PRESIDENCY UNIVERSITY

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PROGRAMME REGULATIONS & CURRICULUM

2025-29

PRESIDENCY SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

BACHELOR OF TECHNOLOGY (B.TECH.) IN COMPUTER SCIENCE AND ENGINEERING (CYBER SECURITY)

PRESIDENCY SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

Program Regulations and Curriculum 2025-2029

BACHELOR OF TECHNOLOGY (B.Tech.) in COMPUTER SCIENCE AND ENGINEERING (Cyber Security)

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

PRESIDENCY UNIVERSITY

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PART A – PROGRAM REGULATIONS

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

1.1 Vision of the University

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

1.2 Mission of the University

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

1.3 Vision of Presidency School of 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 transforming Society.

1.4 Mission of Presidency School of Computer Science and Engineering

- Cultivate a practice-driven environment with a contemporary Learning-pedagogy, integrating theory and practice.
- Attract and nurture world-class faculty to excel in Teaching and Research, in the field of Core Computer Science and Engineering.
- Establish state-of-the-art facilities for effective Teaching and Learning-experiences.
- Promote Interdisciplinary Studies to nurture talent and impart relevant skill-sets for global impact.
- 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 Industrial Based Project Learning, Industrial Training, and Internship to enable the students to become eligible and fully equipped for employment in industries, choose higher studies or entrepreneurship.

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

3. Short Title and Applicability

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

4. Definitions

In these Regulations, unless the context otherwise requires:

a. "Academic Calendar" means the schedule of academic and miscellaneous events as approved by the Vice Chancellor;
b. "Academic Council" means the Academic Council of the University;
c. "Academic Regulations" means the Academic Regulations, of the University;
d. "Academic Term" means a Semester or Summer Term;
e. "Act" means the Presidency University Act, 2013;
f. "AICTE" means All India Council for Technical Education;
g. "Basket" means a group of courses bundled together based on the nature/type of the course;
h. "BOE" means the Board of Examinations of the University;
i. "BOG" means the Board of Governors of the University;
j. "BOM" means the Board of Management of the University;
k. "BOS" means the Board of Studies of a particular Department/Program of Study of the University;
l. "CGPA" means Cumulative Grade Point Average as defined in the Academic Regulations;
m. "Clause" means the duly numbered Clause, with Sub-Clauses included, if any, of these Regulations;
n. "COE" means the Controller of Examinations of the University;
o. "Course In Charge" means the teacher/faculty member responsible for developing and organising the delivery of the Course;
p. "Course Instructor" means the teacher/faculty member responsible for teaching and evaluation of a Course;
q. "Course" means a specific subject usually identified by its Course-code and Course-title, with specified credits and syllabus/course-description, a set of references, taught by some teacher(s)/course-instructor(s) to a specific class (group of

students) during a specific Academic Term;

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

gg. *"PSCSE" 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 2025-2029 are subject to, and, pursuant to the Academic Regulations. These Program Regulations shall be applicable to the following ongoing Bachelor of Technology (B.Tech.) Degree Programs of 2025-2029 offered by the Presidency School of 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
15. Bachelor of Technology in Robotics and Artificial Intelligence Engineering, abbreviated as RAI
16. Bachelor of Technology in Artificial Intelligence and Data Science Engineering, abbreviated as AID

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:

PEO 1: Demonstrate proficiency as a Computer Engineering professional, applying technical knowledge and skills effectively in various engineering fields.

PEO 2: Become a teaching and research professional in the areas of Computer Science and Engineering, engaging in lifelong learning to stay at the forefront of the field.

PEO 3: Contribute as a key member of a consultancy team in the Computer Science and Engineering industry, providing expert solutions to complex problems.

PEO 4: Emerge as an entrepreneur in the fields of Computer Science and related areas, creating innovative solutions and businesses.

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 analyze 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 modeling 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: Display a strong grasp of computer science fundamentals to clearly explain essential concepts, analyze problems, and utilize theory to model and construct reliable, efficient computing systems**.**

PSO 02: Leverage on their programming abilities, knowledge of software development platforms, and understanding of cybersecurity principles to design practical solutions, supporting diverse paths in industry, academia, advanced studies, research, or entrepreneurship.

PSO 03: Comprehend and evaluate the ethical, legal, societal implications of cybersecurity practices to ensure responsible decision-making while designing, implementing, applications that protect data, networks, and infrastructure against cyber threats.

9 Admission Criteria (as per the concerned Statutory Body)

The University admissions shall be open to all persons irrespective of caste, class, creed, gender or nation. All admissions shall be made on the basis of merit in the qualifying examinations; provided that forty percent of the admissions in all Programs of the University shall be reserved for the students of Karnataka State and admissions shall be made through a Common Entrance Examination conducted by the State Government or its agency and seats shall be allotted as per the merit and reservation policy of the State Government from time to time**.** The admission criteria to the B.Tech. Program is listed in the following Sub-Clauses:

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

9.2 Provided further, the applicant must have taken Physics and Mathematics as compulsory subjects in the Pre-University / Higher Secondary / (10+2) / (11+1) examination, along with either Chemistry / Biology / Electronics / Computer

Science / Biotechnology subject, and, the applicant must have obtained a minimum of 45% of the total marks (40% in case of candidates belonging to the Reserved Category as classified by the Government of Karnataka) in these subjects taken together.

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

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

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

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

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

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

10 Lateral Entry / Transfer Students requirements

10.1 Lateral Entry

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

10.1.1 Admission to 2nd year (3rd Semester) of the B.Tech. Degree program shall be open to the candidates who are holders of a 3-year Diploma in Engineering (or equivalent qualification as recognized by the University), who have secured not less than forty-five percentage (45%) marks in the final year examination (5th and 6th Semesters of the Diploma Program) in the appropriate branch of Engineering. Provided that, in case of SC / ST and OBC candidates from Karnataka the minimum marks for eligibility shall be forty percent (40%).

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

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

10.1.4 The Course requirements prescribed for the 1st Year of the B.Tech. Program shall

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

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

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

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

The ***Minimum Credit Requirements*** for the award of the Bachelor of Technology (B.Tech.) Degree prescribed by the concerned Bachelor of Technology Degree Program Regulations and Curriculum, 2024-2028, 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. (Computer Science and Engineering-Cyber Security) 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 Computer Science and Engineering for a student who joins the Program through the provision of the Lateral Entry, shall be "N – M" Credits.

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

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

A student who has completed the 1st Year (i.e., passed in all the Courses / Subjects prescribed for the 1st Year) of the B.Tech/B.E/B.S., Four-Year Degree Program from

another recognized University, may be permitted to transfer to the 2nd Year (3rd Semester) of the B.Tech. Program of the University as per the rules and guidelines prescribed in the following Sub-Clauses:

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

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

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

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

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

11 Change of Branch / Discipline / Specialization

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

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

11.2 Change of Branch, if provided, shall be made effective from the

commencement of the 3rd Semester of the B.Tech. Program. There shall be no provision for change of Branch thereafter under any circumstances whatsoever.

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

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

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

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

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

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

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

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

12.2 Academic performance evaluation of every registered student in every Course registered by the student is carried out through various components of Assessments spread across the Semester. The nature of components of Continuous Assessments and the weightage given to each component of Continuous Assessments (refer Clause 8.8 of Academic regulations12.5) shall be clearly defined in the Course Plan for every Course, and approved by the DAC.

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

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

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

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

Grading shall be done at the end of the Academic Term by considering the aggregate performance of the student in all components of Assessments prescribed for the Course. Letter Grades (Clause 8.10 of Academic Regulations) 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

S. No	Credit Structure [L-T-P-C]	Percentage/ Marks	CA		Mid-Term		End-term		Project	Total	Exam Conducted by
			Theory	Practical	Theory	Practical	Theory	Practical			
1	3-0-0-3	Percentage	25%	-	25%	-	50%	-	-	100 %	Mid-Term & End Term by CoE
		Marks	50	-	50	-	100	-	-	200	
2	2-0-2-3	Percentage	12.50%	12.50 %	12.50%	12.50 %	25%	25%	-	100 %	Mid-Term & End Term by CoE * Except for full stack courses
		Marks	25	25	25	25	50	50	-	200	
3	1-0-4-3	Percentage	-	25%	10%	40%	5%	20%	-	100 %	Mid-Term & End Term by School
		Marks	-	25	10	40	5	25	-	100	
4	2-0-4-4	Percentage	12.50%	12.50 %	10%	15%	20%	30%	-	100 %	*Mid-Term & End Term by CoE
		Marks	25	25	20	30	40	60	-	200	
5	0-0-4-2	Percentage	-	50%	-	-	-	-	50%	100 %	Project evaluated by IC at School level
		Marks	-	50	-	-	-	-	50	100	
6	0-0-2-1	Percentage	-	100%	-	-	-	-	-	100 %	Only CA at School Level
		Marks	-	100	-	-	-	-	-	100	
7	3-0-2-4	Percentage	12.50%	12.50 %	15%	10%	30%	20%	-	100 %	Mid-Term & End Term by CoE
		Marks	25	25	30	20	60	40	-	200	
8	2-0-0-2	Percentage	25 %	-	25%	-	50%	-	-	100 %	Mid-Term & End Term by CoE
		Marks	50	-	50	-	100	-	-	200	

*CSE3426-Front End Full stack development
CSE3427-Java Full Stack Development
CSE3428-.Net Full Stack development

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.

12.6 **Minimum Performance Criteria:**

12.6.1 Theory only Course and Lab/Practice Embedded Theory Course

A student shall satisfy the following minimum performance criteria to be eligible to earn the credits towards the concerned Course:

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

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

12.6.2 Lab/Practice only Course and Project Based Courses

The student must obtain a minimum of 40% of the AGGREGATE of the marks/weightage of all assessment components in the concerned Course.

