fog Computing: Fog Data Management – Smart Building – Predictive Analysis with FogTorch – Machine Learning in Fog Computing – Data Analytics in the Fog – Data Analytics in the Fog Architecture.</td></tr>
<tr><td>Module 4</td><td>Applications of Fog and Edge Computing</td><td>Assignment</td><td>Problem Solving</td><td>8 Classes</td></tr>
<tr><td colspan="5">Exploiting Fog Computing in Health Monitoring-Smart Surveillance Video Stream Processing at the Edge for Real – Time Human Objects Tracking-Fog Computing Model for Evolving Smart Transportation Applications – Testing Perspectives of Fog – Based IoT Applications – Legal Aspects of Operating IoT Applications in the Fog</td></tr>
<tr><td colspan="5">Targeted Application & Tools that can be used:</td></tr>
</table>

Text Book

1. Buyya, Rajkumar, and Satish Narayana Srirama, Fog and Edge computing: Principles and Paradigms, 2019, 1st edition, John Wiley & Sons, USA.

References

R1. Bahga, Arshdeep, and Vijay Madisetti, Cloud computing: A hands-on approach, 2014, 2 ndedition, CreateSpace Independent Publishing Platform, USA.

R2. OvidiuVermesan, Peter Friess, "Internet of Things –From Research and Innovation to Market Deployment", 2014, 1st edition, River Publishers, India.

Web Based Resources and E-books:

W1. https://www.cisco.com/c/en/us/solutions/internet-of-things/fog-computing.html

W2. https://www.fogcomputingconsortium.org/architecture/

W3. https://www.technologyreview.com/2015/03/17/247693/fog-computing/

W4. https://www.etsi.org/technologies/multi-access-edge-computing

Topics relevant to "SKILL DEVELOPMENT":

Edge and Fog computing for IOT for **Skill development** through **Participative Learning t**echniques. This is attained through the assessment component mentioned in the course handout.

Course Code: CIT3406	**Course Title:** Cloud Computing for IOT **Type of Course:** Theory	**L-T-P-C**	3	0	0	3
Version No.						
Course Pre-requisites	CSE3351					
Anti-requisites	NIL					

Course Description	This course offers a comprehensive introduction to the Internet of Things (IoT) and Cloud Computing, focusing on key concepts, technologies, and hands-on experience. The course starts with understanding the fundamentals of IoT, including its components like Arduino architecture, sensors, and actuators. Students will explore IoT communication protocols, networking using the ESP8266 Wi-Fi module, and cloud integration for data storage and processing. The course will provide an overview of cloud platforms such as AWS, Microsoft Azure, and Google Cloud Platform. Additionally, students will delve deeper into cloud services, with a focus on AWS architecture, compute, and storage services. By the end of the course, students will have a solid understanding of designing IoT systems and integrating them with cloud platforms for data management and analytics.			
Course Objective	The objective of the course is to familiarize the learners with the concepts of Cloud Computing for IoT and attain Employability through Problem Solving Methodologies			
Course Out Comes	On successful completion of the course the students shall be able to: 1. Understand the fundamental concepts of IoT and how sensors and actuators work with Arduino. 2. Understand cloud computing and how to manage, store, and process data on cloud platforms. 3.Work with major cloud platforms such as Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform. 4. Understand the core architecture of AWS and its services such as Lambda, EC2, and S3 for building and scaling cloud-based IoT applications.			
Course Content				
Module 1	Introduction of IoT	Assignment	Problem Solving	**12 Classes**
Introduction of IoT Introduction to IoT. Understanding IoT fundamentals, Arduino Simulation Environment. Arduino Uno Architecture, and Sensor & Actuators with Arduino and Overview of Sensors working.				
Module 2	Updation in IoT Systems	Assignment	Problem Solving	**11 Classes**

Updation in IoT Systems Basic Networking with ESP8266 WiFi module. Basics of Wireless Networking, IoT Protocols, and Cloud Platforms for IOT with some real live minor projects.

Module 3	Cloud Computing	Assignment	Problem Solving	**12 Classes**

Cloud Computing: Introduction, Management, storage and processing of data on networks of the internet server, and On-demand IT resources over the internet etc. Introduction to platforms such as Amazon Web Services, Microsoft Azure and Google Cloud Platform.

Module 4	Advancement in Cloud Computing	Assignment	Problem Solving	**10 Classes**

Advancement in Cloud Computing: Brief on AWS Architecture and different models of Cloud Computing. Compute Services: AWS Lambda, Elastic Beanstalk, AWS EC2, Auto Scaling, and Load Balancing. Storage Services: Amazon EBS, Amazon S3, Amazon EFS, Amazon Glacier, Amazon Global Accelerator, Amazon FSx, and Storage Gateway

Targeted Application & Tools that can be used:

Text Book

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. 2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759
3. 3. Raspberry Pi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895

References

R1. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 3. Editors Ovidiu Vermesan

R2. Peter Friess,'Internet of Things – From Research and Innovation to Market Deployment', River Publishers, 2014

R3. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014**Web Based Resources and E-books:**

W1.https://www.coursera.org/learn/iot-wireless-cloud-computing

W2. https://www.edx.org/learn/amazon-web-services-aws/amazon-web-services-aws-iot-developing-

and-deploying-an-internet-of-things
Topics relevant to "SKILL DEVELOPMENT": Cloud Computing for **Skill development** through **Participative Learning t**echniques. This is attained through the assessment component mentioned in the course handout.

Course Code: **CIT3407**	**Course Title: IOT Data Analytics and Machine Learning** **Type of Course: Theory**	**L-T-P-C**	3	0	0	3
Version No.						
Course Pre-requisites	CSE2264					
Anti-requisites	NIL					
Course Description	This course provides an in-depth understanding of data analytics and machine learning techniques for IoT applications. Students will explore how IoT devices generate data, methods for data collection, processing, and real-time analytics. The course covers statistical analysis, feature engineering, and predictive modeling using machine learning techniques tailored for IoT environments. Additionally, students will learn about edge and cloud-based analytics, AI-driven decision-making, and anomaly detection for IoT security and efficiency.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of IOT Data Analytics and Machine Learning and attain Skill Development through Participative Learning techniques					
Course Out Comes	On successful completion of the course the students shall be able to: 1. Understand the fundamentals of IoT Analytics and Challenges 2. Understand and analyze IoT Devices and Networking Protocols 3. Understand exploring and visualizing data 4.Apply IoT Analytics for the Cloud					
Course Content						

Module 1	Defining IoT Analytics and Challenges and IoT Devices and Networking Protocols	Assignment	Problem Solving	**12 Classes**
Defining IoT Analytics and Challenges: Introduction to IoT, applications, IoT architectures, introduction to analytics, IoT analytics challenges IoT Devices and Networking Protocols: IoT devices, Networking basics, IoT networking connectivity protocols, IoT networking data messaging protocols, Analyzing data to infer protocol and device characteristics.				
Module 2	Exploring IoT Data	Assignment	Problem Solving	**12 Classes**
Exploring IoT Data: Exploring and visualizing data, Techniques to understand data quality, Basic time series analysis, Statistical analysis.				
Module 3	Data Science for IoT Analytics	Assignment	Problem Solving	**8 Classes**
Data Science for IoT Analytics: Introduction to Machine Learning, Feature engineering with IoT data, Validation methods, Understanding the bias–variance tradeoff, Use cases for deep learning with IoT data.				
Module 4	ML in Industrial IoT	Assignment	Problem Solving	**8 Classes**
ML in Industrial IoT Big Data Analytics and Software Defined Networks: IIoT Analytics - Introduction, Machine Learning and Data Science - Part I, Part II, R and Julia Programming, Data Management with Hadoop.				
Targeted Application & Tools that can be used:				
Text Book 1. Minteer, Andrew, Analytics for the Internet of Things (IoT), Packt Publishing Ltd. July 2017, ISBN 9781787120730.				
References				

1. Kai Hwang, Min Chen, Big-Data Analytics for Cloud, IoT and Cognitive Computing, Wiley.

2. Hwaiyu Geng, Internet of Things and Data Analytics Handbook, Wiley.

3. John Soldatos, Building Blocks for IoT Analytics Internet-of-Things Analytics, River Publishers Gerardus Blokdyk.

4. IoT Analytics A Complete Guide, 5starcooks

Web Based Resources and E-books:

W1: Coursera – IoT Data Analytics & Machine Learning

W2: Udacity – AI for IoT

W3: edX – Data Analytics for IoT

Topics relevant to "SKILL DEVELOPMENT":
Industrial and Medical IOT for **Skill development** through **Participative Learning t**echniques. This is attained through the assessment component mentioned in the course handout.

Course Code: CIT3408	**Course Title:** **Digital Twin and Simulation in IoT** **Type of Course:** **Theory**	**L-T-P-C**	3	0	0	3
Version No.						
Course Pre-requisites	CSE3078					
Anti-requisites	NIL					
Course Description	This course covers the foundations and advanced concepts of Internet of Things (IoT), communication protocols, and the design of Digital Twins. It emphasizes the integration of IoT with emerging technologies such as edge computing, cloud computing, and machine learning for data-driven insights in manufacturing, healthcare, smart cities, and more. The course will also explore the role of IoT in industrial automation, control systems, and process industry, providing real-world case studies and applications.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Wearable Technology and IOT and attain Skill Development through Participative Learning techniques					
Course Out Comes	On successful completion of the course the students shall be able to: 1. Enumerate different communication technologies used in Industry 4.0. 2. Perform edge, and cloud computing and visualize the data					

	3. Introduce the concept of Digital Twins in manufacturing the industry 4. Design Digital Twins for discrete and process industries			
Course Content				
Module 1	Introduction	Assignment	Problem Solving	**12 Classes**
Introduction: The various industrial revolutions, digitalization, and the networked economy, drivers, enablers, comparison of industry 4.0 factory and today's factory, challenges. Communication Technologies of IIoT Communication Protocols: IEEE 802.15.4, ZigBee, Z Wave, Bluetooth, BLE, NFC, RFID, Industry standards communication technology (LoRA, WAN, OPC UA, MQTT), connecting into existing Modbus and Profibus technology, wireless network.				
Module 2	Visualization and Data Types of IIoT Communication	Assignment	Problem Solving	**12 Classes**
Visualization and Data Types of IIoT Communication. Front-end EDGE devices, Emerging descriptive data standards for IIoT, Cloud database, Could computing, Fog/Edge computing. Pushing data to the cloud. Grabbing the content from a web page, Sending data on the web, Troubleshooting. Application of IIOT Case study: Health monitoring, smart city, Smart irrigation, Robot surveillance.				
Module 3	Design of Digital Twins	Assignment	Problem Solving	**12 Classes**
Design of Digital Twins: Technological needs. Physics-based approach: Model identification, Model creation. Data- driven approach: Model development using ML/DL models. Digital twins for Prototype, Product, and Performance.				
Module 4	Digital Twins validation	Assignment	Problem Solving	**10 Classes**
Digital Twins validation. Control system requirements in a Discrete Industry, Digital Twins of a Product, Digital Thread in a Discrete Industry, Data Collection & Analysis for Product & production improvements, Automation Simulation, and Digital Enterprise. Process Industry: Basics of Process Industry, Trends in the process industry, control system requirements in a process industry, Digital Twins of a plant, Digital Thread in Process Industry.				
Targeted Application & Tools that can be used:				

Text Book

1. Bruno Sergi, Elena G.Popkova, Aleksei V. Bogoviz and Tatiana N. Litvinova, "Understanding Industry 4.0: AI, The internet of things, and the future of work", Emerald publishing limited, 2019.
2. Alp Ustundag and Emre Cevikcan, "Industry 0: Managing the Digital Transformation", Springer Series in Advanced Manufacturing., Switzerland, 2017.

References

R1. Andrew Yeh Chris Nee, Fei Tao, and Meng Zhang, "Digital Twin Driven Smart Manufacturing", Elsevier Science., United States, 2019.

R2. Shyam Varan Nath, Pieter van Schalkwyk, Dan Isaacs, "Building Industrial Digital Twins Design, Develop, and Deploy Digital Twin Solutions for Real-world Industries Using Azure Digital Twins", Packt Publishing, 2021.

Web Based Resources and E-books:

W1.https://docs.oracle.com/en/cloud/paas/iot-cloud/iotgs/iot-digital-twin-framework.html

W2. https://www.cumulocity.com/resource-library/what-are-iot-digital-twins/

W3. https://www.ptc.com/en/blogs/corporate/iot-digital-twin

Topics relevant to "SKILL DEVELOPMENT":

IIoT, Digital Twin and IEEE802.15.4 for **Skill development** through **Participative Learning** techniques. This is attained through the assessment component mentioned in the course handout.

Course Code: CIT3409	**Course Title:** Autonomous System & Robotics with IOT **Type of Course:** **Theory**	**L-T-P-C**	3	0	0	3
Version No.						
Course Pre-requisites	CSE2506					
Anti-requisites	NIL					
Course Description	Robotics and IoT are converging to create intelligent, autonomous systems that enhance efficiency across industries such as agriculture, healthcare, manufacturing, and transportation. By integrating IoT sensors, cloud computing, AI, and machine learning, robots can perceive, analyze, and act in real time, enabling applications like smart warehouses, autonomous vehicles, precision farming, and remote healthcare. IoT-driven robotics allows for real-time monitoring, predictive maintenance, and adaptive decision-making, making systems more efficient and responsive.					

Course Objective	The objective of the course is to familiarize the learners with the concepts of Autonomous System and Robotics with IoT and attain Skill Development through Participative Learning techniques			
Course Out Comes	On successful completion of the course the students shall be able to: 1. Understand IoT ecosystem in robotic paradigm 2. Analyze IoT infrastructure and develop IoRT applications 3. Apply IoT in robotics over different platforms 4. Implement Cloud robotics in automations			
Course Content				
Module 1	Introduction to IoT and Vision systems and Robotic Sensors	Assignment	Problem Solving	**12 Classes**
Introduction to IoT and Vision systems: History and evolution of IoT, AI, ML, Machine Vision, optoelectronic sensors, 3D & 2D machine vision technologies, robot navigation, control schemes, motion controllers, intelligent algorithms and vision systems. **Robotic Sensors:** Optical sensors and actuators; Mechanical sensors and actuators; Acoustic sensors and actuators; Performance characteristics of sensors and actuators				
Module 2	Internet of Robotic Things	Assignment	Problem Solving	**10 Classes**
Internet of Robotic Things: Communication architecture for IoRT; Decentralized and automated IoT infrastructure using Blockchain; IoRT Platforms Architecture, IoRT applications				
Module 3	Autonomous Vehicle Systems and Industrial Internet of Things	Assignment	Problem Solving	**12 Classes**

Introduction to Autonomous Driving; Perception in Autonomous Driving; Robot Operating System (ROS) Overview - Client Systems for Autonomous Driving - Decision planning and control in autonomous vehicle systems - Cloud Platform for Autonomous Driving.