12.6.3 A student who fails to meet the minimum performance criteria listed above in a Course shall be declared as "Fail" and given "F" Grade in the concerned Course. For theory Courses, the student shall have to re-appear in the "Make-Up Examinations" as scheduled by the University in any subsequent semester, or, re-appear in the End Term Examinations of the same Course when it is scheduled at the end of the following Semester or Summer Term, if offered. The marks obtained in the Continuous Assessments (other than the End Term Examination) shall be carried forward and be included in computing the final grade, if the student secures the minimum requirements (as per sub-clauses 12.6.1 and 8.9.2 of Academic Regulations) in the "Make-Up Examinations" of the concerned Course. Further, the student has an option to re-register for the Course and clear the same in the

summer term/ subsequent semester if he/she wishes to do so, provided the Course is offered.

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

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

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

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

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

13.3.1 A student may complete SWAYAM/NPTEL/other approved MOOCs as mentioned in Clause 13.3 (As per Academic Regulations) and transfer equivalent credits to partially or fully complete the mandatory credit requirements of Discipline Elective Courses and/or the mandatory credit requirements of Open Elective Courses as prescribed in the concerned Curriculum Structure. However, it is the sole responsibility of the student to complete the mandatory credit requirements of the Discipline Elective Courses and the Open Elective Courses as prescribed by the Curriculum Structure of the concerned Program.

13.3.2 SWAYAM/NPTEL/ other approved MOOCs as mentioned in Clause 13.3 (As per Academic Regulations) shall be approved by the concerned Board of Studies and placed (as Annexures) in the concerned PRC.

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

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

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

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

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

13.3.8 The credit equivalence of the SWAYAM/NPTEL/other approved MOOCs are based on Course durations and/or as recommended by the Course offering body/institute/university. The Credit Equivalence mapped to SWAYAM/ NPTEL approved Courses based on Course durations for transfer of credits is summarized 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

13.3.9 The maximum permissible number of credits that a student may request for credit transfer from MOOCs shall not exceed 20% of the

mandatory minimum credit requirements specified by the concerned Program Regulations and Curriculum for the award of the concerned Degree.

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

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

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

S (Satisfactorily Completed): Awarded when the student successfully completes all prescribed course requirements.

NC (Not Completed): Awarded when the student fails to meet the prescribed course requirements.

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

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

PART B – PROGRAM STRUCTURE

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

The B.Tech. (Computer Science and Engineering-Cyber Security) Program Structure (2025-2029) totaling 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: B.Tech. (Computer Science & Engineering-Cyber Security) 2025-2029: Summary of Mandatory Courses and Minimum Credit Contribution from various Baskets		
Sl. No.	**Baskets**	**Credit Contribution**
1	Humanities and Social Sciences including Management Courses (HSMC)	10
2	Basic Science Courses (BSC)	24
3	Engineering Science Courses (ESC)	22
4	Professional Core Courses (PCC)	64
5	Project Work (PRW)	16
6	Professional Elective Courses (PEC)	18
7	Open Elective Courses (OEC)	06
8	Mandatory Courses (MAC)*	0
	Total Credits	**160 (Minimum)**

* Please refer to Table 3.6, (where the number '8' corresponds to the serial number of the Mandatory course basket.)

In the entire Program, the practical and skill based course component contribute to an extent of approximately 61% out of the total credits of 160 for B.Tech. (Computer Science and Engineering-Cyber Security) 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 19.2.1**Error! Reference source not found.** 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

Baskets
HSMC - Humanities and Social Sciences (including Management courses) (HSMC)
BSC - Basic Science Courses ESC - Engineering Science Courses
PCC - Professional Core Course
PEC - Professional Elective Courses
OEC - Open Elective Courses
EEC - Employment Enhancement Courses
MAC - Mandatory Course

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

Sl. No.	Course Code	Course Name	L	T	P	Credits	Contact Hours	Type of Skill	Pre-requisite
1	ENG1900	English for Technical Communication	2	0	0	2	2	S	Nil
2	DES1146	Introduction to Design Thinking	1	0	0	1	1	F	Nil
3	ENG2501	Advanced English	2	0	0	2	2	S	Nil
4	FIN1002	Essentials of Finance	3	0	0	3	3	S	Nil
5	APT4005	Aptitude for Employability	0	0	2	1	2	AT	Nil
6	PPS3018	Preparedness for Interview	0	0	2	1	2	SS	Nil

Total	8	0	4	10	12		

Table 3.2: List of Basic Science Courses (BSC)

Sl. No.	Course Code	Course Name	L	T	P	Credits	Contact Hours	Type of Skill	Pre-requisite
1	MAT2301	Calculus and Differential Equations	3	1	0	4	4	F	Nil
2	PHY2501	Optoelectronics and Quantum Physics	3	0	0	3	3	F	Nil
3	PHY2504	Optoelectronics and Quantum Physics Lab	0	0	2	1	2	F	Nil
4	MAT2402	Probability and Statistics	3	1	0	4	4	F	Nil
5	CHE2501	Chemistry of Smart Materials	3	0	0	3	3	S	Nil
6	CHE2502	Chemistry of Smart Materials Lab	0	0	2	1	2	S	Nil
7	MAT2303	Linear Algebra and Vector Calculus	3	1	0	4	4	EM	Nil
8	MAT2404	Discrete Mathematics	3	1	0	4	4	F	Nil
		Total	**18**	**4**	**4**	**24**	**26**		

Table 3.3: List of Engineering Science Courses (ESC)

Sl. No.	Course Code	Course Name	L	T	P	Credits	Contact Hours	Type of Skill	Pre-requisite
1	MEC1006	Engineering Graphics	2	0	0	2	2	**S**	Nil
2	CSE1500	Computational Thinking using Python	2	0	2	3	4	**S**	Nil
3	ECE2022	Digital Design	2	0	0	2	2	**F/S**	Nil
4	ECE2052	Digital Design Lab	0	0	2	1	2	**F/S**	Nil
5	CIV1200	Foundations of Integrated Engineering	2	0	0	2	2	**S**	Nil

6	EEE1200	Basics of Electrical and Electronics Engineering	3	0	0	3	3	**F/S**	Nil
7	EEE1250	Basics of Electrical and Electronics Engineering Lab	0	0	2	1	2	**F/S**	Nil
8	ECE1511	Design Workshop	1	0	2	2	3	**S/EM**	Nil
9	CSE2264	Essentials of AI	3	0	0	3	3	**S/EM**	Nil
10	CSE2265	Essentials of AI Lab	0	0	2	1	2	**S/EM**	Nil
11	CSE2274	Competitive Programming and Problem Solving	0	0	4	2	4	**S/EM**	Nil
		Total	**15**	**0**	**14**	**22**			

Table 3.4: List of Professional Core Courses (PCC)

S. No	Course Code	Course Name	L	T	P	C	Contact Hours	Type of Skills/Focus	Pre-requisites/ Co-requisites
1	CSE2200	Problem Solving using C	2	0	0	2	2	S	Nil
2	CSE2201	Problem Solving using C Lab	0	0	4	2	4	S/EM	Nil
3	CSE2251	Data Communication and Computer Networks	3	0	0	3	3	S	Nil
4	CSE2252	Data Communication and Computer Networks Lab	0	0	2	1	2	S	Nil
5	CSE2253	Data Structures	3	0	0	3	3	S	Nil
6	CSE2254	Data Structures Lab	0	0	2	1	2	S/EM	Nil
7	CSE2255	Object Oriented Programming Using Java	3	0	0	3	3	S	Nil
8	CSE2256	Object Oriented Programming Using Java Lab	0	0	2	1	2	S/EM	Nil
9	CSE2257	Computer Organization and Architecture	3	0	0	3	3	S	NIL
10	CSE2258	Web Technologies	3	0	0	3	3	S	CSE2251
11	CSE2259	Web Technologies Lab	0	0	2	1	2	S	NIL
12	CSE2502	Cryptography and Network Security	3	0	0	3	3	S	CSE2251
13	CSE2269	Operating Systems	3	0	0	3	3	S/EM	NIL
14	CSE2270	Operating Systems Lab	0	0	2	1	2	S/EM	NIL
15	CSE2260	Database Management Systems	3	0	0	3	3	S	NIL

16	CSE2261	Database Management Systems Lab	0	0	2	1	2	**S**	CSE2251
17	CCS2504	Ethical Hacking	2	0	0	2	2	**S**	CSE2251
18	CCS2505	Ethical Hacking Lab	0	0	4	2	4	**S**	CSE2251
19	CSE2262	Analysis of Algorithms	3	1	0	4	4	**S**	NIL
20	CSE2263	Analysis of Algorithms Lab	0	0	2	1	2	**S**	NIL
21	CSE2266	Theory of Computation	3	0	0	3	3	S	NIL
22	CCS2500	Cyber Forensics	2	0	0	2	2	S/EM	CSE2251
23	CCS2501	Cyber Forensics Lab	0	0	2	1	2	S/EM	CSE2251
24	CCS2502	Cyber Threats for IoT and Cloud	3	0	0	3	3	S/EM	CSE2251
25	CCS2510	Security Assessment and Testing	2	0	0	2	2	S/EM	CSE2251
26	CCS2511	Security and Assessment Testing Lab	0	0	2	1	2	S	CSE2251
27	CSE2271	Software Design and Development	3	0	0	3	3	S/EM	Nil
28	CCS2507	Web Security	2	0	0	2	3	S/EM	CSE2251
29	CCS2508	Web Security Lab	0	0	2	1	2	S/EM	CSE2251
30	CCS2506	Intrusion Detection and Prevention System	3	0	0	3	3	S/EM	CSE2502
Total No. of Credits						**64**			

Table 3.5: List of course in Project Work basket (PRW)

Sl. No.	Course Code	Course Name	L	T	P	C	Contact Hours	Type of Skill	Pre-requisite
1	CSE7000	Internship	0	0	0	2	0	S/EM	--
2	CSE7100	Mini Project	0	0	0	4	0	S/EM	--
3	CSE7300	Capstone Project	0	0	0	10	0	S/EM	--
		Total	**0**	**0**	**0**	**16**	**0**		

Table 3.6 : List of Mandatory Courses (MAC)						
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1	CHE7601	Environmental Studies	-	-	-	0
2	LAW7601	Indian Constitution	-	-	-	0
3	CIV7601	Universal Human Values and Ethics	-	-	-	0
4	PPS1025	Industry Readiness Program - I	0	0	2	0
5	PPS1026	Industry Readiness Program - II	0	0	2	0
6	APT4002	Introduction to Aptitude	0	0	2	0
7	APT4004	Aptitude Training - Intermediate	0	0	2	0
8	APT4006	Logical and Critical Thinking	0	0	2	0
					Total No. of Credits	**0**

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

Practical / Skill based Courses like internship, project work, capstone project, research project / dissertation, and such similar courses, where the pedagogy does not lend itself to a typical L-T-P-C Structure as defined in Clause 5.1 of the Academic Regulations, are simply assigned the number of Credits based on the quantum of work / effort required to fulfill the learning objectives and outcomes prescribed for the concerned Courses. Such courses are referred to as Non-Teaching Credit Courses (NTCC). These Courses are designed to provide students with hands-on experience and skills essential for their professional development. These courses aim to equip students with abilities in problem identification, root cause analysis, problem-solving, innovation, and design thinking through industry exposure and project-based learning. The expected outcomes are first level proficiency in problem solving and design thinking skills to better equip B.Tech. graduates for their professional careers. The method of evaluation and grading for the Practical / Skill based Courses shall be prescribed and approved by the concerned Departmental Academic Committee (refer Annexure A of the Academic Regulations). The same shall be prescribed in the Course Handout.

18.1 Internship

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

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

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

Internship to a student;

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

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

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

18.2 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 the Capstone Project Policy of the University.

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

18.4 Research Project / Dissertation

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

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

The student may do the Research Project / Dissertation in an Industry / Company or academic / research institution of her / his choice subject to the above mentioned condition (Sub-Clause 18.4.4). 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 Specializations / Stream Basket

Type of Skill	Course Caters to
F - Foundation	GS - Gender Sensitization

S - Skill Development EM – Employability EN – Entrepreneurship SS-Soft Skills AT-Aptitude Training	ES - Environment and sustainability HP - Human values and Professional Ethics

Baskets
HSMC - Humanities and Social Sciences (including Management courses) (HSMC)
BSC - Basic Science Courses ESC - Engineering Science Courses
PCC - Professional Core Course
PEC - Professional Elective Courses
OEC - Open Elective Courses
EEC - Employment Enhancement Courses
MAC - Mandatory Course

Table 3.7: Professional Electives Courses/Specialization Tracks – Minimum of 12 credits is to be earned by the student in a particular track and overall 18 credits.

Track 1 – Cyber Defense and Operations Basket

S.No	Course Code	Course Name	L	T	P	C	Contact hours	Type of Skills	Pre-Requisite
1	CCS2510	Security Assessment and Testing	2	0	2	3	4	S/EM	CSE2251
2	CCS3403	AI and ML in Cyber Security	3	0	0	3	3	S/EM	CSE2502
3	CCS3404	Incident Response and Threat Hunting	3	0	0	3	3	S/EM	CSE2502
4	CCS3406	Cyber Digital Twin	3	0	0	3	3	S/EM	CSE2502
5	CCS3408	Privacy and Security in Online social media	3	0	0	3	3	S/EM	CSE2502
6	CCS3409	Machine Learning for Cyber Security	3	0	0	3	3	S/EM	CSE2264
7	CCS3411	Security Information and Event Management (SIEM)	3	0	0	3	3	S/EM	CSE2502
8	CCS3412	Blockchain Security	3	0	0	3	3	S/EM	CSE2502

Track 2 – Digital Evidence and Malware Research Basket

S.No	Course Code	Course Name	L	T	P	C	Contact hours	Type of Skills	Pre-Requisite
1	CCS2509	Malware Analysis	3	0	0	3	3	S/EM	CSE2502
2	CCS3407	Quantum Cryptography	3	0	0	3	3	S/EM	CSE2264
3	CCS3410	Digital Watermarking and Steganography	3	0	0	3	3	S/EM	CSE2502
4	CCS3400	Digital and Mobile Forensics	2	0	2	3	4	S/EM	CSE2251
5	CCS3416	Cryptocurrency Technologies	3	0	0	3	3	S/EM	CSE2502

Track 3 – Offensive Security and Engineering									
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Contact hours**	**Type of Skills**	**Pre-Requisite**
1	CCS3402	Identity and Access Management	3	0	0	3	3	S/EM	CSE2251
2	CCS3414	Security in IoT	3	0	0	3	3	S/EM	CSE2502
3	CCS3405	Vulnerability Assessment and Penetration Testing	3	0	0	3	3	S/EM	CSE2251
4	CCS3413	Security Auditing and Governance	3	0	0	3	3	S/EM	CSE2502
5	CCS3415	Cloud Security	3	0	0	3	3	S/EM	CSE2502
6	CCS3417	Security and Privacy in Cloud	2	0	2	3	3	S/EM	CSE2502
Track 04-Special Basket									
1	CSE3426	Front End Full Stack Development*	2	0	2	3	4	S/ EM	CSE2258
2	CSE3427	Java Full Stack Development*	2	0	2	3	4	S/ EM	CSE2258
3	CSE3428	.Net Full Stack Development*	2	0	2	3	4	S/ EM	CSE2258
4	CAI3427	Language Models for Text Mining+	2	0	2	3	4	S/EM	CSE2264
5	CAI3428	Practical Deep Learning with TensorFlow+	2	0	2	3	4	S/EM	CSE2264
6	CAI3429	Deep Learning Techniques for Computer Vision+	2	0	2	3	4	S/EM	MAT2402
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	CHE7601	Environmental Studies **	0	0	0	0	-	F	Nil
3	CIV7601	Universal Human Values and Ethics **	0	0	0	0	-	F	Nil
*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

Baskets
HSMC - Humanities and Social Sciences (including Management courses) (HSMC)
BSC - Basic Science Courses
ESC - Engineering Science Courses

PCC - Professional Core Course
PEC - Professional Elective Courses
OEC - Open Elective Courses
EEC - Employment Enhancement Courses
MAC - Mandatory Course

Table 3.8: Open Elective Courses Baskets: Minimum Credits to be earned from this Basket is 06

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	Course Category
Chemistry Basket												
1	CHE1003	Fundamentals of Sensors	3	0	0	3	SD	ES	-	-		OEC
2	CHE1004	Smart materials for IOT	3	0	0	3	SD	ES	-	-		OEC
3	CHE1006	Introduction to Nano technology	3	0	0	3	SD	ES	-	-		OEC
4	CHE1011	Chemical and Petrochemical catalysts	3	0	0	3	SD	ES	-	-		OEC
5	CHE1013	Chemistry for Engineers	3	0	0	3	SD	ES	-	-		OEC
6	CHE1014	Surface and Coatings technology	3	0	0	3	SD	ES	-	-		OEC
7	CHE1016	Forensic Science	3	0	0	3	SD	HP	-	-		OEC
Civil Engineering Basket												
1	CIV1001	Disaster mitigation and management	3	0	0	3	SD	ES / HP	-	-		OEC
2	CIV1002	Environmental Science and Disaster Management	3	0	0	3	FC	ES	-	-		OEC
3	CIV2001	Sustainablility Concepts in Engineering	3	0	0	3	SD	ES	-	-		OEC
4	CIV2002	Occupational Health and Safety	3	0	0	3	SD		-	-		OEC

5	CIV2003	Sustainable Materials and Green Buildings	3	0	0	3	SD / EM	ES	-	-		OEC
6	CIV2004	Integrated Project Management	3	0	0	3	SD / EM / EN	HP / GS	-	-		OEC
7	CIV2005	Environmental Impact Assessment	3	0	0	3	EM / EN	ES	-	-		OEC
8	CIV2006	Infrastructure Systems for Smart Cities	3	0	0	3	EM / EN	ES	-	-		OEC
9	CIV2044	Geospatial Applications for Engineers	2	0	2	3	SD / EM	ES	-	-		OEC
10	CIV2045	Environmental Meteorology	3	0	0	3	SD	ES	-	-		OEC
11	CIV3046	Project Problem Based Learning	3	0	0	3	SD	ES	-	-		OEC
12	CIV3059	Sustainability for Professional Practice	3	0	0	3	EN	ES	-	-		OEC
Commerce Basket												
1	COM2007	Basics of Accounting	3	0	0	3	FC	-	-	-		OEC
Computer Science Basket												
1	CSE2002	Programming in Java	2	0	2	3	S/ EM					ESC
2	CSE2003	Social Network Analytics	3	0	0	3	S					ESC
3	CSE2004	Python Application Programming	2	0	2	3	S/ EM					ESC
4	CSE2005	Web design fundamentals	2	0	2	3	S/ EM /EN					
Design Basket												
1	DES2001	Design Thinking	3	0	0	3	SD		-	-		OEC
2	DES2080	Art of Design Language	3	0	0	3	SD		-	-		OEC
3	DES2081	Brand Building in Design	3	0	0	3	SD		-	-		OEC