Industrial Internet of Things: IIoT Architecture; IIoT Applications and Challenges; IIoT Standards and Frameworks; IIoT security concerns.

Module 4	IoMT and Robotics in Healthcare and Cloud Robotics and Industrial Automation	Assignment	Problem Solving	**11 Classes**

IoMT and Robotics in Healthcare: IoMT Driven connected healthcare, Efficient design for IoMT based healthcare design, Robotics in healthcare.

Cloud Robotics and Industrial Automation: Components of Cloud Robotics; Limitations and challenges of Cloud Robotics; Applications: Autonomous mobile robots, Cloud medical robots, Industrial robots

Targeted Application & Tools that can be used:

Text Book

1. Vermesan, Ovidiu, and Joël Bacquet, eds.,Cognitive Hyperconnected Digital Transformation: Internet of Things Intelligence Evolution, 1st edition, River Publishers, 2017.

2. A.K.Gupta, S.K.Arora, and J.Riescher, Industrial Automation and Robotics, 1st edition, Mercury Learning and Information LLC,2017

References

R1. A.K Dubey, A.Kumar, and S.R Kumar., AI and IoT-based Intelligent Automation in Robotics, 1st edition. Wiley, 2020

R2. A.E.Hassanien, N.Dey, and S.Borra, Medical Big Data and Internet of Medical Things: Advances, Challenges and Applications, 1st edition ,Taylor & Francis Group,2019

R3. S.Liu, L.Li and J.Tang, Creating Autonomous Vehicle Systems, Synthesis Lectures on Computer Science, 1st edition ,Morgan & Claypool,2018

R4. Nathan Ida, Sensors, Actuators, and Their Interfaces: A multidisciplinary introduction, 2nd edition The Institution of Engineering and Technology, 2017

Web Resources:

W1. https://www.iotforall.com/

W2. https://www.iotforall.com/future-iot-robotics

W3.https://www.iotforall.com/is-the-internet-of-robotic-things-the-future-of-manufacturing
Topics relevant to "SKILL DEVELOPMENT": Autonomous System and robotics for **Skill development** through **Participative Learning** techniques. This is attained through the assessment component mentioned in the course handout.

Course Code: **CIT3410**	**Course Title: Secure IoT** **Type of Course: Theory**	**L-T-P-C**	3	0	0	3
Version No.						
Course Pre-requisites	CSE 3078					
Anti-requisites	NIL					
Course Description	This course is ideal for those pursuing careers in IoT development, network security, and privacy management, providing them with the skills necessary to tackle the unique security challenges presented by the rapidly growing IoT ecosystem.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of IoT security and Privacy 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 different Internet of Things technologies and their applications. 2. Assess the need for Privacy and security model for the Internet of Things. 3. Explore various Trust Model for IoT and customize real time data for IoT applications. 4. Design security framework and solve IoT security issues					
Course Content						
Module 1	Security in IoT and Network Robustness and Malware Propagation Control in IoT	Assignment	Problem Solving	**8 Classes**		

IoT security: Vulnerabilities, Attacks and Countermeasures - Security Engineering for IoT development - IoT security lifecycle **Network Robustness and Malware Propagation Control in IoT:** Network Robustness - Fusion Based Defense Scheme - Sequential Defense Scheme - Location Certificate Based Scheme - Sybil node detection scheme - Formal Modeling and Verification -Sybil Attack Detection in Vehicular Networks - Performance evaluation of various Malware Dynamics Models - Analysis of Attack Vectors on Smart Home Systems.				
Module 2	Privacy Preservation in IoT and Privacy Protection in IoT	Assignment	Problem Solving	**9 Classes**
Privacy Preservation in IoT: Privacy Preservation Data Dissemination: Network Model, Threat Model – Problem formulation and definition - Baseline data dissemination - Spatial Privacy Graph based data dissemination -Experiment Validation - Smart building concept-Privacy Threats in Smart Building - Privacy Preserving Approaches in Smart Building - Smart Meter Privacy Preserving Approaches. **Privacy Protection in IoT:** Lightweight and Robust Schemes for Privacy Protection in IoT Applications: One Time Mask Scheme, One Time Permutation Scheme - Mobile Wireless Body Sensor Network - Participatory Sensing.				
Module 3	Trust Models for IoT	Assignment	Problem Solving	**12 Classes**
Trust Model Concepts - Public Key Infrastructures Architecture Components - Public Key Certificate Formats - Design Considerations for Digital Certificates - Public Key Reference Infrastructure for the IoT - Authentication in IoT - Computational Security for IoT				
Module 4	Security Protocols for IoT Access Networks	Assignment	Problem Solving	**08 Classes**
Time Based Secure Key Generation -Security Access Algorithm: Unidirectional, Bidirectional Transmission - Cognitive Security - IoT Security Framework - Secure IoT Layers – Secure Communication Links in IoT - Secure Resource Management, Secure IoT Databases.				
Targeted Application & Tools that can be used:				
Text Book 1. Hu, Fei. Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations, 2016, 1st edition, CRC Press, USA.				

References

R1. Russell, Brian and Drew Van Duren. Practical Internet of Things Security, 2016,1st edition, PACKT Publishing Ltd, UK

R2. Kim, S., Deka, G. C., & Zhang, P. (2019). Role of blockchain technology in IoT applications. Academic Press.

R3. Whitehouse O Security of things: An Implementers' guide to cyber security for internet of things devices and beyond, 2014, 1st edition, NCC Group, UK.

Web Based Resources and E-books:

W1. https://www.iotsecurityfoundation.org/

W2. https://owasp.org/www-project-internet-of-things/

W3. https://www.csail.mit.edu/research/internet-things

W4. https://www.nist.gov/programs-projects/cybersecurity-internet-things

Topics relevant to "SKILL DEVELOPMENT":

IOT Security and Privacy for **Skill development** through **Participative Learning t**echniques. This is attained through the assessment component mentioned in the course handout.

Course Code: **CIT3412**	**Course Title: IoT for healthcare and Wearable Technology** **Type of Course: Theory**	**L-T-P-C**	3	0	0	3
Version No.						
Course Pre-requisites	CSE3155					
Anti-requisites	NIL					
Course Description	A course on Iot for healthcare and wearable technology within the context of the Internet of Things (IoT) would explore the fundamentals of both, focusing on how wearable devices collect and transmit data, and the applications of this technology across various sectors					
Course Objective	The objective of the course is to familiarize the learners with the concepts of IoT for healthcare and Wearable Technology and attain Skill Development through Participative Learning techniques					

<table>
<tr><td>Course Out Comes</td><td colspan="4">On successful completion of the course the students shall be able to:
1. To provide a basic understanding of evolution of IoT and its functional modules.
2. To develop skillset to implement IoT systems for wearable applications.
3. To identify the real world problem and give IoT solutions.
4. To analyse and select appropriate protocols, wireless techniques for the problem</td></tr>
<tr><td>Course Content</td><td colspan="4"></td></tr>
<tr><td>Module 1</td><td>Role of IoT in wearable devices and IoT supported technologies: Internet/Web and networking basics</td><td>Assignment</td><td>Problem Solving</td><td>12 Classes</td></tr>
<tr><td colspan="5">Role of IoT in wearable devices: Smart connectivity and Big picture of IoT-smart devices, networks, Wireless technologies and need for data analysis. Evolution of wearable technology, Wearable IoT use cases- Smart watches , Android wear, Smart glasses, fitness trackers, health care devices, cameras, smart clothing etc

IoT supported technologies: Internet/Web and networking basics: OSI model, data transfer referred with OSI model, IP Addressing, point to point data transfer, point to multi point data transfer & network topologies, sub-nets, network topologies referred with web, introduction to web servers and cloud computing</td></tr>
<tr><td>Module 2</td><td>IoT supported technologies: Hardware platforms and Wireless communication standards</td><td>Assignment</td><td>Problem Solving</td><td>12 Classes</td></tr>
<tr><td colspan="5">IoT supported technologies: Hardware platforms: Overview of single board computers (Raspberry pi/Beagle bone black), ARM Cortex Processors, Arduino. Network Fundamentals: Overview and working principle of wired and wireless networking equipment's – router, switches, access points, and hubs. Networking configurations in Linux accessing hardware & device files interactions.

Wireless communication standards: Bluetooth - IEEE 802.15.1, Wireless LAN- IEEE 802.11(WiFi) , Near Field communication, WiMaxIEEE 802.16, LR-WPAN- IEEE 802.15.4 (Zigbee), 6LoWPAN, mobile network, GPS</td></tr>
</table>

Module 3	IOT architecture:	Assignment	Problem Solving	**10 Classes**
IoT functional requirements, building blocks, IoT architecture layers, cloud and fog based architecture, M2M – Machine to Machine architecture, Web of Things, physical layer, MAC layer, 6LoWPAN security aspects in IoT				
Module 4	IOT Application Development and Wearable IoT	Assignment	Problem Solving	**11 Classes**
Application Protocols: MQTT, REST/HTTP, CoAP, MySQL Back-end Application Designing: Apache for handling HTTP Requests, PHP & MySQL for data processing, MongoDB Object type Database, HTML, CSS &jQuery for UI Designing, JSON lib for data processing, Security & Privacy during development, Application Development for mobile Platforms: Overview of Android / IOS App Development tools **Wearable IoT:** Case studies – Health care, fitness and sports, industrial, defence and security, home automation, gaming, fashion and apparel				
Targeted Application & Tools that can be used:				
Text Book 1. Alessandro Bassi, Martin Bauer, Martin Fiedler, Thorsten Kramp, Rob van Kranenburg, Sebastian Lange, Stefan Meissner, "Enabling things to talk – Designing IoT solutions with the IoT Architecture Reference Model", Springer Open, 2013				
References 1. The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World 1st Edition 2. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, StamatisKarnouskos, Stefan Avesand, David Boyle, "From Machine to Machine to Internet of Things", Elsevier Publications, 2014. 3. IEEE Standards Association Working Group for an Architectural Framework for the Internet of Things (IoT) (P2413) - http://grouper.ieee.org/groups/2413/ 4. Internet of Things – Architecture – Final Architectural Reference Model for the IoT v3.0, http://www.iot-a.eu/publi **Web Based Resources and E-books:** W1.https://www.techtarget.com/searchmobilecomputing/definition/wearable-technology W2. https://www.investopedia.com/terms/w/wearable-technology.asp				

Topics relevant to "SKILL DEVELOPMENT":
Wireless Communication Standards, Application protocols and wearable devices for **Skill development** through **Participative Learning t**echniques. This is attained through the assessment component mentioned in the course handout.

Course Code: **CIT3413**	**Course Title:** Industrial IOT **Type of Course: Theory**	**L-T-P-C**	3	0	0	3
Version No.						
Course Pre-requisites	CSE3155					
Anti-requisites	NIL					
Course Description	The Industrial Internet of Things (IIoT) course explores the integration of smart sensors, edge computing, and connectivity in industrial settings to enhance automation, efficiency, and data-driven decision-making. It covers IIoT architecture, communication protocols, security challenges, real-world applications in manufacturing, energy, and healthcare, and the role of AI and machine learning in predictive maintenance. The course also delves into industrial cloud platforms, digital twins, and cybersecurity best practices, providing a comprehensive understanding of IIoT's impact on Industry 4.0 and smart factories.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Industrial IoT 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 Key opportunities and benefits in Industrial IoT 2. Apply virtual network to demonstrate the use of Cloud in Industrial IoT 3. Analyze industrial IoT Three tier topology and data management system 4. Summarize Legacy Industrial and Modern Communication Protocols					
Course Content						
Module 1	Introduction	Assignment	Problem Solving	**12 Classes**		

Introduction To Industrial Internet and Use-Cases: Industrial Internet- Key IIoT Technologies- Innovation and the IIoT -Key Opportunities and Benefits - The Digital and Human Workforce - Logistics and the Industrial Internet-IOT Innovations in Retail. The Technical and Business Innovators of The Industrial Internet: Cyber Physical Systems (CPS), – IP Mobility – Network Virtualization - SDN (Software Defined Networks)- The Cloud and Fog – Role of Big Data in IIOT - Role of Machine learning and AI in IIOT				
Module 2	IIOT Reference Architecture	Assignment	Problem Solving	**10 Classes**
IIOT Reference Architecture: Industrial Internet Architecture Framework (IIAF) -Industrial Internet Viewpoints -. Architectural Topology: The Three Tier Topology- Key System Characteristics- Data Management- Advanced data analytics				
Module 3	Protocols for Industrial Internet Systems	Assignment	Problem Solving	**12 Classes**
Protocols for Industrial Internet Systems: Legacy Industrial Protocols - Modern Communication Protocols- Proximity Network Communication Protocols- Wireless Communication Technologies- Gateways: industrial gateways - CoAP (Constrained Application Protocol)- NFC.				
Module 4	Middleware Software Patterns and IIOT Platforms	Assignment	Problem Solving	**11 Classes**
Middleware Software Patterns and IIOT Platforms: Publish/Subscribe Pattern: MQTT, XMPP, AMQP, DDS- Middleware Architecture- SigFoxLoRaWAN Augmented reality- Real-World Smart Factories, Application of IIOT: Case study: Health monitoring, IoT smart city, Smart irrigation, Robot surveillance				
Targeted Application & Tools that can be used:				
Text Book 1. Gilchrist, Alasdair, "Industry 4.0 The Industrial Internet of Things", Apress, 2017.				
References R1. Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat "Industrial Internet of Things: Cyber manufacturing Systems" (Springer), 2017. R2. Zaigham Mahmood, "The Internet of Things in the Industrial Sector: Security and Device connectivity, smart environments and Industry 4.0 (Springer), 2019. R3. Industrial IoT Challenges, Design Principles, Applications, and Security by Ismail Butun (editor)				

R4. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-onApproach)", 1st Edition, VPT, 2014.

R5. Michahelles, "Architecting the Internet of Things", ISBN 978-3- 642- 19156-5 e-ISBN 978-3-642- 19157-2, Springer

R6. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 20132 Cuno Pfister, Getting Started with the Internet of Things, O "Reilly Media, 2011, ISBN: 978-1-4493-9357-1

Web Resources:

W1. https://www.coursera.org/learn/applied-industrial-internet-of-things

W2. https://www.isa.org/training/course-description/dt101

W3. https://www.coursera.org/certificates/iiot-boulder

Topics relevant to "SKILL DEVELOPMENT":
Industrial IOT for **Skill development** through **Participative Learning t**echniques. This is attained through the assessment component mentioned in the course handout.