4	DES2085	Web Design Techniques	3	0	0	3	SD		-	-		OEC
5	DES2089	3D Modeling for Professionals	1	0	4	3	SD		-	-		OEC
6	DES2090	Creative Thinking for Professionals	3	0	0	3	SD		-	-		OEC
7	DES2091	Idea Formulation	3	0	0	3	SD		-	-		OEC
Electrical and Electronics Engineering Basket												
1	EEE1002	IoT based Smart Building Technology	3	0	0	3	SD	-	-	-		OEC
2	EEE1003	Basic Circuit Analysis	3	0	0	3	SD	-	-	-		OEC
3	EEE1004	Fundamentals of Industrial Automation	3	0	0	3	SD	-	-	-		OEC
4	EEE1005	Electric Vehicles & Battery technology	3	0	0	3	SD	-	-	-		OEC
5	EEE1006	Smart Sensors for Engineering Applications	3	0	0	3	SD	-	-	-		OEC
Electronics and Communication Engineering Basket												
1	ECE1003	Fundamentals of Electronics	3	0	0	3	FC	-	-	-		OEC
2	ECE1004	Microprocessor based systems	3	0	0	3	FC	-	-	-		OEC
3	ECE3089	Artificial Neural Networks	3	0	0	3	SD	-	-	-		OEC
4	ECE3097	Smart Electronics in Agriculture	3	0	0	3	FC / EM	-	-	-		OEC
5	ECE3098	Environment Monitoring Systems	3	0	0	3	FC / EM	-	-	-		OEC
6	ECE3102	Consumer Electronics	3	0	0	3	FC / EM	-	-	-		OEC
7	ECE3103	Product Design of Electronic Equipment	3	0	0	3	SD / FC / EM	-	-	-		OEC

							/ EN					
8	ECE3106	Introduction to Data Analytics	3	0	0	3	FC / EM	-	-	-		OEC
9	ECE3107	Machine Vision for Robotics	3	0	0	3	FC / EM	-	-	-		OEC
English Basket												
1	ENG1009	Reading Advertisement	3	0	0	3	SD		-	-		OEC
2	ENG1010	Verbal Aptitude for Placement	2	0	2	3	SD		-	-		OEC
3	ENG1011	English for Career Development	3	0	0	3	SD		-	-		OEC
4	ENG1013	Indian English Drama	3	0	0	3			-	-		OEC
5	ENG1014	Logic and Art of Negotiation	2	0	2	3						OEC
Kannada Basket												
1	KAN1003	Kannada Kaipidi	3	0	0	3	SD	-	-	-		OEC
2	KAN2005	Anuvadha Kala Sahithya	3	0	0	3	SD	-	-	-		OEC
3	KAN2006	Vichara Manthana	3	0	0	3	SD	-	-	-		OEC
4	KAN2007	Katha Sahithya Sampada	3	0	0	3	SD	-	-	-		OEC
5	KAN2008	Ranga Pradarshana Kala	3	0	0	3	SD	-	-	-		OEC
Foreign Language Basket												
1	FRL1009	Mandarin Chinese for Beginners	3	0	0	3	SD	-	-	-		OEC
Law Basket												
1	LAW2014	Introduction to Competition Law	3	0	0	3	FC	HP	-	-		OEC
2	LAW2015	Cyber Law	3	0	0	3	FC	HP	-	-		OEC
Mathematics Basket												
1	MAT2008	Mathematical Reasoning	3	0	0	3	SD	-	-			OEC
2	MAT2014	Advanced Business Mathematics	3	0	0	3	SD	-	-	-		OEC

3	MAT2041	Functions of Complex Variables	3	0	0	3	SD	-	-	-		OEC
4	MAT2042	Probability and Random Processes	3	0	0	3	SD	-	-	-		OEC
5	MAT2043	Elements of Number Theory	3	0	0	3	SD	-	-	-		OEC
6	MAT2044	Mathematical Modelling and Applications	3	0	0	3	SD	-	-	-		OEC
Mechanical Engineering Basket												
1	MEC1001	Fundamentals of Automobile Engineering	3	0	0	3	SD	-	-	-		OEC
2	MEC1002	Introduction to Matlab and Simulink	3	0	0	3	SD / EM	-	-	-		OEC
3	MEC1003	Engineering Drawing	1	0	4	3	SD	-	-	-		OEC
4	MEC2001	Renewable Energy Systems	3	0	0	3	FC	ES	-	-		OEC
5	MEC2002	Operations Research & Management	3	0	0	3	FC	-	-	-		OEC
6	MEC2003	Supply Chain Management	3	0	0	3	SD / EM / EN	-	-	-		OEC
7	MEC2004	Six Sigma for Professionals	3	0	0	3	SD / EM	-	MEC 2008	-		OEC
8	MEC2005	Fundamentals of Aerospace Engineering	3	0	0	3	FC	-	-	-		OEC
9	MEC2006	Safety Engineering	3	0	0	3	SD / EM	ES	-	-		OEC
10	MEC2007	Additive Manufacturing	3	0	0	3	FC / EM	-	-	-		OEC
11	MEC3069	Engineering Optimisation	3	0	0	3	SD / EM	-	-	-		OEC
12	MEC3070	Electronics Waste Management	3	0	0	3	FC / SD	ES	-	-		OEC

13	MEC3071	Hybrid Electric Vehicle Design	3	0	0	3	SD / EM	ES	-	-		OEC
14	MEC3072	Thermal Management of Electronic Appliances	3	0	0	3	SD / EM	-	-	-		OEC
15	MEC3200	Sustainable Technologies and Practices	3	0	0	3	SD / EM	-	-	-		OEC
16	MEC3201	Industry 4.0	3	0	0	3	SD / EM	-	-	-		OEC
Petroleum Engineering Basket												
1	PET1011	Energy Industry Dynamics	3	0	0	3	FC / SD / EM	ES	-	-	-	OEC
2	PET1012	Energy Sustainability Practices	3	0	0	3	FC / SD / EM	ES	-	-	-	OEC
Physics Basket												
1	PHY1003	Mechanics and Physics of Materials	3	0	0	3	FC / SD		-	-		OEC
2	PHY1004	Astronomy	3	0	0	3	FC		-	-		OEC
3	PHY1005	Game Physics	2	0	2	3	FC / SD		-	-		OEC
4	PHY1007	Physics of Nanomaterials	3	0	0	3	FC		-	-		OEC
5	PHY2004	Laser Physics	3	0	0	3	FC	ES	-	-		OEC
6	PHY2005	Science and Technology of Energy	3	0	0	3	FC	ES	-	-		OEC
Management Basket												
1	MGT1001	Introduction to Psychology	3	0	0	3	FC	HP	-	-		OEC
2	MGT1002	Business Intelligence	3	0	0	3	EN		-	-		OEC
3	MGT1003	NGO Management	3	0	0	3	SD		-	-		OEC
4	MGT1004	Essentials of Leadership	3	0	0	3	EM / EN	GS / HP	-	-		OEC
5	MGT1005	Cross Cultural Communication	3	0	0	3	SD / EM	HP	-	-		OEC

							/ EN					
6	MGT2001	Business Analytics	3	0	0	3	SD / EM / EN		-	-		OEC
7	MGT2002	Organizational Behaviour	3	0	0	3	FC	HP	-	-		OEC
8	MGT2003	Competitive Intelligence	3	0	0	3	SD	-	-	-		OEC
9	MGT2004	Development of Enterprises	3	0	0	3	SD / EM / EN		-	-		OEC
10	MGT2005	Economics and Cost Estimation	3	0	0	3	SD / EM		-	-		OEC
11	MGT2006	Decision Making Under Uncertainty	3	0	0	3	SD		-	-		OEC
12	MGT2008	Econometrics for Managers	3	0	0	3	SD		-	-		OEC
13	MGT2009	Management Consulting	3	0	0	3	SD / EM / EN		-	-		OEC
14	MGT2010	Managing People and Performance	3	0	0	3	SD / EM / EN	HP / GS	-	-		OEC
15	MGT2011	Personal Finance	3	0	0	3	FC		-	-		OEC
16	MGT2012	E Business for Management	3	0	0	3	SD / EM		-	-		OEC
17	MGT2013	Project Management	3	0	0	3	EN / EM	GS / HP / ES	-	-		OEC
18	MGT2014	Project Finance	3	0	0	3	EN / EM	HP	-	-		OEC
19	MGT2015	Engineering Economics	3	0	0	3	SD		-	-		OEC
20	MGT2016	Business of Entertainment	3	0	0	3	EM / EN		-	-		OEC

21	MGT2017	Principles of Management	3	0	0	3	SD / EM / EN		-	-		OEC
22	MGT2018	Professional and Business Ethics	3	0	0	3	SD / EM / EN	HP	-	-		OEC
23	MGT2019	Sales Techniques	3	0	0	3	SD / EM / EN	HP	-	-		OEC
24	MGT2020	Marketing for Engineers	3	0	0	3	SD / EM / EN	HP				OEC
25	MGT2021	Finance for Engineers	3	0	0	3	SD / EM / EN	HP				OEC
26	MGT2022	Customer Relationship Management	3	0	0	3	SD / EM / EN	HP				OEC
27	MGT2023	People Management	3	0	0	3	SD / EM / EN	HP				OEC
Media Studies Basket												
1	BAJ3051	Digital Photography	2	0	2	3	EM	HP				OEC

21.List of MOOC (NPTEL) Courses

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	Evaluation
1.	12 weeks	3	Continuous Assessment –50 Marks Mid Term –50 Marks End Term-100 Marks
2.	8 weeks	2	Mid Term-50 Marks End Term-100 Marks
3	4 weeks	1	End Term-100 Marks

21.2 MOOC – Discipline Elective Courses for B.Tech. Computer Science and Engineering (Cyber Security) Program of 4 weeks (01 credit)/ 8 weeks (02 credits)/ 12 weeks (03 credits)

Table 3.9: 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	CSE502	Technical Skills in JAVA	3	0-0-6-3
7	CSE503	Technical Skills in Python	3	0-0-6-3
8	CSE504	Comprehensive Technical Skills	5	0-0-10-5
9	CSE505	The Joy of Computing Using Python	3	3-0-0-3
10	CSE3119	Coding Skills in Python	3	3-0-0-3
11	CSE3121	Parallel Computer Architecture	3	3-0-0-3
12	CSE3124	Games and Information	3	3-0-0-3
13	CSE3140	Introduction to Industry 4.0 and Industrial Internet of Things	3	3-0-0-3
14	CSE3142	Affective Computing	3	3-0-0-3
15	CSE3196	Foundations of Cyber Physical Systems	3	3-0-0-3
16	CSE3197	Getting Started with Competitive Programming	3	3-0-0-3
17	CSE3198	GPU Architectures and Programming	3	3-0-0-3
18	CSE3199	Artificial Intelligence: Knowledge Representation and Reasoning	3	3-0-0-3
19	CSE3200	Programming in Modern C++	3	3-0-0-3
20	CSE3201	Circuit Complexity Theory	3	3-0-0-3
21	CSE3202	Basics of Computational Complexity	3	3-0-0-3
22	CSE3212	Introduction to Computer and Network Performance Analysis using Queuing	1	1-0-0-1
23	CSE3213	C Programming and Assembly Language	1	1-0-0-1
24	CSE3214	Python for Data Science	1	1-0-0-1
25	CSE3215	Software Conceptual Design	1	1-0-0-1
26	CSE3117	Industrial Digital Transformation	3	3-0-0-3
27	CSE3118	Blockchain for Decision Makers	3	3-0-0-3
28	CSE3349	Technology for Lawyers	3	3-0-0-3
29	CSE3430	Deep Learning for Natural Language Processing	3	3-0-0-3
30	CSE3431	Machine Learning for Engineering and Science Applications	3	3-0-0-3
31	CSE3432	Algorithms in Computational Biology and Sequence Analysis	3	3-0-0-3
32	CSE3433	Introduction to Large Language Models (LLMs)	3	3-0-0-3
33	CSE3434	Quantum Algorithms and Cryptography	3	3-0-0-3

21.3 MOOC - Open Elective Courses for B. Tech. (Computer Science and Engineering-Cyber Security)

Table 3.10: MOOC Open Elective Courses

Open Elective Courses Duration is 4 weeks (01 credit)/ 8 weeks (02 credits)/ 12 weeks (03 credits)

Sl. No.	Course code	Course Name	L	T	P	C
1	BBA2022	Supply Chain digitization	3	0	0	3
2	BBA2021	E Business	3	0	0	3
3	BBB2016	Business Analytics for Management Decisions	3	0	0	3
4	BBB2015	Artificial Intelligence for Investments	3	0	0	3
5	MEC3001 *	Design and Development of Product	1	0	0	1
6	ENG3004 **	Perspectives of Neurolinguistics	1	0	0	1
7	PPS4009 ***	Working in Contemporary Teams	1	0	0	1

8	MGT3001	Data Analysis and Decision Making	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

First Year Cycle 1

Sl. No.	Course Code	Course Name	L	T	P	C	Contact Hours	Type of Skill	Pre-requisite	Basket
Semester I - PHYSICS Cycle (CSE-Allied (29 Sec))			**15**	**1**	**8**	**19**	**24**			
1	MAT2301	Calculus and Differential Equations	3	1	0	4	4	F	Nil	BSC
2	ENG1900	English for Technical Communication	2	0	0	2	2	S	Nil	HSMC
3	PHY2501	Optoelectronics and Quantum Physics	3	0	0	3	3	F	Nil	BSC
4	PHY2504	Optoelectronics and Quantum Physics Lab	0	0	2	1	2	F	Nil	BSC
5	MEC1006	Engineering Graphics	2	0	0	2	2	S	Nil	ESC
6	ECE2022	Digital Design	2	0	0	2	2	F/S	Nil	ESC
7	ECE2052	Digital Design Lab	0	0	2	1	2	F/S	Nil	ESC
8	DES1146	Introduction to Design Thinking	1	0	0	1	1	F	Nil	HSMC
9	CSE1500	Computational Thinking using Python	2	0	2	3	4	S	Nil	ESC
10	PPS1025	Industry Readiness Program – I	0	0	2	0	2	SS	Nil	MAC
Semester I - CHEMISTRY Cycle (CSE (21 Sec + Engg 10 Sec))			**16**	**1**	**8**	**19**	**25**			
1	MAT2301	Calculus and Differential Equations	3	1	0	4	4	F	Nil	BSC
2	ENG1900	English for Technical Communication	2	0	0	2	2	S	Nil	HSMC
3	CHE2501	Chemistry of Smart Materials	3	0	0	3	3	S	Nil	BSC
4	CHE2502	Chemistry of Smart Materials Lab	0	0	2	1	2	S	Nil	BSC
5	CIV1200	Foundations of Integrated Engineering	2	0	0	2	2	S	Nil	ESC
6	EEE1200	Basics of Electrical and Electronics Engineering	3	0	0	3	3	F/S	Nil	ESC
7	EEE1250	Basics of Electrical and Electronics Engineering Lab	0	0	2	1	2	F/S	Nil	ESC
8	LAW7601	Indian Constitution	1	0	0	0	1	F	Nil	MAC
9	CSE1500	Computational Thinking using Python	2	0	2	3	4	S	Nil	ESC
10	PPS1025	Industry Readiness Program – I	0	0	2	0	2	SS	Nil	MAC

First Year Cycle 2

Semester II - CHEMISTRY Cycle (CSE-Allied (29 Sec))	**16**	**1**	**10**	**22**	**27**			

1	MAT2402	Probability and Statistics	3	1	0	4	4	F	Nil	BSC
2	ENG2501	Advanced English	2	0	0	2	2	S	Nil	HSMC
3	CHE2501	Chemistry of Smart Materials	3	0	0	3	3	S	Nil	BSC
4	CHE2502	Chemistry of Smart Materials Lab	0	0	2	1	2	S	Nil	BSC
5	CIV1200	Foundations of Integrated Engineering	2	0	0	2	2	S	Nil	ESC
6	EEE1200	Basics of Electrical and Electronics Engineering	3	0	0	3	3	F/S	Nil	ESC
7	EEE1250	Basics of Electrical and Electronics Engineering Lab	0	0	2	1	2	F/S	Nil	ESC
8	LAW7601	Indian Constitution	0	0	0	0	0	F	Nil	MAC
9	CSE2000	Problem Solving using C	2	0	0	2	2	S	Nil	PCC
10	CSE2001	Problem Solving using C Lab	0	0	4	2	4	S	Nil	PCC
11	PPS1026	Industry Readiness Program – II	0	0	2	0	2	SS	Nil	MAC
12	ECE1511	Design Workshop	1	0	2	2	3	S/EM	Nil	ESC
13	CHE7601	Environmental Studies	0	0	0	0	0	F	Nil	MAC
Semester II - PHYSICS Cycle (CSE (21 Sec + Engg 10 Sec))			**15**	**1**	**10**	**22**	**26**			
1	MAT2402	Probability and Statistics	3	1	0	4	4	F	Nil	BSC
2	ENG2501	Advanced English	2	0	0	2	2	S	Nil	HSMC
3	PHY2501	Optoelectronics and Quantum Physics	3	0	0	3	3	F	Nil	BSC
4	PHY2504	Optoelectronics and Quantum Physics Lab	0	0	2	1	2	F	Nil	BSC
5	MEC1006	Engineering Graphics	2	0	0	2	2	S	Nil	ESC
6	ECE2022	Digital Design	2	0	0	2	2	F/S	Nil	ESC
7	ECE2052	Digital Design Lab	0	0	2	1	2	F/S	Nil	ESC
8	DES1146	Introduction to Design Thinking	1	0	0	1	1	F	Nil	HSMC
9	CSE2000	Problem Solving using C	2	0	0	2	2	S	Nil	PCC
10	CSE2001	Problem Solving using C Lab	0	0	4	2	4	S	Nil	PCC
11	PPS1026	Industry Readiness Program – II	0	0	2	0	2	SS	Nil	MAC
12	ECE1511	Design Workshop	1	0	2	2	3	S/EM	Nil	ESC
13	CHE7601	Environmental Studies	0	0	0	0	0	F	Nil	MAC

Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Contact Hours**	**Type of Skill**	**Pre-requisite**	**Basket**
Semester 3			**18**	**1**	**10**	**23**	**29**			
1	MAT2303	Linear Algebra and Vector Calculus	3	1	0	4	4	EM	Nil	BSC
2	CSE2251	Data Communication and Computer Networks	3	0	0	3	3	S	Nil	PCC
3	CSE2252	Data Communication and Computer Networks Lab	0	0	2	1	2	S	Nil	PCC
4	CSE2253	Data Structures	3	0	0	3	3	S	Nil	PCC