Course Code: **CIT3414**	**Course Title: IOT Data Analytics and Machine Learning** **Type of Course: Theory**	**L-T-P-C**	3	0	0	3
Version No.						
Course Pre-requisites	CSE3155					
Anti-requisites	NIL					
Course Description	This course provides a comprehensive understanding of energy management principles and techniques in IoT systems. It covers various energy sources, storage solutions, and power management strategies, focusing on optimizing energy consumption in IoT devices. Students will explore energy-efficient sensors, low-power communication technologies, and AI-driven energy optimization techniques. The course also delves into designing and implementing energy-efficient IoT solutions, including renewable energy integration and performance optimization. Additionally, it addresses advanced topics such as energy management in smart cities, industrial IoT applications, and sustainability challenges.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Energy Efficient IOT system and attain Skill Development through Participative Learning techniques					

<table>
<tr><td>Course Out Comes</td><td colspan="4">On successful completion of the course the students shall be able to:
1. Understand various energy sources, consumption patterns, and management techniques in IoT systems.
2. Analyze energy-efficient hardware and software solutions for IoT energy optimization.
3. Design and implement energy-efficient IoT solutions using renewable energy sources.
4. Evaluate real-world applications of IoT energy management in smart cities, industries, and sustainable development.</td></tr>
<tr><td>Course Content</td><td colspan="4"></td></tr>
<tr><td>Module 1</td><td>Energy Management Basics in IoT</td><td>Assignment</td><td>Problem Solving</td><td>12 Classes</td></tr>
<tr><td colspan="5">Energy Management Basics in IoT: Energy sources and storage options, Battery technologies and renewable energy solutions, Energy consumption patterns in IoT devices, Power management strategies, Energy-efficient design principles.</td></tr>
<tr><td>Module 2</td><td>Technologies for IoT Energy Management</td><td>Assignment</td><td>Problem Solving</td><td>12 Classes</td></tr>
<tr><td colspan="5">Technologies for IoT Energy Management: Energy-efficient sensors and actuators, Low-power communication technologies (LoRaWAN, Zigbee, BLE), AI-driven energy optimization, Software-based energy analytics, Networking and connectivity considerations for energy efficiency.</td></tr>
<tr><td>Module 3</td><td>Designing and Implementing IoT Energy Solutions</td><td>Assignment</td><td>Problem Solving</td><td>8 Classes</td></tr>
<tr><td colspan="5">Designing and Implementing IoT Energy Solutions: Efficient design principles, Component selection and integration, Renewable energy integration in IoT, Prototyping and testing methodologies, Deployment and performance optimization strategies.</td></tr>
<tr><td>Module 4</td><td>Advanced Topics in IoT Energy Management</td><td>Assignment</td><td>Problem Solving</td><td>8 Classes</td></tr>
<tr><td colspan="5">Advanced Topics in IoT Energy Management: Smart cities and smart grids, Energy management in industrial IoT, Sustainable development and environmental considerations, Emerging trends and challenges, Ethical and regulatory aspects of IoT energy solutions.</td></tr>
</table>

Targeted Application & Tools that can be used:

Text Book

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis Karnouskos, Stefan Avesand, and David Boyle, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 2014, First Edition, Academic Press.

2. Shuang-Hua Yang, Wireless Sensor Networks: Principles, Design, and Applications, 2013, First Edition, Springer.

References

R1. Mischa Dohler, Burkhard Rätting, Energy Harvesting for Autonomous Systems, 2010, First Edition, Artech House.

R2. Sudip Misra, Anandarup Mukherjee, Arijit Roy, Introduction to IoT, 2021, First Edition, Cambridge University Press.

R3. Mohammad S. Obaidat, Mieso K. Denko, Isaac Woungang, Handbook of Green Information and Communication Systems, 2013, First Edition, Elsevier. **Web Based Resources and E-books:**

W1: https://iot-analytics.com/

W2: https://www.coursera.org/certificates/iiot-boulder

W3: https://www.coursera.org/learn/energy-management-for-iot-devices

Topics relevant to "SKILL DEVELOPMENT":

Energy Efficiency for IOT System for **Skill development** through **Participative Learning t**echniques. This is attained through the assessment component mentioned in the course handout.

Course Code: **CSE3125**	**Course Title:** **Service Oriented Architecture** **Type of Course:** **Program Core**	**L-T-P-C**	3-0-0-3
Version No.	2.0		
Course Pre-requisites	CSE3156, CSE1504		
Anti-requisites	NIL		

Course Description	The study of the course is to enable the students to understand the different architectural styles and XML based web applications which is required to explore the basics of service-oriented Architecture(SOA) in two approaches i.e. Web Services (WS) and Representational State Transfer (REST) architecture.			
Course Objective	The objective of the course is to familiarize the learners with the concepts of Service Oriented Architecture and attain Skill Development through Participative Learning techniques.			
Course Out Comes	On successful completion of this course the students shall be able to: 1. Discuss the XML Fundamentals and to manipulate the data using XML. [Comprehension] 2.Define the key principles of SOA [Knowledge] 3.Discuss the web services technology elements for realizing SOA[Comprehension] 4. Illustrate the various Web Service Standards[Application]			
Course Content:				
Version No.	2.0			
Module 1	**Introduction to XML**	**Assignment**	**Programming Task**	**08 Sessions**
Topics: XML document structure ,Well formed and valid documents ,Namespaces – DTD – xml Schema – X-Files,Parsing XML – using DOM, SAX – XML Transformation and XSL Formatting – Modelling Databases in XML.				
Module 2	**Service Oriented Architecture**	**Assignment**	**Architectural study**	**10 Sessions**
Topics: Types of Architecture, Objectives of Software architecture, SOA Planning and analysis, Architecture patterns and styles ,Characteristics of SOA, Comparing SOA with Client-Server and Distributed architectures – Benefits of SOA ,Security and implementation ,Principles of Service orientation ,Service Layers, Application development process, SOA methodology for Enterprise.				
Module 3	**Web Services**	**Quiz**	**Data patterns**	**08 Sessions**
Topics: Service Descriptions – WSDL – Messaging with SOAP – Service Discovery – UDDI – Message Exchange Patterns – Orchestration – Choreography – WS Transactions.				
Module 4	**Building SOA based Applications**	**Quiz**	**Security aspects**	**11 Sessions**
Topics: Business Process Design, Business case for SOA, Stake holder objectives, Service Oriented Analysis and Design – Service Modeling – Design standards and guidelines – Composition – WS-BPEL – WS-Coordination – WS-Policy – WS-Security , Tools available for implementing SOA, SOA Security, approach for enterprise wide SOA implementation, Trends in SOA, Technologies in Relation to SOA, Advances in SOA, SOA Support in J2EE.				
Targeted Application & Tools that can be used: **Basic HTML and XML**				

Textbook(s):

1. Thomas Erl, "*Service Oriented Architecture: Concepts, Technology, and Design*", Pearson Education, 2016. http://182.72.188.195/cgi-bin/koha/opac-detail.pl?biblionumber=6532

2. Ron Schmelzer et al. "*XML and Web Services*", Pearson Education, 2013 http://182.72.188.195/cgi-bin/koha/opac-detail.pl?biblionumber=6645

References

1. Frank P.Coyle, "*XML, Web Services and the Data Revolution*", Pearson Education, 2002 http://182.72.188.195/cgi-bin/koha/opac-detail.pl?biblionumber=6647

2. Eric Newcomer, Greg Lomow, "*Understanding SOA with Web Services*", Pearson Education, 2005 http://182.72.188.195/cgi-bin/koha/opac-detail.pl?biblionumber=6619

3. Sandeep Chatterjee and James Webber, "*Developing Enterprise Web Services: An Architect's Guide*", Prentice Hall, 2004. http://182.72.188.195/cgi-bin/koha/opac-detail.pl?biblionumber=5906

4. James McGovern, Sameer Tyagi, Michael E.Stevens, Sunil Mathew, "*Java Web Services Architecture*", Morgan Kaufmann Publishers, 2003. https://www.elsevier.com/books/java-web-services-architecture/mcgovern/978-1-55860-900-6

Web Resources:

1. https;//presiuniv.knimbus.com/user#/home
2. https://www.coursera.org/learn/service-oriented-architecture
3. https://nptel.ac.in/courses/soa

Topics relevant to "SKILL DEVELOPMENT": Based on an understanding of architectural styles, understanding web applications based on XML, review architectures for web applications, Service-Oriented Architecture (SOA) in two approaches: Web Services (WS*) and Representational State Transfer (REST) architecture for Skill Development through Participative Learning techniques. This is attained through the Presentation as mentioned in the assessment component.

Course Code: **CSE3426**	**Course Title:** **Front-end Full Stack Development**	**L- T-P- C**	2-0-2-3
Version No.	1.0		
Course Pre-requisites	**CSE2258**		
Anti-requisites	**NIL**		

Course Description	This intermediate course enables students to perform front-end full stack development, with emphasis on employability skills. The course covers key technologies and architectures that enables the student to design and implement front-end. On successful completion of this course, the student shall be able to pursue a career in full-stack development. The students shall develop strong problem-solving skills as part of this course.			
Course Objectives	This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies.			
Course Outcomes	On successful completion of the course the students shall be able to: 1] Describe the fundamentals of DevOps and Front-end full stack development. [Comprehension] 2] Illustrate development of a responsive web. [Application] 3] Apply concepts of Angular.js to develop a web front-end. [Application] 4] Apply concepts of Angular.js to develop a web front-end. [Application]			
Course Content:				
Module 1	Fundamentals of DevOps and Web Development	Project	Programming	**04 Sessions**
Topics: Introduction to Agile Methodology; Scrum Fundamentals; Scrum Roles, Artifacts and Rituals; DevOps – Architecture, Lifecycle, Workflow & Principles; DevOps Tools Overview – Jenkins, Docker, Kubernetes. Review of GIT source control. HTML5 – Syntax, Attributes, Events, Web Forms 2.0, Web Storage, Canvas, Web Sockets; CSS3 – Colors, Gradients, Text, Transform **Assignment:** Develop a website for managing HR policies of a department.				
Module 2	Responsive web design	Project	Programming	**03 Sessions**
Topics: BootStrap for Responsive Web Design; JavaScript – Core syntax, HTML DOM, objects, classes, Async; Ajax and jQuery Introduction **Assignment:** Design and develop a website that can actively keep track of entry-exit information of a housing society.				
Module 3	Fundamentals of Angular.js	Project	Programming	**08 Sessions**
Topics: Setting up Development & Build Environment: Node.js and NPM; Introduction to TypeScript; Working with OOP concepts with TypeScript; Angular Fundamentals; Angular CLI; Introduction to TypeScript; Debugging Angular applications; Components & Databinding in Depth; Angular Directives; Using Services & Dependency Injection; Angular Routing; Observables; Handling Forms in Angular Apps; Output transformation using Pipes; Making Http Requests; Authentication & Route Protection; Dynamic Components; Angular Modules & Optimizing Angular Apps; Deploying an Angular App; Angular Animations; Adding Offline Capabilities with Service Workers; Unit Testing in Angular Apps (Jasmine, Karma). **Assignment:** Develop a software tool to do inventory management in a warehouse.				

Module 4	Fundamentals of React.js	Project	Programming	**15 Sessions**

Topics:
Overview of React.js.; Reactive Programming; React Components; Render Method; Virtual DOM and Bandwidth Salvation; Two Distinct Ways of Initializing a React Class; States & Life Cycles; Component Mounting; Node.js & NPM; JSX Walkthrough; React Testing.
Assignment: Develop a web-based application to book movies/events (like bookmyshow).

Targeted Application & Tools that can be used:

Application Area is to Design and Analyzing the efficiency of Algorithms. This fundamental course is used by all application developers.

Professionally Used Software: GCC compiler.

Project work/Assignment:

1. **Problem Solving: Design of Algorithms and implementation of programs.**
2. **Programming: Implementation of given scenario using Java.**

Text Book:

T1. Fender, Young, "*Front-end Fundamentals",* Leanpub, 2015
T2. Northwood, Chris, "*The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer",* APress, 2018

References:

R1. Flanagan D S, *"Javascript : The Definitive Guide"* 7th Edition. 7th ed. O'Reilly Media; 2020.
R2. Alex Libby, Gaurav Gupta, and Asoj Talesra. *"Responsive Web Design with HTML5 and CSS3 Essentials",* Packt Publishing, 2016
R3. Duckett J Ruppert G Moore J. *"Javascript & Jquery : Interactive Front-End Web Development.";* Wiley; 2014.
R4. Greg Sidelnikov, *"React.js Book_ Learning React JavaScript Library"*, 1 edition, Scratch-River Tigris LLC 2016
R5. Web Reference: https://www.youtube.com/watch?v=JGNTYXkVCVY&list=PLd3UqWTnYXOkTSBCBNyyhxo_jxlY_uTWA&index=2

Course Code: **CSE3427**	**Course Title: Java Full Stack Development**	**L- T-P- C**	2-0-2-3
Version No.	1.0		
Course Pre-requisites	CSE2258		
Anti-requisites	**CSE3428 .NET Full Stack Development**		
Course Description	This advanced level course enables students to perform full stack development using Java, with emphasis on employability skills. The key technologies used for Full Stack development is based on either Java technology or .NET technology. In this course, the focus is on using		

	Java, and the related technologies/tools like Java EE, Java Persistence, Hibernate, Maven, Spring Core, etc. On successful completion of this course, the student shall be able to pursue a career in full-stack development. The students shall develop strong problem-solving skills as part of this course.			
Course Objectives	This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies.			
Course Outcomes	**On successful completion of the course the students shall be able to:** **1] Practice the use of Java for full stack development [Application]** **2] Show web applications using Java EE. [Application]** **3] Solve simple applications using Java Persistence and Hibernate [Application]** **4] Apply concepts of Spring to develop a Full Stack application. [Application]** **5] Employ automation tools like Maven, Selenium for Full Stack development. [Application]**			
Course Content:				
Module 1	Introduction	Project	Programming	**03 Sessions**
Topics: Review of Java; Advanced concepts of Java; Java generics; Java IO; New Features of Java. Unit Testing tools.				
Module 2	Java EE Web Applications	Project	Programming	**05 Sessions**
Topics: Introduction to Eclipse & Tomcat; JSP Fundamentals; Reading HTML form Data with JSP; State Management with JSP; JSP Standard Tag Library - Core & Function Tags; Servlet API Fundamentals; ServletContext, Session, Cookies; Request Redirection Techniques; Building MVC App with Servlets & JSP; Complete App - Integrating JDBC with MVC App **Assignment:** Develop an application for managing HR policies of a department.				
Module 3	Java Persistence using JPA and Hibernate	Project	Programming	**06 Sessions**
Topics: Fundamentals of Java Persistence with Hibernate; JPA for Object/Relational Mapping, Querying, Caching, Performance and Concurrency; First & Second Level Caching, Batch Fetching, Optimistic Locking & Versioning; Entity Relationships, Inheritance Mapping & Polymorphic Queries; Querying database using JPQL and Criteria API (JPA) **Assignment:** Design and develop a website that can actively keep track of entry-exit information of a housing society..				
Module 4	Spring Core	Project	Programming	**10 Sessions**
Topics:				

Spring Core, Spring MVC, Spring Boot REST API; Understanding Spring Framework; Using Spring MVC; Building a Database Web App with Spring and Hibernate o Spring AOP (Aspect Oriented Programming); Implementing Spring Security; Developing Spring REST API; Using Spring Boot for Rapid Development

Assignment: Develop a software tool to do inventory management in a warehouse.

Module 5	Automation tools	Project	Programming	**06 Sessions**

Topics:

Introduction to Automation Tools; Apache Maven: Maven Fundamentals, Software Setup - Commandline and Eclipse, pom.xml and Directory Structure, Multi-Module Project Creation, Scopes, Dependency Management, Profiles; Functional/BDD Testing using Selenium, Selenium Fundamentals and IDE, Selenium WebDriver, Installation and Configuration, Locating WebElements, Driver Commands, WebElement Commands

Assignment: Illustrate the use of automation tools in the development of a small software project.

Targeted Application & Tools that can be used:

Application Area is to Design and Analyzing the efficiency of Algorithms. This fundamental course is used by all application developers.

Professionally Used Software: Eclipse, NetBeans, Hibernate, Selenium, Maven, GIT.

Project work/Assignment:

1. **Problem Solving: Design of Algorithms and implementation of programs.**
2. **Programming: Implementation of given scenario using Java.**

Text Book:

T1. Fender, Young, "*Front-end Fundamentals",* Leanpub, 2015

References

R1. Soni, Ravi Kant. *"Full Stack AngularJS for Java Developers: Build a Full-Featured Web Application from Scratch Using AngularJS with Spring RESTful."* , Apress, 2017.

R2. Mardan, Azat. *"Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB."*, Apress, 2015

Course Code: **CSE3428**	**Course Title:** **.NET Full Stack Development**	**L-T- P- C**	2-0-2-3
Version No.	1.0		
Course Pre-requisites	CSE2258		
Anti-requisites	**CSE3427 Java Full Stack Development**		

Course Description	This advanced level course enables students to perform full stack development using .NET, with emphasis on employability skills. The key technologies used for Full Stack development is based on either Java technology or .NET technology. In this course, the focus is on using .NET and the related technologies/tools like C#, ASP.NET, Entity Framework Core, etc. On successful completion of this course, the student shall be able to pursue a career in full-stack development. The students shall develop strong problem-solving skills as part of this course.			
Course Objectives	This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies.			
Course Outcomes	**On successful completion of the course the students shall be able to:** **1] Practice the use of C# for developing a small application [Application]** **2] Show web applications using Entity Framework. [Application]** **3]Solve simple web applications that use SQL and ASP.NET [Application]** **4] Apply concepts of ASP.NET to develop a Full Stack application. [Application]**			
Course Content:				
Module 1	C# Programming for Full Stack Development	Project	Programming	**10 Sessions**
Topics: .NET Framework Fundamentals, Visual Studio IDE Fundamentals, C# Language Features, Working with arrays and collections, Working with variables, operators, and expressions, Decision and iteration statements, Managing program flow and events, Working with classes and methods, OOP concepts, Properties, Auto Implemented, Delegates, Anonymous Methods and Anonymous Types, Extension methods, Sealed Classes/Methods, Partial Classes/Methods, Asynchronous programming and threading, Data validation and working with data collections including LINQ, Handling errors and exceptions, Working with Files, Unit Testing – Nunit framework **Assignment:** Develop a small application for managing library using C#.				
Module 2	Entity Framework Core 2.0	Project	Programming	**06 Sessions**
Topics: Entity Framework Core 2.0 Code First Approach; Introduction To Entity Framework and EDM; Querying the EDM; Working With Stored Procedures; Advanced Entity Framework - DbContext [EF6]; Advanced Operations; Performance Optimization; Data Access with ADO.NET **Assignment:** Develop an application for managing HR policies of a department.				
Module 3	ASP.NET	Project	Programming	**06 Sessions**
Topics: ASP.NET Core, ASP.Net Core 3.1 MVC, ASP.NET Core Middleware and Request pipeline, Review of SQL using MS SQL, Working With Data In Asp.Net, Razor View Engine, State Management In Asp. Net MVC & Layouts; **Assignment:** Develop a web application to mark entry/exit of guests in a building.				
Module 4	ASP.NET	Project	Programming	**08 Sessions**

Topics: Introduction To Models, Validations In Asp.Net MVC, Authentication and Authorization In Asp.Net MVC, Advanced Asp.Net MVC - Ajax Action Link In MVC, Advanced Asp.Net MVC - Ajax Forms In MVC, Microsoft Testing Framework – Unit Testing the .NET Application **Assignment:** Develop a software tool to do inventory management in a warehouse.
Targeted Application & Tools that can be used: **Application Area is to Design and Analyzing the efficiency of Algorithms. This fundamental course is used by all application developers.** **Professionally Used Software: Visual Studio**
Project work/Assignment:
1. **Problem Solving: Design of Algorithms and implementation of programs.** 2. **Programming: Implementation of given scenario using .NET.**
Text Book: T1. Fender, Young, "*Front-end Fundamentals",* Leanpub, 2015 T2. Valerio De Sanctis, *"ASP.NET Core 5 and Angular: Full-stack web development with .NET 5 and Angular 11"*, 4th Edition, Packt, 2021.
References R1. Benjamin Perkins, Jon D. Reid, *"Beginning C# and .NET"*, Wiley, 2021 Reid, 2021. R2. Piotr Gankiewicz, *"Full Stack .NET Web Development"*, Packt Publishing, 2017. R3. Tamir Dresher, Amir Zuker, Shay Friedman, *"Hands-On Full-Stack Web Development with ASP.NET Core"*, Packt Publishing, 2018. R4. Dustin Metzgar, *"Exploring .NET core with microservices, ASP.NET core, and Entity Framework Core"*, Manning, 2017.

Course Code: **CSE2505**	**Course Title:** Mobile Application Development **Type of Course:** Theory	**L- T-P- C**	2	**0**	0	2
Version No.	2.0					
Course Pre-requisites	CSE1004					
Anti-requisites	**NIL**					
Course Description	The course deals with the basics of android platform and application life cycle. The goal of the course is to develop mobile applications with Android containing at least one of the following phone material components: GPS, accelerometer or phone camera, use simple GUI applications and work with database to store data locally or in a server. Topics include user interface					

	design; user interface building; input methods; data handling; network techniques and URL loading; GPS and motion sensing. Android application framework and deployment. Power management, Screen resolution, Touch interface, Store data on the device.			
Course Objective	The objective of the course is to familiarize the learners with the concepts of Mobile Applications and Development as mentioned above and attain Employability Skills through Experiential Learning Techniques.			
Course Outcomes	On successful completion of the course the students shall be able to: 1. Discuss the fundamentals of mobile application development and its architecture. (Comprehension) 2. Illustrate mobile applications with appropriate android view. (Application) 3. Demonstrate the use of services, broadcast receiver, Notifications and content provider.(Application) 4. Apply data persistence techniques, to perform CRUD operations. (Application) 5. Use advanced concepts for mobile application development. (Application)			
Course Content:				
Module 1	Introduction and Architecture of Android	Assignment	Simulation/Data Analysis	10 Sessions
Topics: Android: History and features, Architecture, Development Tools, Android Debug Bridge (ADB), and Life cycle.				
Module 2	User Interfaces, Intent and Fragments	Term paper/Assignment	Simulation/Data Analysis	15 Sessions
Topics: Views, Layout, Menu, Intent and Fragments.				
Module 3	Components of Android	Term paper/Assignment	Simulation/Data Analysis	15 Sessions
Topics: Activities, Services, Broadcast receivers, Content providers, User Navigation				
Module 4	Notifications and Data Persistence	Term paper/Assignment	Simulation/Data Analysis	15 Sessions
Topics: Notification, Shared Preferences, SQLite database, Android Room with a View, Firebase.				
Module 5	Advance App Development	Term paper/Assignment	Simulation/Data Analysis	15 Sessions
Topics: Graphics and Animation, App Widgets, Sensors, Performance, Location, Places, Mapping, Custom Views, Canvas.				

Targeted Application & Tools that can be used:

Applications:

- Native Android Applications
- Native iOS Applications
- Cross Platform mobile Apps
- Mobile web Applications

Text Book(s):

T1. Pradeep kothari "Android Application Development - Black Book", dreamtechpress
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

Reference(s):

1. Bill Phillips, Chris Stewart, and Kristin Marsicano (Author) "Android Programming" 3rd edition,
2017.The Big Nerd Ranch Guide, Big Nerd Ranch LLC, 5. The Big Nerd Ranch Guide, by"
2. Erik Hellman, "Android Programming – Pushing the Limits", 1st Edition, Wiley India Pvt Ltd,
2014.
3. Dawn Griffiths and David Griffiths, "Head First Android Development", 1st Edition, O'Reilly SPD
Publishers, 2015.
4. J F DiMarzio, "Beginning Android Programming with Android Studio", 4th Edition, Wiley India Pvt
Ltd, 2016. ISBN-13: 978-8126565580
5. Anubhav Pradhan, Anil V Deshpande, " Composing Mobile Apps" using Android, Wiley 2014,
ISBN: 978-81-265-4660-2
6. Reto Meier "Professional Android Application Development"

E-Resources: https://puniversity.informaticsglobal.com/login Or http://182.72.188.193/

Course Code: **CSE2506**	**Course Title:** Mobile Application Development Lab **Type of Course:** Lab	**L- T-P- C**	0	**0**	4	2

Version No.	2.0			
Course Pre-requisites	CSE1004			
Anti-requisites	**NIL**			
Course Description	The course provides hands-on experience in designing, developing, and deploying mobile applications for Android and iOS platforms. Students will work with native development frameworks such as Android Studio (Java/Kotlin) and Xcode (Swift), as well as explore cross-platform tools like Flutter or React Native.			
Course Objective	The objective of the course is to develop Native and Cross-Platform Mobile Applications, design Interactive and Responsive User Interfaces, integrate Backend Services and APIs, implement State Management and Performance Optimization, ensure Mobile App Security and Data Protection			
Course Outcomes	On successful completion of the course the students shall be able to: 1. Develop Functional Mobile Applications 2. Design and Implement Interactive UIs 3. Integrate Cloud Services and APIs 4. Integrate Backend Systems and Data Management 5. Deploy, Publish, and Maintain advanced Mobile Application			
Course Content:				
Module 1	Introduction and Architecture of Android	Assignment	Simulation/Data Analysis	10 Sessions
1.a. Design an app to read user inputs using edit text and display the result of arithmetic operations using toast message. 1.b. Create an android app to calculate the current age of yourself, select your DOB using date picker. 2. Design an app to input your personal information. Use an autocomplete text view to select your place of birth.				
Module 2	User Interfaces, Intent and Fragments	Term paper/Assignment	Simulation/Data Analysis	15 Sessions
3. a. Design an app to select elective course using spinner view and on click of the display button, toast your ID and selected elective course. 3. b. Design a restaurant menu app to print the total amount of orders.				
Module 3	Components of Android	Term paper/Assignment	Simulation/Data Analysis	15 Sessions
4. Develop an android app that uses intent to maintain the following scenario.				

Check the eligibility criteria for voting. Input the Aadhar no., Name & age in the first activity. If the age is above 18, display the voter's detail in the second activity. Else, display, “You are not eligible to vote” in the second Activity.
5. Demonstrate the use of fragment with list of buttons representing various colors, and on click of these buttons, the appropriate color is filled in the next fragment. Create an Android application to input the vitals of a person (temperature, BP). If the vitals are abnormal, give proper notification to the user.
6. Create an android app to for movie ticket booking. Save the user name of the customer using shared preferences. After completion of booking, retrieve the username from the shared preferences and print the ticket details.

Module 4	Notifications and Data Persistence	Term paper/Assignment	Simulation/Data Analysis	15 Sessions

7. Create an android application to manage the details of students' database using SQLite.Use necessary UI components, which perform the operations such as insertion, modification, removal and
view.Presidency University needs an APP for Admission eligibility checking for students, for that you need to take the following information from the Student: registration ID, physics, chemistry and mathematics marks (PCM), fees is allotted as below criteria.
PCM (Total marks %) Fee concession
90 above 80 %
70 to 89 60 %
Below 69 % no concession
On click on the button “Registration” details should be stored in the database using SQLite. Create button DISPLAY ALL (full students list) on click on the button it should display the students list per the fee
concession.
8. A company need to design an app that plays soft music automatically in the background. Create an app to achieve this functionality.
9. Create an android application such that your view object in the Activity can be Animated with fade-in effect. Create an appropriate XML file named fade-in and write the application to perform the property animation.

Module 5	Advance App Development	Term paper/Assignment	Simulation/Data Analysis	15 Sessions

10. Demonstrate how to send SMS and email.
11. Create an android application to transfer a file using WiFi. Create an android application “Where am I” with an Activity that uses the GPS Location provider to find the device’s last known location.

Targeted Application & Tools that can be used:
Applications:

1. Native Android Applications (Java/Kotlin)

- Android Mobile Apps built for Android smartphones and tablets using Java or Kotlin programming languages.
- Target audience: Android users.

2. Native iOS Applications (Swift)
   - iOS Mobile Apps designed for iPhone and iPad using Swift.
   - Target audience: iOS users (Apple ecosystem).
3. Cross-Platform Mobile Apps (Flutter, React Native)
   - Cross-platform apps designed to run on both Android and iOS from a single codebase using frameworks like Flutter or React Native.
   - Target audience: Users on both Android and iOS platforms.
4. Mobile Web Applications (Progressive Web Apps - PWA)
   - Mobile-optimized web applications using HTML5, CSS3, and JavaScript that run in a browser with native-like functionality (offline support, push notifications).
   - Target audience: Users accessing apps via mobile browsers.