5	CSE2254	Data Structures Lab	0	0	2	1	2	S	Nil	PCC
6	CSE2255	Object Oriented Programming Using Java	3	0	0	3	3	S/EM	Nil	PCC
7	CSE2256	Object Oriented Programming Using Java Lab	0	0	2	1	2	S/EM	Nil	PCC
8	CSE2257	Computer Organization and Architecture	3	0	0	3	3	S	Nil	PCC
9	CSE2258	Web Technologies	3	0	0	3	3	S/EM	Nil	PCC
10	CSE2259	Web Technologies Lab	0	0	2	1	2	S/EM	Nil	PCC
11	CIV7601	Universal Human Values and Ethics	0	0	0	0	0	S	Nil	MAC
12	APT4002	Introduction to Aptitude	0	0	2	0	2	AT	Nil	MAC
Semester 4			**17**	**2**	**12**	**24**	**31**			
1	**MAT2404**	**Discrete Mathematics**	**3**	**1**	**0**	**4**	**4**	**F**	**Nil**	**BSC**
2	CSE2502	Cryptography and Network Security	3	0	0	3	**3**	S	**CSE2251**	**PCC**
3	**CSE2269**	**Operating Systems**	**3**	**0**	**0**	**3**	**3**	**S**	**Nil**	**PCC**
4	**CSE2270**	**Operating Systems Lab**	**0**	**0**	**2**	**1**	**2**	**S/EM**	**Nil**	**PCC**
5	**CSE2260**	**Database Management Systems**	**3**	**0**	**0**	**3**	**3**	**S**	**Nil**	**PCC**
6	**CSE2261**	**Database Management Systems Lab**	**0**	**0**	**2**	**1**	**2**	**S**	**Nil**	**PCC**
7	**CCS2504**	Ethical Hacking	**2**	**0**	**0**	**2**	**2**	**S/EM**	**CSE2251**	**PCC**
8	**CCS2505**	Ethical Hacking Lab	**0**	**0**	**4**	**2**	**4**	**S/EM**	**CSE2251**	**PCC**
9	**CSE2262**	**Analysis of Algorithms**	**3**	**1**	**0**	**4**	**4**	**S**	**Nil**	**PCC**
10	**CSE2263**	**Analysis of Algorithms Lab**	**0**	**0**	**2**	**1**	**2**	**S**	**Nil**	**PCC**
11	APT4004	Aptitude Training-Intermediate	0	0	2	0	2	AT	Nil	MAC
Semester 5			**19**	**0**	**8**	**24**	**27**			
1	**CSE2266**	**Theory of Computation**	**3**	**0**	**0**	**3**	**3**	**S**	**Nil**	**PCC**
2	**CCS2500**	Cyber Forensics	**2**	**0**	**0**	**2**	**2**	**S/EM**	**CSE2251**	**PCC**
3	**CCS2501**	Cyber Forensics Lab	**0**	**0**	**2**	**1**	**2**	**S/EM**	**CSE2251**	**PCC**
4	**CCS2502**	Cyber Threats for IoT and Cloud	**3**	**0**	**0**	**3**	**3**	**S/EM**	**CSE2251**	**PCC**
5	**CSE2264**	**Essentials of AI**	**3**	**0**	**0**	**3**	**3**	**S/EM**	**Nil**	**ESC**
6	**CSE2265**	**Essentials of AI Lab**	**0**	**0**	**2**	**1**	**2**	**S/EM**	**Nil**	**ESC**
7	CCS2510	Security Assessment and Testing	2	0	0	2	2	S/EM	**CSE2251**	PCC
8	CCS2511	Security and Assessment Testing Lab	0	0	2	1	2	S/EM	**CSE2251**	PCC
9	CSEXXXX	Professional Elective – I	3	0	0	3	**3**	S/EM	Nil	PEC
10	**CSE7000**	**Internship**	**0**	**0**	**0**	**2**	**0**	**S/EM**	**Nil**	**PRW**
11	FIN1002	Essentials of Finance	3	0	0	3	3	S	Nil	HSMC
12	**APT4006**	**Logical and Critical Thinking**	**0**	**0**	**2**	**0**	**2**	**AT**	**Nil**	**MAC**
Semester 6			**17**	**0**	**8**	**21**	**26**			
1	**CSE2271**	**Software Design and Development**	**3**	**0**	**0**	**3**	**3**	**S**	**Nil**	**PCC**
2	CCS2507	Web Security	2	0	0	2	3	S/EM	**CSE2251**	PCC
3	CCS2508	Web Security Lab	0	0	2	1	2	S/EM	**CSE2251**	PCC
4	CCS2506	Intrusion Detection and Prevention System	3	0	0	3	3	S/EM	CSE2502	PCC
5	**CSE2274**	**Competitive Programming and Problem Solving**	**0**	**0**	**4**	**2**	**4**	**S/EM**	**Nil**	**ESC**
6	CSEXXXX	Professional Elective – II	3	0	0	3	3	S	Nil	PEC

7	CSEXXXX	Professional Elective – III	3	0	0	3	3	S	Nil	PEC
8	XXXXXXX	Open Elective – I	3	0	0	3	3	S	Nil	OEC
9	**APT4005**	**Aptitude for Employability**	**0**	**0**	**2**	**1**	**2**	**AT**	**Nil**	**HSMC**
Semester 7			**12**	**0**	**2**	**17**	**14**			
1	CSEXXXX	Professional Elective – IV	3	0	0	3	3	S	Nil	PEC
2	CSEXXXX	Professional Elective – V	3	0	0	3	3	S	Nil	PEC
3	CSEXXXX	Professional Elective – VI	3	0	0	3	3	S	Nil	PEC
4	XXXXXXX	Open Elective – II	3	0	0	3	3	S	Nil	OEC
5	**PPS3018**	**Preparedness for Interview**	**0**	**0**	**2**	**1**	**2**	**SS**	**Nil**	**HSMC**
6	**CSE7100**	**Mini Project**	**0**	**0**	**0**	**4**	**0**	**S**	**Nil**	**PRW**
Semester 8			**0**	**0**	**0**	**10**	**0**			
1	**CSE7300**	**Capstone Project**	**0**	**0**	**0**	**10**	**0**	**S/EM**	**Nil**	**PRW**

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.

The Course Catalogues for the Courses offered in each basket are attached below:

Course Code: MAT2301	**Course Title: Calculus and Differential Equations** **Type of Course: BSC**	**L-T- P- C**	**3**	**1**	**0**	**4**
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	**NIL**					
Course Description	Calculus and differential equations are used ubiquitously throughout mathematics, statistics and operations research. In this course, students can be able to build upon the foundations of calculus established to greatly enhance their repertoire of theory and practice in these areas. The application of calculus and differential equations in the description and modelling of real-world problems will also be considered. This unit will extend the problem-solving skills, range of knowledge and use of techniques in differential and integral calculus. The course focuses on the concepts of Calculus and Differential Equations with reference to specific engineering problems. The course is of both conceptual and analytical type in nature.					
Course Objective	The goal of the course Calculus and Differential Equations is to facilitate the students with a concrete foundation of differential calculus and to solve the first and higher-order ordinary differential equations enabling them to acquire the knowledge of these mathematical tools.					

Course Out Comes	On successful completion of the course the students shall be able to: 1. Apply the knowledge of calculus to solve problems related to polar curves and its applications in determining the bentness of a curve. 2. Apply the principles of integral calculus to evaluate integrals. 3. Learn the notion of partial differentiation to calculate rate of change of multivariate functions and solve problems related to composite functions and Jacobian. 4. Solve first-order linear/nonlinear ordinary differential equations analytically using standard methods.		
Course Content:			
Module 1	**Differential Calculus**		**(10 Classes)**
Polar Coordinates, polar curves, angle between radius vector and the tangent, angle between two curves, pedal equations, curvature and radius of curvature. Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.			
Module 2	**Integral Calculus**	**Assignment**	**(10 Classes)**
Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. Rolle's theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.			
Module 3	**Multivariable Calculus**		**(10 lectures)**
Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.			
Module 4	**Differential Equations**	**Assignment**	**(15 lectures)**
Definition, types of Differential Equations, Applications, Variable Separable, Homogeneous, Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type. Linear differential equations of second and higher order with constant coefficients - Non-Homogeneous term of the type $Q(x) = e^{ax}$, Sin ax, Cosax, $e^{ax}v(x)$, $x^n v(x)$ - Method of variation of parameters.			
Targeted Application & Tools that can be used: Differential calculus is used extensively in science and engineering. It can solve problems related to motion, velocity, acceleration, angles of incline or curve on a surface, etc. Differential Equations are used to model the behavior of electromagnetic fields, including in the design of antennas, microwave ovens, and other devices. Biology: PDEs are used to model biological processes, such as the spread of diseases and the development of biological tissues. Tools Used: Python.			
Assignment:			
1. Select any one simple differential equation pertaining to the respective branch of engineering, identify the dependent and independent variable – Obtain the solution and compare the solution sets by varying the values of the dependent variable.			
Text Book 1. Erwin Kreyzig, Advanced Engineering Mathematics, John Wiley and sons, Inc.10th Edition 2. B. S. Grewal (2017), Higher Engineering Mathematics by, 44th Edition, Khanna Publishers.			

References:

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

E-resources/ Web links:

1. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_103205
2. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_106839
3. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_61605
4. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_134719
5. https://www.math.hkust.edu.hk/~maqian/ma006_0607F.html
6. https://www.scu.edu.au/study-at-scu/units/math1005/2022/

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

Course Code: PHY2504	**Course Title: Optoelectronics and Quantum Physics Lab** **Type of Course: BSC**	**L-T-P-C**	**0**	**0**	**2**	**1**
Version No.	1.0					
Course Pre-requisites	**NIL**					
Anti-requisites	**NIL**					
Course Description	The laboratory provides an opportunity to validate the concepts taught and enhances the ability to use the concepts for technological applications. The laboratory tasks aim to develop following skills: **An attitude of enquiry, confidence and ability to tackle new problems, ability to interpret events and results, observe and measure physical phenomena, select suitable equipment, instrument and materials, locate faults in systems.**					
Course Out Comes	On successful completion of the course the students shall be able to: CO1: To understand electrical and optical properties of materials CO2: Interpret the results of various experiments to verify the concepts used in optoelectronics and advanced devices.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of " Applied Physics for Computer Science Cluster "and attain **Skill Development** through **Experiential Learning** techniques					

List of Laboratory Tasks:

Experiment No. 1: Experimental errors and uncertainty using excel

Level 1: Calculation of accuracy and precision of a given data

Level 2: propagation of errors in addition, subtraction, multiplication and division.

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

Level 1: Determination of Wavelength of Laser

Level 2: Finding the particle size of lycopodium powder.