Development Tools and Frameworks

1. Integrated Development Environments (IDEs)
   - Android Studio (for Android): The official IDE for Android development, supporting Java, Kotlin, and Android SDK.
   - Xcode (for iOS): The official IDE for iOS development with Swift and Objective-C, providing a comprehensive suite of development tools for iPhone/iPad applications.
   - Visual Studio Code (VS Code): Lightweight IDE for working with Flutter, React Native, and web development projects.
2. Cross-Platform Development Frameworks
   - Flutter: Open-source UI framework by Google for building natively compiled applications for mobile, web, and desktop from a single codebase.
   - React Native: Open-source framework developed by Facebook for building cross-platform apps with JavaScript and React.
3. Backend & Cloud Tools
   - Firebase: Google's backend-as-a-service (BaaS) platform offering authentication, real-time databases, cloud storage, and push notifications for mobile apps.
   - AWS Amplify: Cloud platform for backend services (API, storage, authentication) and mobile deployment.
   - SQLite / Realm: Local storage solutions for mobile apps to manage data storage and retrieval on-device.
4. Mobile App Testing and Debugging Tools
   - Android Emulator (for Android): A virtual device to run and test Android apps without needing physical devices.
   - Xcode Simulator (for iOS): A tool to simulate different iOS devices and test apps during development.

- Appium: Open-source tool for automated testing across native, hybrid, and mobile web applications.

5. Version Control and Collaboration
   - Git: Version control system for managing code changes and collaborating with teams.
   - GitHub / GitLab / Bitbucket: Online platforms for hosting Git repositories, collaboration, and version control management.
6. Mobile App Deployment Tools
   - Google Play Console: For managing Android app publishing, distribution, and monitoring.
   - Apple App Store Connect: For managing iOS app submissions, reviews, and releases on the Apple App Store.
7. UI/UX Design Tools
   - Figma / Adobe XD: Tools for UI/UX design and wireframing to create the visual elements of mobile applications before development.
   - Sketch: Vector-based design tool for iOS UI design and prototyping

Text Book(s):

T1. Pradeep kothari "Android Application Development - Black Book", dreamtechpress
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

Reference(s):

1. Bill Phillips, Chris Stewart, and Kristin Marsicano (Author) "Android Programming" 3rd edition,
2017.The Big Nerd Ranch Guide, Big Nerd Ranch LLC, 5. The Big Nerd Ranch Guide, by"
2. Erik Hellman, "Android Programming – Pushing the Limits", 1st Edition, Wiley India Pvt Ltd,
2014.
3. Dawn Griffiths and David Griffiths, "Head First Android Development", 1st Edition, O'Reilly SPD
Publishers, 2015.
4. J F DiMarzio, "Beginning Android Programming with Android Studio", 4th Edition, Wiley India Pvt
Ltd, 2016. ISBN-13: 978-8126565580
5. Anubhav Pradhan, Anil V Deshpande, " Composing Mobile Apps" using Android, Wiley 2014,

ISBN: 978-81-265-4660-2
6. Reto Meier “Professional Android Application Development”
E-Resources: https://puniversity.informaticsglobal.com/login Or http://182.72.188.193/

Course Code: **CSE2510**	**Course Title:** Competitive Programming and Problem Solving **Type of Course: Program Core**	L-T-P-C	0	0	4	2
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	**NIL**					
Course Description	The **Competitive Programming and Problem Solving** course equips students with efficient problem-solving skills for coding competitions and real-world challenges. Starting with brute-force solutions, students learn to optimize time and space complexity using advanced techniques like dynamic programming, greedy algorithms, and backtracking. Hands-on practice on platforms like CodeChef and Codeforces helps tackle problems involving number theory, data structures, and algorithmic paradigms. By understanding CP constraints and fostering a strategic mindset, students gain the confidence to excel in competitions, technical interviews, and practical applications.					
Course Out Comes	On successful completion of the course the students shall be able to: CO1 : Understanding the issues of online platforms and Competitive Programming (CP) and developing brute force coding for commonly asked CP problems. CO2 : Analyzing the space and time complexity of brute force solutions and designing efficient solutions. CO3 : Evaluating the applicability of suitable algorithmic approaches to solve relevant CP problems. CO4: Creating efficient solutions of CP problems using the learnt algorithmic approaches.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Competitive Programming and Problem Solving** and attain **Skill Development** through **Experiential Learning** techniques.					

Module 1: Introduction to Competitive Programming

Overview of Efficient Coding for Problem Solving and CP: Introduction to competitive programming (CP); revisit of complexity analysis; introduction to online platforms such as codechef, codeforces etc and online submission; constraints during CP, online testing process and common errors such as TLE; use of STL

Module 2: Number Theory for Problem-Solving

Use of Number Theory for problem-solving: reducing time/space complexity of brute force coding solution of Sieve Method, Inverse Module, Euclidian Method of factorization; efficient coding for Permutation Combination; XORing based and pattern-based solutions.

Module 3: Optimizing Time & Space Using Sequential Storage

Coding for Optimizing time and Space using Sequential Storage: two pointer approach; problem-solving using arrays and strings such as rotation on sorted arrays, duplicate removal, string matching algorithms; Kadane's algo, stacks, priority-queues and hashing based efficient coding; median based problems and alternate solutions.

Module 4: Non-Linear Data Structures

Applying Non-Linear Data Structures for real-life problems: design of efficient solutions for problems such as finding loops in a linked list, memory efficient DLL, block reversal in LL; problem solving using trees and binary trees, Catalan numbers, applications of graphs, spanning tree and path algos for CP problems with reduced time/space complexity.

Module 5: Problem Solving using Advanced Topics

CP Problem Solving using Advanced Topics: concept of disjoint sets and their efficient representation, algorithmic approaches such as Greedy, Backtracking, Dynamic Programming and applying them for CP problems using bottom-up dynamic programming.

List of Laboratory Tasks:

1. You are given the finishing times of 'N' runners in a marathon. Write a program to find the runner who finished in the third position. **Focus:** Basic data structures (arrays), sorting algorithms (e.g., insertion sort, selection sort), and basic input/output.
2. In the same marathon, you are given the finishing times of 'N' runners and their bib numbers. Write a program to efficiently find the top 10 runners and their corresponding bib numbers. **Focus:** Efficient sorting algorithms (e.g., merge sort, quick sort), data structures like priority queues, and optimizing for large datasets.
3. A library maintains a list of books with their unique IDs. Write a program to check if a given book ID is present in the library. Focus: Searching algorithms (linear search), basic data structures (arrays or lists).
4. The library wants to implement a system to quickly find books by their titles. Suggest an efficient data structure (e.g., a hash table or a trie) and explain how to implement it to achieve fast book lookups. Focus: Understanding the trade-offs between different data structures, choosing the most appropriate data structure for a specific problem, and implementing efficient search operations.
5. An online store sells products with different prices. Write a program to calculate the total cost of a given list of products. **Focus:** Basic arithmetic operations, working with arrays or lists to store product prices.
6. The online store offers discounts based on the total purchase amount. Design an algorithm to efficiently calculate the final cost of an order, considering different discount rules (e.g., percentage discounts, fixed amount discounts, tiered discounts). Focus: Algorithmic design, conditional statements, handling complex scenarios with multiple rules, and potentially using dynamic programming techniques for optimization.
7. You are given two integers, 'a' and 'm'. Calculate 'a' raised to the power 'm' modulo a large prime number 'p'. **Focus:** Basic modular arithmetic operations (modular exponentiation), understanding the modulo operator.

8. In a secure communication system, you need to efficiently compute the modular exponentiation for very large values of 'm'. Implement and analyze the efficiency of the binary exponentiation algorithm for this task. **Focus:** Efficient algorithms for modular exponentiation (binary exponentiation), time complexity analysis, and understanding the importance of efficient algorithms in cryptography.
9. You have a deck of 'N' cards. Calculate the total number of possible hands of size 'K' that can be drawn from the deck. **Focus:** Basic combinatorics (combinations), factorial calculations.
10. In a card game, you need to calculate the probability of drawing certain combinations of cards (e.g., a pair, a three-of-a-kind) from a shuffled deck. Design an efficient algorithm to calculate these probabilities. **Focus:** Advanced combinatorics (permutations and combinations with repetitions), probability calculations, and optimizing calculations to avoid overflows.
11. You are given a network of devices represented as a graph. Determine if there is a path between two given devices in the network. **Focus:** Graph traversal algorithms (depth-first search or breadth-first search).
12. In a secure network, you need to detect and isolate compromised devices. Design an algorithm that efficiently identifies devices that exhibit anomalous behavior (e.g., unusual traffic patterns) using XOR-based techniques for data comparison and pattern matching. **Focus:** Applying XOR operations for data comparison and pattern recognition, understanding the properties of XOR (e.g., commutative, associative), and designing algorithms for network anomaly detection.
13. You are given an array representing the speeds of cars on a highway. Find the minimum time required for all cars to pass a certain point. **Focus:** Basic array traversal, finding the minimum element in an array.
14. In a more realistic scenario, cars have different lengths. Implement a two-pointer approach to simulate the movement of cars and determine the minimum time for all cars to pass a given point. **Focus:** Two-pointer technique, simulating real-world scenarios with arrays, optimizing time complexity.
15. Given a string, find the number of occurrences of a specific substring within the string. **Focus:** Basic string manipulation, string matching (brute-force approach).
16. Implement the KMP (Knuth-Morris-Pratt) string matching algorithm to efficiently find all occurrences of a given pattern within a large text document. **Focus:** Advanced string matching algorithms, understanding the concept of the "next" array in KMP, optimizing for large input sizes.
17. An online auction platform receives bids for different items. Implement a data structure (e.g., a priority queue) to efficiently track the highest bid for each item. **Focus:** Priority queues, insertion and extraction operations on priority queues, basic implementation of a priority queue using an array or a suitable library.
18. The auction platform needs to handle a large number of bids concurrently. Design and implement a system that efficiently processes bids, updates the highest bid for each item, and handles potential race conditions. **Focus:** Concurrent data structures and algorithms, thread safety, handling race conditions, optimizing for high-throughput scenarios.
19. A social network can be represented as a graph where users are nodes, and connections between users are edges. Write an algorithm to find if two given users are connected in the network. **Focus:** Graph traversal algorithms (depth-first search or breadth-first search), basic graph representation (adjacency list or adjacency matrix).
20. In a large social network, efficiently finding the shortest path between two users is crucial. Implement Dijkstra's algorithm to find the shortest paths between users in the network, considering edge weights (e.g.,

representing the strength of connections). **Focus:** Shortest path algorithms (Dijkstra's algorithm), graph algorithms with weighted edges, optimizing for large graphs.

21. A file system can be modeled as a tree structure. Implement a function to traverse the file system and print the names of all files and directories. **Focus:** Tree traversal algorithms (depth-first search or breadth-first search), basic tree representation (using nodes and pointers).
22. Design and implement a file system that supports efficient operations like creating directories, deleting files, and finding files based on their names or paths. Consider using a combination of tree structures and hash tables for efficient indexing and searching. **Focus:** Designing and implementing file system structures, using multiple data structures together, optimizing for common file system operations.
23. An online shopping cart can be represented as a tree, where each node represents an item or a category of items. Write an algorithm to calculate the total price of all items in the shopping cart. **Focus:** Tree traversal, calculating sums within a tree structure.
24. Implement a system that allows customers to apply discounts and coupons to their shopping carts. Consider using a combination of trees and other data structures (e.g., hash tables) to efficiently apply discounts and calculate the final price. **Focus:** Applying discounts and promotions to tree-like structures, efficient implementation of discount rules, optimizing for complex pricing scenarios.
25. In a social network, users can form groups. Given a list of friendships, determine if all users in a specific group are connected (directly or indirectly) through friendships. **Focus:** Disjoint set union (DSU) data structure, basic connectivity checks.
26. Design an efficient algorithm to find the minimum number of new friendships needed to connect all users in the social network into a single, connected component. **Focus:** Applying DSU for finding connected components, greedy algorithms, optimization for minimizing connections.
27. A treasure hunt involves a series of clues leading to the final treasure. Given a list of possible paths and their associated costs, find the cheapest path to reach the treasure. **Focus:** Greedy algorithms (e.g., Dijkstra's algorithm for shortest paths), basic graph representation.
28. In a more complex treasure hunt, there are time constraints associated with each path. Design an algorithm to find the fastest path to the treasure while considering both path costs and time constraints.
    Focus: Combining greedy approaches with other techniques (e.g., priority queues), handling multiple constraints, optimizing for time-critical scenarios.
29. In a simplified chess game with only rooks, determine the minimum number of moves required for a rook to reach a specific target square on an empty board. **Focus:** Breadth-first search (BFS) on a graph (the chessboard), basic graph traversal.
30. In a more realistic chess game with multiple pieces and obstacles, implement a minimax algorithm with alpha-beta pruning to determine the best move for a player. **Focus:** Game tree search, minimax algorithm, optimization techniques like alpha-beta pruning, handling complex game states.

Targeted Application & Tools that can be used:

1. C or C++ Compiler (g++): The standard compiler for CP. Familiarize students with compilation flags (e.g., -O2 for optimization).
2. IDE (Integrated Development Environment): Code:: Blocks, Visual Studio, CLion, or similar IDEs. These provide debugging capabilities, code completion, and other helpful features.

3. Online Judges (CodeChef, Codeforces, LeetCode, HackerRank): Essential for practicing and submitting solutions.
4. Debugger (gdb): Crucial for understanding code execution and finding bugs. Origin, excel and Mat lab soft wares for programming and data analysis.
5. Number Theory Libraries: Some libraries provide pre-built functions for number theory operations (though often it's better to implement them yourself for learning).
6. Wolfram Alpha: A useful tool for verifying number theory calculations and exploring concepts.
7. **String Libraries:** Familiarize students with the string manipulation functions available in C++.
8. **Graph Visualization Tools:** Tools like Graphviz can be helpful for visualizing graphs and understanding graph algorithms.
9. **DP Debugging Techniques:** Practice debugging DP solutions, as they can be complex. Visualizing the DP table can be helpful.

Text Books:

1 **Guide to Competitive Programming: Learning and Improving Algorithms Through Contests" (3rd Edition),** ***Antti Laaksonen, springer, 2024***

2 **"Data Structures and Algorithms in Java: A Project-Based Approach" –** ***Dan S. Myers, Cambridge University Press***

Reference Books:

1. **Data Structures and Algorithmic Thinking with Python/C++/Java",** ***Narasimha Karumanchi, 5th Edition, Career Monk, 2017.***
2. **Introduction to Algorithms, Thomas H. Cormen (Author), Charles E. Leiserson (Author), Ronald L. Rivest , fourth edition April 2022**

Web Resources

1. **https://nptel.ac.in/courses/106106231**
2.

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

Course Code: **CSE7000**	**Course Title:** **Internship** **Type of Course:**	**L- T-P- C**	-	-	-	2
Version No.	**1.0**					
Course Pre-requisites	**Knowledge and Skills related to all the courses studied in previous semesters.**					
Anti-requisites	**NIL**					
Course Description	Students observe science and technology in action, develop an awareness of the method of scientific experimentation, and often get an opportunity to see, study and operate sophisticated and costly equipment. They also learn about the implementation of the principles of management they have learnt in class, when they observe multidisciplinary teams of experts from engineering, science, economics, operations research, and management deal with techno-economic problems at the micro and macro levels. Finally, it enables them to develop and refine their language, communication and inter-personal skills, both by its very nature, and by the various evaluation components, such as seminar, group discussion, project report preparation, etc. The broad-based core education, strong in mathematics and science and rich in analytical tools, provides the foundation necessary for the student to understand properly the nature of real-life problems.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Professional Practice and attain Employability Skills through Experiential Learning techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: 1. Identify the engineering problems related to local, regional, national or global needs. (Understand) 2. Apply appropriate techniques or modern tools for solving the intended problem. (Apply) 3. Design the experiments as per the standards and specifications. (Analyze) 4. Interpret the events and results for meaningful conclusions. (Evaluate)					

Course Code: CSE3426	Course Title: Front-end Full Stack Development	L- T-P- C	2	0	2	3
Version No.	1.0					
Course Pre-requisites	CSE2260					
Anti-requisites	NIL					
Course Description	This intermediate course enables students to perform front-end full stack development, with emphasis on employability skills. The course covers key technologies and architectures that enables the student to design and implement front-end. On successful completion of this course, the student shall be able to pursue a career in full-stack development. The students shall develop strong problem-solving skills as part of this course.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Front-end Full Stack Development and attain Employability Skills through Experiential Learning techniques.					
Course Outcomes	On successful completion of the course the students shall be able to: CO1. Design and develop static web pages using HTML5 elements and CSS3 [Apply] CO2.Develop responsive web pages using CSS, JavaScript and bootstrap. [Apply] CO3.Demonstrate the concepts of Angular.js to develop a web front-end. [Apply] CO4.Illustrate the concepts of React.js to develop a web front-end. [Apply]					
Course Content:						
Module 1	Introduction to web technology	Project	Programming		15Sessions [7L +8P]	
Topics: HTML5 – Syntax,Attributes, Events, Web Forms 2.0, Web Storage, Canvas, Web Sockets; CSS3 – Colors, Gradients, Text, Transform.						
Module 2	Responsive web design	Project	Programming		15 Sessions [7L+8P]	

Topics:

BootStrap for Responsive Web Design; JavaScript – Core syntax,JavaScript – Core syntax,HTML DOM, objects, classes,HTML DOM, objects, classes, Async; Ajax ,jQuery Introduction.

Assignment: Design and develop a website that can actively keep track of entry-exit information of a housing society.

Module 3	JavaScript Frameworks	Project	Programming	20Sessions [10L+10P]

Topics:

Setting up Development & Build Environment: Node.js and NPM; Introduction to TypeScript;

Working with OOP concepts with TypeScript; Angular Fundamentals; Angular CLI; Introduction to TypeScript; Debugging Angular applications;Components& Databinding in Depth; Angular Directives; Using Services & Dependency Injection; Angular Routing; Observables; Handling Forms in Angular Apps; Output transformation using Pipes; Making Http Requests; Authentication & Route Protection; Dynamic Components;Angular Modules & Optimizing Angular Apps;AngularAnimations;Adding Offline Capabilities with Service Workers; React.js ; Developing single page application

Assignment: Develop a software tool to do inventory management in a warehouse.

Module 4	Fundamentals of DevOps and Project Management	Project	Programming	10 Sessions [6L+4P]

Topics:

Introduction to Agile Methodology; Scrum Fundamentals; Scrum Roles, Artifacts and Rituals; Scrum Fundamentals; Scrum Roles, Artifacts and Rituals;DevOps – Architecture, Lifecycle, Workflow & Principles; DevOps Tools Overview – Jenkins, Docker, Kubernetes. Review of GIT source control. Deploying an Angular/React App; Unit Testing in Angular Apps (Jasmine, Karma).

Assignment: Develop a web-based application to book movies/events (like bookmyshow).

List of Laboratory Tasks:(7 X 2= 14 Sessions)

Experiment No. 1: [3 + 1 Practical Sessions]

Level 1: Familiarization of HTML and CSS basics.

Level 2: Create an HTML webpage showcasing biodata with CSS styling.

Experiment No. 2: [3 + 1 Practical Sessions]

Level 1: Design an interactive web page for a new restaurant using CSS3 features.

Level 2: Create a simple web form to gather user information.

Experiment No. 3: [4 + 1 Practical Sessions]

Level 1: Practice basic JavaScript exercises, including creating a canvas drawing application.

Level 2: Implement JavaScript exercises for form validation.

Experiment No. 4 [3 + 1 Practical Sessions]

Level 1: Create a student registration form using JavaScript.

Level 2: Design an RSVP form using Bootstrap form controls.

Experiment No. 5 [3 + 1 Practical Sessions]

Level 1: Create a responsive image grid using Bootstrap 5.

Level 2: Write a JavaScript program using AJAX to dynamically load content and implement jQuery effects like fading.

Experiment No. 6 [3 + 1 Practical Sessions]

Level 1: Create an AngularJS application module and controller in app.js.

Level 2: Design an "AngularJS Solar System Explorer" for planet data visualization.

Targeted Application & Tools that can be used: Application Area is to Design and Analyzing the efficiency of Algorithms. This fundamental course is used by all application developers. Professionally Used Software: Replit
Project work/Assignment: Problem Solving: Design of Algorithms and implementation of programs. Programming: Implementation of given scenario using Java.
Text Book: T1. Fender, Young, “Front-end Fundamentals”,Leanpub, 2015 T2. Northwood, Chris, “The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer”,APress, 2018
References: R1. Flanagan D S, “Javascript : The Definitive Guide” 7th Edition. 7th ed. O'Reilly Media; 2020. R2. Alex Libby, Gaurav Gupta, and AsojTalesra. “Responsive Web Design with HTML5 and CSS3 Essentials”,Packt Publishing, 2016 R3. Duckett J Ruppert G Moore J. “Javascript&Jquery : Interactive Front-End Web Development.”; Wiley; 2014. R4. Greg Sidelnikov, “React.js Book_ Learning React JavaScript Library”, 1 edition, Scratch-River Tigris LLC 2016 R5. Web Reference: https://www.youtube.com/watch?v=JGNTYXkVCVY&list=PLd3UqWTnYXOkTSBCBNyyhxo_jxlY_uTWA&index=2

Course Code: CSE3427	Course Title: Java Full Stack Development	L- P- C	2	2	3

Version No.	1.0				
Course Pre-requisites	Nil				
Anti-requisites	CSE2260				
Course Description	This advanced level course enables students to perform full stack development using Java, with emphasis on employability skills. The key technologies used for Full Stack development is based on either Java technology or .NET technology. In this course, the focus is on using Java, and the related technologies/tools like Java EE, Java Persistence, Hibernate, Maven, Spring Core, etc. On successful completion of this course, the student shall be able to pursue a career in full-stack development. The students shall develop strong problem-solving skills as part of this course.				
Course Objectives	This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies.				
Course Outcomes	On successful completion of the course the students shall be able to: 1] Practice the use of Java for full stack development [Application] 2] Show web applications using Java EE. [Application] 3] Solve simple applications using Java Persistence and Hibernate [Application] 4] Apply concepts of Spring to develop a Full Stack application. [Application] 5] Employ automation tools like Maven, Selenium for Full Stack development. [Application]				
Course Content:					
Module 1	Introduction	Project	Programming	03 Sessions	
Topics: Review of Java; Advanced concepts of Java; Java generics; Java IO; New Features of Java. Unit Testing tools.					
Module 2	Java EE Web Applications	Project	Programming	05 Sessions	
Topics:					

Introduction to Eclipse & Tomcat; JSP Fundamentals; Reading HTML form Data with JSP; State Management with JSP; JSP Standard Tag Library - Core & Function Tags; Servlet API Fundamentals; ServletContext, Session, Cookies; Request Redirection Techniques; Building MVC App with Servlets & JSP; Complete App - Integrating JDBC with MVC App Assignment: Develop an application for managing HR policies of a department.				
Module 3	Java Persistence using JPA and Hibernate	Project	Programming	06 Sessions
Topics: Fundamentals of Java Persistence with Hibernate; JPA for Object/Relational Mapping, Querying, Caching, Performance and Concurrency; First & Second Level Caching, Batch Fetching, Optimistic Locking & Versioning; Entity Relationships, Inheritance Mapping & Polymorphic Queries; Querying database using JPQL and Criteria API (JPA) Assignment: Design and develop a website that can actively keep track of entry-exit information of a housing society..				
Module 4	Spring Core	Project	Programming	10 Sessions
Topics: Spring Core, Spring MVC, Spring Boot REST API; Understanding Spring Framework; Using Spring MVC; Building a Database Web App with Spring and Hibernate o Spring AOP (Aspect Oriented Programming); Implementing Spring Security; Developing Spring REST API; Using Spring Boot for Rapid Development Assignment: Develop a software tool to do inventory management in a warehouse.				
Module 5	Automation tools	Project	Programming	06 Sessions
Topics: Introduction to Automation Tools; Apache Maven: Maven Fundamentals, Software Setup - Commandline and Eclipse, pom.xml and Directory Structure, Multi-Module Project Creation, Scopes, Dependency Management, Profiles; Functional/BDD Testing using Selenium, Selenium Fundamentals and IDE, Selenium WebDriver, Installation and Configuration, Locating WebElements, Driver Commands, WebElement Commands Assignment: Illustrate the use of automation tools in the development of a small software project.				
Targeted Application & Tools that can be used:				

Application Area is to Design and Analyzing the efficiency of Algorithms. This fundamental course is used by all application developers. Professionally Used Software: Eclipse, NetBeans, Hibernate, Selenium, Maven, GIT.
Project work/Assignment:
Problem Solving: Design of Algorithms and implementation of programs. Programming: Implementation of given scenario using Java.
Text Book: T1. Fender, Young, “Front-end Fundamentals”, Leanpub, 2015
References R1. Soni, Ravi Kant. “Full Stack AngularJS for Java Developers: Build a Full-Featured Web Application from Scratch Using AngularJS with Spring RESTful.” , Apress, 2017. R2. Mardan, Azat. “Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB.”, Apress, 2015

Course Code: CSE3428	Course Title: .NET Full Stack Development	L- P- C	2	2	3
Version No.	1.0				
Course Pre-requisites	Nil				
Anti-requisites	CSE2260				

Course Description	This advanced level course enables students to perform full stack development using .NET, with emphasis on employability skills. The key technologies used for Full Stack development is based on either Java technology or .NET technology. In this course, the focus is on using .NET and the related technologies/tools like C#, ASP.NET, Entity Framework Core, etc. On successful completion of this course, the student shall be able to pursue a career in full-stack development. The students shall develop strong problem-solving skills as part of this course.			
Course Objectives	This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies.			
Course Outcomes	On successful completion of the course the students shall be able to: 1] Practice the use of C# for developing a small application [Application] 2] Show web applications using Entity Framework. [Application] 3]Solve simple web applications that use SQL and ASP.NET [Application] 4] Apply concepts of ASP.NET to develop a Full Stack application. [Application]			
Course Content:				
Module 1	C# Programming for Full Stack Development	Project	Programming	10 Sessions
Topics: .NET Framework Fundamentals, Visual Studio IDE Fundamentals, C# Language Features, Working with arrays and collections, Working with variables, operators, and expressions, Decision and iteration statements, Managing program flow and events, Working with classes and methods, OOP concepts, Properties, Auto Implemented, Delegates, Anonymous Methods and Anonymous Types, Extension methods, Sealed Classes/Methods, Partial Classes/Methods, Asynchronous programming and threading, Data validation and working with data collections including LINQ, Handling errors and exceptions, Working with Files, Unit Testing – Nunit framework Assignment: Develop a small application for managing library using C#.				
Module 2	Entity Framework Core 2.0	Project	Programming	06 Sessions

Topics:

Entity Framework Core 2.0 Code First Approach; Introduction To Entity Framework and EDM; Querying the EDM; Working With Stored Procedures; Advanced Entity Framework - DbContext [EF6]; Advanced Operations; Performance Optimization; Data Access with ADO.NET

Assignment: Develop an application for managing HR policies of a department.

Module 3	ASP.NET	Project	Programming	06 Sessions

Topics:

ASP.NET Core, ASP.Net Core 3.1 MVC, ASP.NET Core Middleware and Request pipeline, Review of SQL using MS SQL, Working With Data In Asp.Net, Razor View Engine, State Management In Asp. Net MVC & Layouts;

Assignment: Develop a web application to mark entry/exit of guests in a building.

Module 4	ASP.NET	Project	Programming	08 Sessions

Topics:

Introduction To Models, Validations In Asp.Net MVC, Authentication and Authorization In Asp.Net MVC, Advanced Asp. Net MVC - Ajax Action Link In MVC, Advanced Asp.Net MVC - Ajax Forms In MVC, Microsoft Testing Framework – Unit Testing the .NET Application

Assignment: Develop a software tool to do inventory management in a warehouse.

Targeted Application & Tools that can be used:

Application Area is to Design and Analyzing the efficiency of Algorithms. This fundamental course is used by all application developers.

Professionally Used Software: Visual Studio

Project work/Assignment:

Problem Solving: Design of Algorithms and implementation of programs.

Programming: Implementation of given scenario using .NET.

Text Book: T1. Fender, Young, “Front-end Fundamentals”, Leanpub, 2015 T2. Valerio De Sanctis, “ASP.NET Core 5 and Angular: Full-stack web development with .NET 5 and Angular 11”, 4th Edition, Packt, 2021.
References R1. Benjamin Perkins, Jon D. Reid, “Beginning C# and .NET”, Wiley, 2021 Reid, 2021. R2. Piotr Gankiewicz, “Full Stack .NET Web Development”, Packt Publishing, 2017. R3. Tamir Dresher, Amir Zuker, Shay Friedman, “Hands-On Full-Stack Web Development with ASP.NET Core”, Packt Publishing, 2018. R4. Dustin Metzgar, “Exploring .NET core with microservices, ASP.NET core, and Entity Framework Core”, Manning, 2017.

Course Code: CAI3427	Course Title: Language Models for Text Mining	L-T-P-C	2	0	2	3
Version No.	1.0					
Course Pre-requisites	CSE2264					
Anti-requisites	NIL					
Course Description	This course introduces the basics of Text Mining and Natural Language Processing. The course will teach students different concepts such as text mining, NLP, Sequence Labeling, etc. Topics: Text Mining, NLP, Tokenization, Lemmatization, Stemming, One-hot encoding, Language modelling, Bag-of-words, Term-document Matrix, Cosine similarity, Viterbi Algorithm, etc.					
Course Objectives	The objective of the course is EMPLOYBILITY of student by using EXPERIENTIAL LEARNING techniques.					