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

Level 1: To determine the proportionality of Hall Voltage and magnetic flux density

Level 2: To determine the polarity of Charge carrier.

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

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

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

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

Level 1: To determine the input resistance of a given transistor.

Level 2: To determine current transfer characteristics and transistor parameters of a given transistor.

Experiment No. 6: Determination of Fermi energy and Fermi temperature of a given metal and bimetallic wire.
Level 1: Determination of Fermi energy and Fermi temperature of given metal wire.
Level 2: Determination of Fermi energy and Fermi temperature of given bimetallic wire.

Experiment No. 7: To study the 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. 8: 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. 9: 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. 10: 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.

Experiment No. 11: Determination of dielectric constant of given materials.
Level 1: Determination of Stefan's constant
Level 2: compare the obtain results with other materials

Experiment No. 12: determine the wavelength of monochromatic light, such as sodium light, using Newton's rings.
Level 1: Determination of wavelength
Level 2: determine the radius of curvature of the Plano-convex lens.

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.

ject 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

Prepare a comprehensive report on non-conventional energy resources in Karnataka and their pros and cons.

Write a report on importance of quantum entanglement in supercomputers.

Course Code: PHY2501	**Course Title:** Optoelectronics and Quantum Physics **Type of Course:** **BSC**	**L-T-P-C**	**3**	**0**	**0**	**3**
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	**NIL**					
Course Description	The purpose of this course is to enable the students to understand the fundamentals, working and applications of optoelectronic devices and to develop the basic abilities to appreciate the applications of advanced microscopy and quantum computers. The course develops the critical thinking and analytical skills.					
Course Out Comes	On successful completion of the course the students shall be able to: CO1: To understand the concepts of electrical conducting properties of metal, semiconductor and superconductivity. CO2: To understand the principles of quantum mechanics. CO3: Discuss the quantum concepts used in quantum computers. CO4: Explain the applications of lasers and optical fibers in various technological fields.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "Applied Physics for Computer Science Cluster "and to attain the basic knowledge related to quantum mechanics and computation.					
Course Content:						
Module 1	**Electrical Conductivity of Solids and Semiconducting Devices**	Assignment	Data collection on efficiency of solar cells.			**12 Sessions**
Topics: Classification of materials based on bandgap, Fermi energy and Fermi level, Fermi level in semiconductors, Law of mass action, Electrical conductivity of a semiconductor, Hall effect, Superconductivity, p-n junctions, Zener diode, Solar cells, I-V characteristics, and LEDs						
Module 2	**Quantum Mechanics**	Assignment				12 Sessions
Topics: Introduction, de-Broglie hypothesis, Heisenberg's uncertainty principle- statement and physical significance. Wave function-properties and physical significance. Schrodindger's time independent wave equation, Probability density and normalization of wave function. Wave Function in Ket Notation: Matrix form of wave function, Identity operator, Determination of I|0> and I|1>, Pauli Matrices and its operations on 0 and 1 states, Mention of Conjugate and Transpose, Unitary Matrix U, Examples: 2x2 Matrices and their multiplication (Inner Product), Probability, Orthogonality						
Module 3	**Quantum Computing**	Term paper	Seminar on quantum computers.			11 Sessions
Topics: Introduction to quantum computing, Moore's law & its end, Differences between classical and quantum computing, Concept of Qubit and its properties, . Representation of qubit by Bloch sphere, Quantum Gates: Single Qubit Gates: Quantum Not Gate, Pauli Z Gate, Hadamard Gate, Phase Gate (or S Gate), T Gate. Multiple Qubit Gates: Controlled gate - CNOT Gate, (Discussion for 4 different input states). Representation of Swap gate, Controlled - Z gate, Toffoli gate. Problems.						

Module 4	**Lasers And Optical Fibers**	Term paper	Case study on medical applications of Lasers.	10 Sessions

Topics: Interactions of radiations with matter, expression for energy density of a system under thermal equilibrium in terms of Einstein's coefficients, conditions for LASER action using Einstein's coefficients, Characteristics of laser, conditions and requisites of laser, 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.

Targeted Application & Tools that can be used:

3. 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.
4. Origin, excel and Mat lab soft wares for programming and data analysis.

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

Assessment Type

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

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

Text Book

1. Engineering Physics by Avadhanalu, Revised edition, S. Chand Publications,2024.
2. Quantum Computation and Quantum Information, Michael A. Nielsen & Isaac L. Chuang, Cambridge Universities Press, 2010 Edition

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: 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 conventions and standards. 2. Comprehend the theory of projection for drawing projections of Points, Lines andPlanes under different conditions. 3. Prepare multiview orthographic projections of Solids by visualizing them in different positions. 4. Prepare pictorial drawings using the principles of isometric projections to visualizeobjects 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, Lineconventions, dimensioning, Selection of drawing sheet size and scale.				
Module 2	Orthographic projections of Points, Straight Lines and Plane Surfaces	Assignment	Projection methods Analysis	**10 Sessions**
Topics: Introduction, Definitions – Elements of projection and methods of projection, Planes of projection, reference line and conventions adopted. First angle and third angle projections. Projection of Points 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.				
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 in different positions (Problems resting on HP only and First angle projection).

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.

ENG1900	**English for Technical Communication**	**L- T- P- C**	2	0	0	2
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	**NIL**					
Course Description	This course enhances the technical communication skills of BTech students, focusing on clarity, precision, and conciseness in academic and professional settings. Students will learn to differentiate between general and technical communication, analyze technical content, develop structured writing skills, and deliver effective presentations. Through interactive activities such as TED Talk analyses, report writing, and presentation practice, the course provides hands-on experience for real-world applications. By the end, students will be equipped to communicate complex technical information effectively in various professional contexts.					
Course Outcomes	On successful completion of the course the students shall be able to: 1. Differentiate between general and technical communication. 2. Explain key reading comprehension techniques to enhance understanding of technical texts. 3. Write clear, concise, and well-structured technical reports and documents. 4. Deliver technical presentations and implement peer feedback for continuous improvement. 5. Explain ethical practices in digital communication for professional use.					

Course Content: Theory

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

Introduction to Communication
Technical vs. General Communication
Characteristics of technical communication
Importance of clarity, precision, and objectivity

Activity:

- Watching TED Talks/videos to identify differences in technical and general vocabulary

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

Reading Comprehension
Note making & Notetaking
Content Analysis

Activity:

- Reading technical articles and answering comprehension questions
- Note making techniques

Module 3	**Technical Writing**	**Assignment**	**Writing**	**12hours**

Paragraph Writing
Structure of a paragraph (topic sentence, supporting details, coherence)
Report Writing
Structure of technical and project reports (Introduction, Methods, Results, Discussion)

Activity:

- Writing a structured paragraph on a technical topic
- Writing project reports

Module 4	Professional Presentation	Presentation	Speaking	12Hours

Introduction to Presentation Skills

Preparing a Presentation

- Structuring content (Introduction, Body, Conclusion)
- Designing effective slides (Text. visual aids, readability, and impact)

Delivering a Presentation

- Engagement techniques, Storytelling, narration, pitching ideas handling Q&A
- Conviction, commitment, generating interest through enthusiasm

Demonstration & Practice

- Giving presentations on topics based on their academic interest
- Evaluating and providing peer feedback

Activity:

- Analyze a real-world engineering issue and present solutions using a structured approach.

Targeted Application & Tools that can be used: YouTube, Instagram, Quill Bot, Grammarly, & Padlet.

References:

Text books:

1. Gupta, R.C. *Technical Communication.* 2nd ed., Cambridge University Press, 2021.
2. Lannon, John M., and Laura J. Gurak. *Technical Communication.* 15th ed., Pearson, 2022.

Reference Books:

1. Gerson, Sharon J., and Steven M. Gerson. Technical Communication: Process and Product. 9th ed., Pearson, 2020.
2. Lannon, John M., and Laura J. Gurak. Technical Communication. 15th ed., Pearson, 2022.
3. Markel, Mike, and Stuart A. Selber. Technical Communication. 13th ed., Bedford/St. Martin's, 2020.

Web Resources:

1. https://owl.purdue.edu/owl/subject_specific_writing/technical_writing.
2. https://journals.ieeeauthorcenter.ieee.org/.
3. https://www.stc.org/.
4. https://ocw.mit.edu/.https://www.ted.com/talks.

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

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

Course Code: CSE1500	**Course Title:** Computational Thinking using Python **Type of Course:** ESC	**L-T-P-C**	2	0	2	3
Version No.	1.0					
Course Pre-requisites	Nil					
Anti-requisites	NIL					
Course Description	The course efficiently introduces fundamental ideas including conditionals, loops, functions, lists, strings, and tuples through some inspiring examples. It then discusses dynamic programming like handling exceptions and file usage. In terms of data structures, the course covers Python dictionaries, classes, and objects for constructing user-defined datatypes like linear and binary search.					
Course Object	The objective of the course is to familiarize the learners with the concepts of **Computational Thinking using Python** and attain **Skill Development** through **Participative Learning** techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: 1) Describe algorithmic solutions for basic computing issues.. (Understand) 2) Explain data types and operators. (Understand) 3) Demonstrate control structures and Functions. (Apply) 4) Apply the data structures for the given data. (Apply) 5) Demonstrate the file operations. (Apply)					

Course Content:

Module 1	**Computational Thinking And Problem Solving**	Assignment		Programming	**6 Sessions**

Topics:

Fundamentals of Computing– Identification of Computational Problems Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi

Module 2	**Datatypes, Expressions, Statements**	Assignment		Programming	**6 Sessions**

Topics:

Python interpreter and interactive mode,debugging; values and types: int, float, boolean, string , and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

Module 3	**Control flow, Functions, Strings**	Assignment		Programming	**6 Sessions**

Topics:

Conditionals:Boolean values and operators, conditional (if), alternative (if else),chained conditional (if-elif-else);Iteration: state, while, for, break, continue, pass; Fruitful functions: return values,parameters, local and global scope, function composition, recursion; Strings: string slices,immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

Module 4	**Lists, Tuples, Dictionaries**	Assignment		Programming	**6 Sessions**

Topics:

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing- list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.