<table>
<tr><td>Course Out Comes</td><td colspan="4">On successful completion of this course the students shall be able to:
Process text data to derive information from text. [Apply]
Apply insights from textual information to real-world business. [Apply]
Develop solutions for a particular NLP problem using different machine learning and deep learning techniques. [Apply]
Utilize different NLP tools and packages. [Apply]</td></tr>
<tr><td colspan="5">Course Content:</td></tr>
<tr><td>Module 1</td><td>Text Mining</td><td>Adversarial Quiz Tests</td><td>Module Tests</td><td>No. of Sessions: 09</td></tr>
<tr><td colspan="5">Introduction to Text Mining. Text Mining vs. NLP. Text Mining Algorithms. Steps in Text Mining - Extraction, Preprocessing, Analysis and Evaluation. Lexical Resource Creation (NEW). Data collection. String Manipulation to Clean Data. Natural Language Processing. Research Paradigms in NLP. Sequential Data. Sequence Labeling (NEW). Viterbi Algorithm (NEW). Corpus. Building a HMM using a Corpus (NEW). Unknown word handling (NEW).</td></tr>
<tr><td>Module 2</td><td>Text Preprocessing</td><td>Adversarial Quiz Tests</td><td>Module Tests</td><td>No. of sessions: 06</td></tr>
<tr><td colspan="5">Introduction to Preprocessing. Tokenization. Stop Words Removal. Lemmatization and Stemming. PoS Tagging. Integer Encoding. Padding. One-Hot Encoding.</td></tr>
<tr><td>Module 3</td><td>Text Representations</td><td>Adversarial Quiz Tests</td><td>Module Tests</td><td>No. of sessions: 08</td></tr>
<tr><td colspan="5">Language Modeling. N-Gram Language Model. Bag-of-Words Model. Term-Document Matrix. Term Frequency. Inverse Document Frequency. TF-IDF. Cosine Similarity. Naive Bayes Classifier using Bag-of-Words. Topic Modeling. Latent Semantic Analysis. Singular Value Decomposition. Truncated SVD and Topic Vector. LDA Algorithm.</td></tr>
<tr><td>Module 4</td><td>Natural Language Processing with Keras</td><td>Adversarial Quiz Tests</td><td>Module Tests</td><td>No. of Sessions: 06</td></tr>
<tr><td colspan="5">Word Embeddings vs. One-Hot Encoding. Contextual Bag of Words (CBOW). Skipgram. Deep Learning for Document Classification.</td></tr>
<tr><td colspan="5">List of Laboratory Tasks:
Experiment No. 1: File Handling
Level 1: Read text files using Python and extract meaningful content.</td></tr>
</table>

Level 2: Parse text files using Python to preprocess the data for NLP tasks.

Experiment No. 2: Introduction to NLP Tools

Level 1: Install and use NLTK for basic text processing.

Level 2: Install and use SpaCy for tokenization, PoS tagging, and Named Entity Recognition.

Experiment No. 3: Corpus Cleaning Techniques

Level 1: Use NLTK for corpus cleaning techniques such as tokenization, stopword removal, and stemming.

Level 2: Prepare cleaned text data for downstream NLP tasks like classification or translation.

Experiment No. 4: Word Vector Usage

Level 1: Download and use pre-trained word vectors (e.g., Word2Vec, GloVe, or FastText).

Level 2: Compute similarity between two words, find the most similar word, and complete word analogies (e.g., king - man + woman = queen).

Experiment No. 5 & 6: Language Identification

Level 1: Build a simple language identifier using Bag-of-Words (BoW) features.

Level 2: Predict the language of a given text using the trained model.

Experiment No. 7 & 8: Lexical Simplification

Level 1: Implement a lexical simplifier to replace complex words with simpler alternatives.

Level 2: Generate a simplified version of a given word or sentence while preserving meaning.

Experiment No. 9 & 10: Sentiment Analysis

Level 1: Implement a basic sentiment classifier using a lexicon-based or machine learning approach.

Level 2: Compare the performance of an existing sentiment classifier (e.g., VADER, TextBlob, or a pre-trained Transformer model).

Experiment No. 11: Named Entity Recognition (NER)

Level 1: Extract named entities from a text using NLTK.

Level 2: Extract named entities using SpaCy and compare results.

Experiment No. 12 & 13: Implement a Hidden Markov Model (HMM)

Level 1: Implement a generic HMM for sequence prediction.

Level 2: Calculate the forward probability of a given sequence using HMM.

Experiment No. 14: Linguistic HMM

Level 1: Develop a Hidden Markov Model (HMM) for NLP tasks such as PoS tagging.

Level 2: Evaluate the performance of the HMM on a specific NLP task (e.g., Named Entity Recognition or Chunking).

Experiment No. 15: Machine Translation

Level 1: Implement Machine Translation (MT) using a pre-trained model from Hugging Face Transformers.

Level 2: Evaluate the quality of MT output via Round-Trip Translation (translate text to another language and back to check accuracy).

Targeted Application & Tools that can be used:

Google Colab

Python IDEs like PyCharm

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

Group project on some NLP Task like text classification (Creating a Simple Text Classifier: Use Scikit-learn to classify positive vs. negative reviews from a dataset), sentiment analysis, etc.

Textbook(s):

Daniel Jurafsky, James H. Martin. “Speech and Language Processing: An Introduction to Natural Language Processing”, Computational Linguistics and Speech, Pearson Publication, 2025 (3rd Edition Draft).

Aditya Joshi, Pushpak Bhattacharyya. “Natural Language Processing”, Wiley Publication, 2023 (1st Edition).

References:

R1. Chris Manning and Hinrich Schutze, “Foundations of Statistical Natural Language Processing”, 1st Edition, MIT Press. 1999.

R2. Pawan Goyal. “Natural Language Processing”. 1st Edition, 2016.

Weblinks

W1. E-Book link or R2: https://drive.google.com/file/d/10nbwAJd-dv6htOOZVBgAvLd1WscI0RqC/view

W2. Web Resource for T1: https://web.stanford.edu/~jurafsky/slp3/ - VERY VERY IMPORTANT!!!

W3. NPTEL Courses: https://nptel.ac.in/courses/106106211 CMI), https://nptel.ac.in/courses/106105158 (IIT Kgp), https://nptel.ac.in/courses/106101007 (IITB), https://nptel.ac.in/courses/106105572 (IIT Kgp - NEW)

Course Code: CAI3428	Course Title: Practical Deep Learning with TensorFlow	L- T-P- C	2	0	2	3
Version No.	1.0					
Course Pre-requisites	CSE2264					
Anti-requisites	NIL					
Course Description	This course introduces students to the concepts of deep neural networks and state of the art approaches to develop deep learning models. In this course students will be given an exposure to the details of neural networks as well as deep learning architectures and to develop end-to-end models for such tasks. It will help to design and develop an application-specific deep learning models and also provide the practical knowledge handling and analyzing end user realistic applications.					

<table>
<tr><td>Course Objective</td><td colspan="4">This course is designed to improve the learners EMPLOYABILITY SKILLS by using EXPERIENTIAL LEARNING techniques.</td></tr>
<tr><td>Course Outcomes</td><td colspan="4">On successful completion of this course the students shall be able to:

Implement backpropagation and gradient descent techniques to train neural networks effectively. (Apply)

Build and train deep learning models using Python libraries such as TensorFlow and Keras for real-world applications. (Apply)

Utilize deep learning techniques for image classification, object detection, sentiment analysis, and language modeling. (Apply)</td></tr>
<tr><td colspan="5">Course Content:</td></tr>
<tr><td>Module 1</td><td>Basics of Neural Networks</td><td>Assignment</td><td></td><td>18[8L+10P]

Sessions</td></tr>
<tr><td colspan="5">Topics:

Understanding Perceptron with Excel, Understanding Multilayer Perceptron with Excel, From Multilayer Perceptron to Deep Learning, Error Backpropagation and Gradient Descent to reduce errors, Activation Functions, Deep Learning, Problems with Deep Learning with solutions.</td></tr>
<tr><td>Module 2</td><td>TensorFlow Basics</td><td>Assignment</td><td></td><td>14[7L+7P]

Sessions</td></tr>
<tr><td colspan="5">Topics:

Introduction to TensorFlow, TensorFlow dataset, Machine Learning with TensorFlow</td></tr>
<tr><td>Module 3</td><td>Deep Learning methods with Tensor Flow and Keras</td><td>Assignment</td><td></td><td>14[6L+8P]

Sessions</td></tr>
<tr><td colspan="5">Topics:

Main Features of TensorFlow, Keras basics, AI with Keras.</td></tr>
<tr><td colspan="5">Project work/Assignment:</td></tr>
<tr><td colspan="5">Assignment 1 on (Module 1 and Module 2)

Assignment 2 on (Module 3)</td></tr>
</table>

List of Laboratory Tasks:

Lab 1: Working with Deep Learning Frameworks

Objective: Explore various Deep Learning Frameworks

Tasks: Identify deep learning frameworks (Keras, Tensorflow, Matplotlib, etc)

Activity: Practice with various methods available in DL Frameworks to develop a Model.

Lab 2: Build a Basic Artificial Neural Network

Objective: Create a ANN with DL frameworks.

Task: Identify suitable ANN Layers using Keras and Tensorflow.

Activity: Design a basic Artificial Neural Networks using Keras with TensorFlow (pima-indians-diabetes)

Lab 3: Build a MultiLayer Perceptron

Objective: Create a MLP for classification task.

Task: Identify suitable model for house price prediction.

Activity: Design a MLP for implementing classification and fine-tuning using House price.csv

Lab 4: Create a Tensor in TensorFlow using List or Numpy array.

Objective: To understand how to create a tensor in TensorFlow using a Python list or NumPy array

Task: Create a simple tensor using both a Python list and a NumPy array in TensorFlow.

Activity: Create a tensor using a Python list and Numpy array

Lab 5: Apply math operations on tensor using various mathematical functions.

Objective: To learn how to apply mathematical operations on tensors using various TensorFlow mathematical functions.

Task: Perform basic mathematical operations (addition, subtraction, multiplication, division) and advanced functions (square, square root, exponential) on tensors.

Activity: Perform basic math operations: Add, Subtract, Multiply, Divide and Apply advanced math functions: Square, Square root, Exponential.

Lab 6: Connecting two tensors in dataset.

Objective: Combine two tensors using concatenation and stacking operations in TensorFlow.

Task: Combine two tensors using concatenation and stacking operations in TensorFlow

Activity: Concatenate them along a specific axis and Stack them along a new axis.

Lab 7: Building dataset from a file stored in a local drive

Objective: To learn how to build a dataset in TensorFlow from a file stored in a local drive.

Task: Load a dataset from a CSV file stored on the local drive and process it using TensorFlow

Activity: Load the file using TensorFlow's tf.data API and Process the dataset (e.g., convert it into tensors)

Lab 8: Loading Dataset from TensorFlow.dataset Library

Objective: To learn how to load a dataset from the tensorflow_datasets library and use it in machine learning models.

Task: Load a dataset from TensorFlow Datasets (tfds), preprocess it, and display sample data

Activity: Load a dataset (e.g., MNIST, CIFAR-10, IMDB Reviews) and Split the dataset into training and testing sets.

Lab 9: Build a Convolutional Neural Network

Objective: Create a CNN model.

Task: Build CNN architecture for Dog-Cat classification problem.

Activity: Implement a Convolution Neural Network (CNN) for dog/cat classification problem using keras.

Lab 10: Build a Time-Series Model

Objective: Create a RNN and LSTM Model

Task: Build RNN/LSTM Model for predicting time series data.

Activity Train a sentiment analysis model on IMDB dataset, use RNN layers with LSTM/GRU notes.
REFERENCE MATERIALS: TEXTBOOKS François Chollet, “Deep Learning with Python”, 2nd Edition, Manning Publications, 2022 Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2017. REFERENCES Amlan Chakrabarti Amit Kumar Das, Saptarsi Goswami, Pabitra Mitra , “Deep Learning”, Pearson Publication, 2021. David Foster, “Generative Deep Learning” O’Reilly Publishers, 2020. John D Kellehar, “Deep Learning”, MIT Press, 2020. JOURNALS/MAGAZINES IEEE Transactions on Neural Networks and Learning Systems https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=5962385 IEEE Transactions on Pattern Analysis and Machine Intelligence https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=34http://ijaerd.com/papers/special_papers/IT032.pdf International Journal of Intelligent Systems https://onlinelibrary.wiley.com/journal/1098111x SWAYAM/NPTEL/MOOCs: Swayam Nptel – Deep Learning – IIT Ropar https://onlinecourses.nptel.ac.in/noc21_cs35/preview Coursera – Neural Networks and Deep Learning Andrew Ng Coursera - Neural Networks for Machine Learning by Geoffrey Hinton in Coursera

Course Code: CAI3429	Course Title: Deep Learning Techniques for Computer Vision	L-T- P-C	2	0	2	3
Version No.	1.0					

<table>
<tr><td>Course Pre-requisites</td><td colspan="4">MAT2402</td></tr>
<tr><td>Anti-requisites</td><td colspan="4">NIL</td></tr>
<tr><td>Course Description</td><td colspan="4">This course covers the fundamentals and advanced concepts of deep learning for computer vision applications. Students will explore convolutional neural networks (CNNs), object detection, image segmentation, and generative models. Hands-on lab experiments will reinforce theoretical concepts using frameworks like TensorFlow and PyTorch.</td></tr>
<tr><td>Course Out Comes</td><td colspan="4">On successful completion of the course the students shall be able to:
Understand the Fundamentals of Deep Learning for Vision
Explain the core concepts of neural networks and deep learning architectures for image processing.
Implement and optimize convolutional neural networks (CNNs) for classification tasks.
Apply Object Detection and Image Segmentation Techniques
Implement and analyze state-of-the-art object detection algorithms such as YOLO, Faster R-CNN, and SSD.
Develop and evaluate image segmentation models like U-Net and Mask R-CNN.
Explore Advanced Deep Learning Techniques for Vision
Utilize Vision Transformers (ViTs) and attention mechanisms for image classification.
Generate and manipulate images using Generative Adversarial Networks (GANs).
Deploy and Optimize Deep Learning Models for Real-World Applications</td></tr>
<tr><td>Course Content:</td><td colspan="4"></td></tr>
<tr><td>Module 1</td><td>Fundamentals of Deep Learning for Vision</td><td>Assignment</td><td>Practical</td><td>No. of Classes:8</td></tr>
<tr><td colspan="5">Introduction to Deep Learning & Neural Networks, Convolutional Neural Networks (CNNs) Architecture Backpropagation & Optimization in CNNs, Transfer Learning & Pretrained Models.</td></tr>
<tr><td>Module 2</td><td>Object Detection & Image Segmentation</td><td>Assignment</td><td>Practical</td><td>No. of Classes:14</td></tr>
<tr><td colspan="5">Introduction to Object Detection (R-CNN, SSD, YOLO), Region Proposal Networks (Faster R-CNN)
Semantic & Instance Segmentation (U-Net, Mask R-CNN), Real-time Object Detection Applications</td></tr>
</table>

Module 3	Advanced Topics in Vision	Assignment	Practical	No. of Classes:8
Attention Mechanisms & Vision Transformers (ViTs), Generative Adversarial Networks (GANs) for Image Generation, Self-supervised Learning for Vision, Multi-modal Learning (CLIP, DALL·E)				
Module 4	Applications & Deployment	Assignment	Practical	No. of Classes:8
Edge AI & Mobile Deployment (TensorFlow Lite, ONNX), Adversarial Attacks & Robustness in Vision Models, Explainability & Interpretability of Vision Models, Case Studies & Industry Applications				

Lab Experiments are to be conducted on the following topics:-

Lab Sheet 1:

Keras Sequential API model

Read in the data and explore

Define a Sequential API model

Define the hyperparameters and optimizer

Train the model and visualize the history

Testing

Keras Functional API model:

Define a Functional API model

Train the model and visualize the history

Lab Sheet 2:

Softmax regression with Keras

Read in the data and prepare

Define a Sequential API model

Define the hyperparameters and optimizer

Train the model and visualize the history

Testing

Lab Sheet 3:

Convolutional Neural Network with Keras (grayscale images)

Read in the data:

Visualize the data:

Prepare the data:

Define a CNN model:

Define the hyperparameters and optimizer:

Train the model and visualize the history:

Testing:

Lab Sheet 4:

Convolutional Neural Network with Keras (color images):

Read in the data:

Visualize the data:

Prepare the data:

Define a CNN model:

Define the hyperparameters and optimizer:

Train the model and visualize the history:

Testing:

Lab Sheet 5:

Time series and prediction:

Read in the data and explore:

Apply the exponential smoothing method and predict

Recurrent neural network (RNN):

Pre-processing:

Do the necessary definitions: (Hyper parameters, Model,

Train the model:

Predict the future:

Lab Sheet 6:

Document classification with LSTM network:

Read in the data:

Explore the data:

Data preprocessing:

Define the model:

Define the optimizer and compile:

Train the model and visualize the history:

Testing:

Lab Sheet 7:

Document classification with LSTM network (Binary):

Read in the data:

Explore the data:

Data preprocessing:

Define the model:

Define the optimizer and compile:

Train the model and visualize the history:

Testing:

Lab Sheet 8:

Document classification with LSTM + CNN network (Binary):

Read in the data:

Explore the data:

Data preprocessing:

Define the model:

Define the optimizer and compile:

Train the model and visualize the history:

Testing:

Lab Sheet 9:

Softmax regression to recognize the handswritten digits:

Download the MNIST data:

Take a look at the dataset:

Do the necessary definitions:

Training and Testing:

Multi-layer neural network to recognize the handswritten digits:

Download the MNIST data:

Take a look at the dataset:

Do the necessary definitions:

Training and Testing:

Lab Sheet 10:

Object Detection using YOLOv5

Lab Sheet 11:

Image Segmentation using U-Net

Custom Object Detection using Faster R-CNN

Lab Sheet 12:

Implementing Vision Transformers for Image Classification

Generating Images using GANs (DCGAN, StyleGAN)

(Group Project)

Object Detection and Recognition:

Haar cascade object detection (e.g., face detection or object detection using pre-trained classifiers).

Feature-based object detection using techniques like Speeded-Up Robust Features (SURF) or Scale-Invariant Feature Transform (SIFT).

Deep learning-based object detection using Convolutional Neural Networks (CNNs) or You Only Look Once (YOLO) algorithm.

Optical Character Recognition (OCR):

Preprocessing of text images (e.g., binarization, noise removal, or skew correction).

Text localization using techniques like connected component analysis or Stroke Width Transform (SWT).

Character recognition using machine learning algorithms like Support Vector Machines (SVM) or Convolutional Neural Networks (CNNs).

Gesture Recognition:

Hand segmentation using techniques like background subtraction or skin color detection.

Feature extraction from hand regions (e.g., finger counting, hand shape descriptors).

Classification of gestures using machine learning algorithms (e.g., k-Nearest Neighbors or Support Vector Machines).

Tools/Software Required :

OpenCV 4

Python 3.7

MATLAB

Text Books

"Deep Learning for Computer Vision Image Classification, Object Detection and Face Recognition in Python" Jason Brownlee (2019)

"Deep Learning for Computer Vision with python" Adrian Rosebrock (2017)

References

Goodfellow, I., Bengio, Y., & Courville, A. (2016). Deep Learning. MIT Press.

A foundational book covering deep learning principles, including CNNs, optimization, and generative models.

Raschka, S., & Mirjalili, V. (2022). Machine Learning with PyTorch and Scikit-Learn. Packt Publishing.

Covers practical deep learning techniques using PyTorch, including CNNs and transfer learning.

Geron, A. (2022). Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow (3rd Edition). O'Reilly Media.

Provides hands-on implementations of deep learning for computer vision using TensorFlow and Keras.

Zhang, A., Lipton, Z. C., Li, M., & Smola, A. J. (2021). Dive into Deep Learning. Available online (https://d2l.ai).

Open-access book covering CNNs, object detection, and advanced vision techniques with PyTorch and TensorFlow.

Chollet, F. (2021). Deep Learning with Python (2nd Edition). Manning Publications.

Explains deep learning fundamentals and applications with Keras, including image classification and segmentation.

Ballé, J., Laparra, V., & Simoncelli, E. P. (2017). Deep Learning for Computer Vision: A Brief Introduction.

A concise introduction to CNNs, object detection, and generative models.

Course Code: APT4006	**Course Title: Logical and Critical Thinking** **Type of Course:** Audited	**L- T-P- C**	0	0	2	0
Version No.	1.0					
Course Pre-requisites	Students should have the basic concepts of Logical reasoning and Critical thinking, along with its applications in real life problems.					
Anti-requisites	Nil					
Course Description	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.					
Course Objective	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.					
Course Outcomes	On successful completion of the course the students shall be able to:					
	CO1] **Understand** all the concepts.					
	CO2] **Apply** the concepts in problem solving (Bloom's taxonomy Level 3)					
	CO3] **Analyze** and structure the reasoning techniques and spatial visualization skills					
Course Content:						
Module 1	Logical Thinking	Assignment				**16 Hours**
	Topics:					
	Syllogisms, Cubes and Dices, Mirror and Water images, Paper cutting and Folding, Embedded figures & Completion of figures, Data Interpretation, Data sufficiency					
Module 2	Critical Thinking	Assignment				**14 Hours**
	Topics:					
	Analogy, Symbol and Notations, Statement and assumption, Cause of action, Statement and conclusion, Puzzles					
	Targeted Application & Tools that can be used:					
	Application area: Placement activities and Competitive examinations.					
	Tools: LMS					
Evaluation	**Continuous Evaluation**					
	· Topic wise evaluation					

	· Internal Assessments
	Text Book
	1. A new approach to reasoning verbal, non-verbal & analytical by BS Sijwali
	2. R S Aggarwal
	3. Kiran publications
	References
	1. www.indiabix.com
	2. www.testbook.com
	3. www.youtube.com/c/TheAptitudeGuy/videos
	Topics relevant to Skill Development Logical reasoning and Critical thinking for Skill Development through Problem solving Techniques. This is attained through assessment component mentioned in course handout.

Course Code: APT4026	**Course Title:** Aptitude For Employability **Type of Course:** Practical Only	**L- T-P- C**	0	0	2	0

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: **CSE7101**	**Course Title:** **Mini Project** **Type of Course:**	**L- T-P-C**	0	0	0	5
Version No.	**1.0**					
Course Pre-requisites	**Knowledge and Skills related to all the courses studied in previous semesters.**					
Anti-requisites	**NIL**					
Course Description	Students observe science and technology in action, develop an awareness of the method of scientific experimentation, and often get an opportunity to see, study and operate sophisticated and costly equipment. They also learn about the implementation of the principles of management they have learnt in class, when they observe multidisciplinary teams of experts from engineering, science, economics, operations research, and management deal with techno-economic problems at the micro and macro levels. Finally, it enables them to develop and refine their language, communication and inter-personal skills, both by its very nature, and by the various evaluation components, such as seminar, group discussion, project report preparation, etc. The broad-based core education, strong in mathematics and science and rich in analytical tools, provides the foundation necessary for the student to understand properly the nature of real-life problems. The students have options to pursue this course as either Project Work and Dissertation at the university, or Project Work in an Industry/ Company/ Research Laboratory, or Internship Program in an Industry/Company.						

Course Objectives	The objective of the course is to familiarize the learners with the concepts of Professional Practice and attain Employability Skills through Experiential Learning techniques.
Course Outcomes	On successful completion of this course the students shall be able to: 1. Identify the engineering problems related to local, regional, national or global needs. (Understand) 2. Apply appropriate techniques or modern tools for solving the intended problem. (Apply) 3. Design the experiments as per the standards and specifications. (Analyze) 4. Interpret the events and results for meaningful conclusions. (Evaluate) 5. Appraise project findings and communicate effectively through scholarly publications. (Create)

Course Code: PPS4027	**Course Title: Preparedness for Interview** Type of Course: Practical Only Course	L- T- P- C	0	0	2	0
Version No.		1.0				
Course Pre-requisites		Students are expected to understand Basic English. Students should have desire and enthusiasm to involve, participate and learn.				
Anti-requisites		NIL				
Course Description		This course is designed to enable students to understand soft skills concepts to be corporate ready. The modules are set to improve self-confidence, communicate effectively and Prepare for the Interview to assist in employability. It helps the students to get a glimpse of the acceptable corporate readiness and equip them with the fundamental necessities of being able to confidently deal with the highly competitive corporate environment and helps in crafting different types of resumes. The pedagogy used will be group discussions, flipped classrooms, continuous feedback, role-play and mentoring.				

Course Objective		The objective of the course is to familiarize the learners with the concepts of "**Preparing for Interview**" and attain SKILL DEVELOPMENT through PARTICIPATIVE LEARNING techniques.			
Course Out Comes		**On successful completion of this course the students shall be able to:** CO1: **Develop** professional Resumes CO2: **Illustrate** Resumes effectively CO3: **Apply** skills and knowledge learnt for active and effective Group Discussions and Interview			
Course Content:					
Module 1		**Resume Building**	**Classroom activity**		10 Hours
	Topics: Resume structure, use of templates, Do's and Don'ts, ATS methods, Cover Letter and Video Resume **Activity:** Real world scenarios				
Module 2		**Group Discussion**	**Mock G D**		9 Hours
	Topics: -Group discussion as a placement process, GD techniques like Keyword. SPELT & POV of affected parties. Do & Don't of GD, Case-lets and topics for GD, practice session and evaluation **Activity:-** Real world scenarios				
Module 3		**Personal Interview**	**Grooming checks + Evaluation + Mock Interview+ Role Play**		9 Hours
	Topics: Placement process, Different interview rounds, HR interviews, Interview questions and desired answers, Different types of interviews, Do's and Don'ts. **Activity: -** Role Play & Real-world scenario				
Module 4		**Recap/Revision /Feedback Session**	**Practice sessions**		2 Hours
	Targeted Application & Tools that can be used: 1. TED Talks 2. You Tube Links 3. Role Play activities				

	Project work/Assignment: 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: **CSE7300**	**Course Title:** **Capstone Project** **Type of Course:**	**L- T-P-C**	0	0	0	10
Version No.	**1.0**					
Course Pre-requisites	**Knowledge and Skills related to all the courses studied in previous semesters.**					
Anti-requisites	**NIL**					
Course Description	Students observe science and technology in action, develop an awareness of the method of scientific experimentation, and often get an opportunity to see, study and operate sophisticated and costly equipment. They also learn about the implementation of the principles of management they have learnt in class, when they observe multidisciplinary teams of experts from engineering, science, economics, operations research, and management deal with techno-economic problems at the micro and macro levels. Finally, it enables them to develop and refine their language, communication and inter-personal skills, both by its very nature, and by the various evaluation components, such as seminar, group discussion, project report preparation, etc. The broad-based core education, strong in mathematics and science and rich in analytical tools, provides the foundation necessary for the student to understand properly the nature of real-life problems. The students have options to pursue this course as either Project Work and Dissertation at the university, or Project Work in an Industry/ Company/ Research Laboratory, or Internship Program in an Industry/Company.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Professional Practice and attain Employability Skills through Experiential Learning techniques.					

Course Outcomes	On successful completion of this course the students shall be able to: 1. Identify problems based on societal /research needs. (Understand) 2. Apply Knowledge and skill to solve societal problems in a group. (Apply) 3. Develop interpersonal skills to work as member of a group or leader. (Apply) 4. Analyze the inferences from available results through theoretical / Experimental / Simulations. (Analyze) 5. Analyze the impact of solutions in societal and environmental context for sustainable development. (Analyze) 6. Improve in written and oral communication. (Create) 7. Demonstrate capabilities of self-learning in a group, which leads to lifelong learning. (Understand)

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

1. HM Seervai, Constitutional Law of India, 4th Ed. Vol I, II, & III
2. Uday Raj Rai, Constitutional Law-I
3. Democracy and Constitutionalism in India, Oxford University Press 2009

Resources:

1. https://onlinecourses.nptel.ac.in/noc20_lw03/course?&force_user=true
2. https://onlinecourses.swayam2.ac.in/cec19_hs13/course?&force_user=true
3. https://nptel.ac.in/courses/129106003
4. https://nptel.ac.in/courses/129106411
5. https://nptel.ac.in/courses/129105608
6. https://nptel.ac.in/courses/129106002

Topics relevant to Skill Development:

1. An attitude of inquiry.
2. Write reports

The topics related to Constitutional Studies and its application :

All topics in theory component are relevant to Indian Constitution.

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*:

1) UHV II - https://www.youtube.com/watch?v=NhFBzn5qKIM&list=PLWDeKF97v9SO8vvjC1KyqteziTbTjN1So&pp=0gcJCWMEOCosWNin
2) Lecture by Dr. Kumar Sambhav, NPTEL course: Universal Human Values, https://onlinecourses.swayam2.ac.in/aic22_ge23/preview
3) 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. 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
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2019.

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3. https://onlinecourses.swayam2.ac.in/ini25_hs52/preview
4. https://onlinecourses.nptel.ac.in/noc25_hs219/preview
5. https://onlinecourses.swayam2.ac.in/cec25_mg14/preview
6. https://onlinecourses.swayam2.ac.in/imb25_mg195/preview
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Topics relevant to Skill Development:

1. An attitude of enquiry.
2. Write reports

The topics related to Human values and Professional ethics:

All topics in are relevant to Human values and Professional ethics.