Module 5	**Files**	Assignment		Programming	**6 Sessions**

Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter's age validation, Marks range validation (0-100).

Project work/Assignment:

1. **Assignment 1 on (Module 1 and Module 2)**
2. **Assignment 2 on (Module 3 and Module 4 & 5)**

Text Book

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021
2. Eric Matthes, Python Crash Course,: A Hands-On, Project-Based Introduction to Programming, 3rd Edition, 2023

References

1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.

Web Resources

W1. https://onlinecourses.nptel.ac.in/noc20_cs70/preview

Topics relevant to development of "Employability": Data structures using python.

Topics relevant to "PROFESSIONAL ETHICS": Naming and coding convention for simple programs using python.

Course Code: ECE2022	**Course Title:** Digital Design **Type of Course:** ESC	**L- T-P- C**	2	0	0	2
Version No.	1.0					
Course Pre-requisites	[1] Elements of Electronics/Electrical Engineering, 2] Basic concepts of number representation, Boolean Algebra					
Anti-requisites	NIL					
Course Description	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					
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.						
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: DES1146	**Course Title:** Introduction to Design Thinking **Type of Course:** Theory	**L-T-P- C**	1	0	0	1
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The course aims to introduce students to the fundamental principles and processes of Design Thinking and will learn to apply Design Thinking methodologies to real-world challenges. The course emphasizes empathy, creativity, and collaboration, equipping students with essential skills for successful engineering practice.					
Course Objective	This course is designed to develop and familiarize the learners with the concepts of creating thinking and attain Entrepreneurship by using Participative Learning techniques.					
Course Outcomes	On successful completion of the course the students shall be able to: 1) Understand the concept and importance of Design Thinking. 2) Differentiate between traditional problem-solving and Design Thinking. 3) Identify the core stages of the Design Thinking process.					
Course Content:	All assignments and projects must be developed using the reference materials available from the PU e-resource database – JSTOR, EBSCO, Library OPAC, NPTEL Videos, etc.					
Module 1	Introduction to Design Thinking	Visual journal, book of essays, context-specific assignment/project	Visual output generation, by Visual Journal and narrative development.	**3 hours**		
Topic 1) Definition and Introduction to Design Thinking 2) Understand the Design Thinking Process						
Module 2	Design Thinking in Action	Visual journal, book of essays, context-specific assignment/project	Visual output generation, by visual journal and narrative development.	**12 hours**		
Topics: 1) Introduction to the steps of Design Thinking Process 2) Understand use cases of Design thinking 3) Design Thinking and Research Tools pertaining to Consumer Tech. , Home Tech. , Personal Tech. , Auto Tech. or Extended Reality.						
Targeted Application & Tools that can be used: 1) Design ideation tools like Miro , SCAMPER etc. 2) Research Tools for Human Centric Design using forecasting tools like WGSN 3) Feedback tools like Google Forms , etc. 4) Expert Lectures						
1. **Text Book** 2. Thinking Design by S Balaram. New Delhi [India]: Sage Publications Pvt. Ltd. 2010. eBook., Database: eBook Collection (EBSCOhost)						

3. https://puniversity.informaticsglobal.com:2284/ehost/detail/detail?vid=6&sid=18ab1f43-1f92-4d02-ae2e-a9c06dc06d8c%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=354920&db=nlebk

References

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

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

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

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

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

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

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

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

Course Code: PPS 1025	**Course Title: Industry Readiness Program – I (Audited Course)** **Type of Course: HSMC**	**L- T - P- C**	0	0	2	0
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course is designed to enable students to set SMART goals, form Professional & personal ethics for success and learn various email writing techniques. The course will benefit learners in presenting themselves effectively through various activities and learning methodologies.					
Course Objective	The objective of the course is to **familiarize the learners with the concepts of "Employability for Young Professionals" and attain SKILL DEVELOPMENT through PARTICIPATIVE LEARNING techniques.**					
Course Out Comes	**On successful completion of this course the students shall be able to:** CO 1 **Define** their career goals CO 2 **Practice ethical habits** for better career success CO3 **Demonstrate** effective email writing techniques					
Course Content						

Module 1	**Goal Setting & Grooming**	Classroom activities	**10 Hours**
Topics: SMART Goals, formal grooming through self-introduction activity **Activity:** Real world scenarios			
Module 2	**Habit Formation**	Role plays	**10 Hours**
Topics: Professional and Personal ethics for success and activity-based practice **Activity:** Students to present 2 min video on building professional ethics			
Module 3	**Email Etiquettes**	Individual and group presentation	**10 Hours**
Topics: Types of prompts to generate effective or desired results for email etiquettes **Activity:** Individual student presenting various search prompts			
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: SMART Goal Assignment 2: AI tools for prompt search
Continuous Individual Assessment Module 1: Presentation Module 2: Activity based assessment Module 3: Class assessment
The topics related to skill development: Students acquire knowledge on SMART goals, implement grooming standards, practice ethical behavior in class and campus, acquire hands-on experience to use AI tools to get search prompts for desired email etiquettes.

Course Code: MAT2402	Course Title: Probability and Statistics Type of Course: BSC	L-T- P- C	3	1	0	4
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	NIL					
Course Description	The course introduces the concepts of probability theory and statistical analysis, covering how to collect, organize, interpret, and draw inferences from data using mathematical models to understand randomness and uncertainty, with applications across various fields like science, engineering, economics, and social sciences.					
Course Objective	The objective of the course is to equip students with the foundational knowledge of probability theory and statistical methods, enabling them to collect, analyze, interpret data, and make informed decisions based on the likelihood of events occurring in various situations, often applied across different fields like science, engineering, and business.					
Course Out Comes	On successful completion of the course the students shall be able to: 1. Be able to compute conditional probabilities directly and using Bayes' theorem, and check for independence of events. 2. Be able to set up and work with discrete & continuous random variables; in particular, to understand the Bernoulli, binomial, geometric, Poisson distributions, uniform, normal, and exponential distributions. 3. Identifying different types of data relationships (linear, polynomial, exponential, logarithmic). 4. Be able to use specific significance tests, including z-test, t-test (one- and two-sample), and chi-squared test					

Course Content:

Module 1	Basic Probability		(6 Classes)
Probability of an Event, multiplication rule, combinations, permutations, Addition Law, Multiplication Law, Conditional Probability, Bayes's Theorem and Problems.			
Module 2	Random Variables and Bivariate Distributions	Assignment	(15 Classes)
Random Variables (discrete and continuous), Probability Mass/Density Functions, Mathematical Expectations, discrete probability distributions - Binomial distribution, Poisson distribution, geometric distribution, Continuous uniform distribution - exponential distribution, normal distribution, gamma distribution. Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.			
Module 3	Curve Fitting & Statistical Methods		(13 Classes)
Curve Fitting (Straight Line ($y = a + bx$), Parabola ($y = a + bx + cx^2$), Exponential Curves ($y = ae^{bx}$, $y = ab^x$ and $y = ax^b$) Measures of Central tendency, Moments, skewness and Kurtosis, Correlation - Karl Pearson's coefficient of correlation and rank correlation (with & Without repetition, Multiple Correlation - Problems. Regression analysis - lines of regression, Multiple regression - Problems.			
Module 4	Joint Probability Distribution and Sampling Theory	Assignment	(15 Classes)

Joint Probability distribution for two discrete random variables, expectation and covariance.
Random sampling, sampling distributions, Standard Error, Type I & Type II errors, Testing of Hypothesis, Test of significance - Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations, Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

Targeted Application & Tools that can be used:

The contents of this course has direct applications in most of the core engineering courses for problem formulations, Problem Solution and system Design.
Tools Used: R software (Open Source)

Assignment:

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

Text Book

1. Ronald .E. Walpole, Raymond. H. Myers, Sharon. L Myers, and Keying E. Ye, "Probability and Statistics for Engineers and Scientists", Pearson Education, Delhi-9th edition, 2012.
2. B. S. Grewal (2017), Higher Engineering Mathematics by, 44th Edition, Khanna Publishers.

References:

1. Miller and Freund, Probability and Statistics for Engineers, Pearson Education Ltd.
2. Erwin Kreyzig, Advanced Engineering Mathematics, John Wiley and sons, Inc.10th Edition.
3. Douglas C. Montgomery & George Runger, Applied Statistics and Probability for Engineers, , Wiley Publications

E-resources/ Web links:

1. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_10427
2. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_100198
3. https://nptel.ac.in/courses/109104124
4. https://nptel.ac.in/courses/111106051
5. https://nptel.ac.in/courses/111102137
6. https://www.math.hkust.edu.hk/~maqian/ma006_0607F.html
7. https://www.scu.edu.au/study-at-scu/units/math1005/2022/
8. Presidency University's Knimbus library URL is: presiuniv.knimbus.com

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

Course Code: CHE7601	**Environmental Studies** **Type of Course: MOOC course**	**L- T- P- C**	-	-	-	-
		Contact hours	-	-	-	-
Course Pre-requisites	NIL					
Anti-requisites	**NIL**					
Course Description	This course is designed to improve the learners' SKILL DEVELOPMENT by using PATICIPATIVE LEARNING techniques. This course aims to familiarize students with fundamental environmental concepts and their relevance to business operations, preparing them to address forthcoming sustainability challenges. It is designed to equip students with the knowledge and skills needed to make decisions that account for environmental consequences, fostering environmentally sensitive and responsible future managers. **This course is designed to cater to Environment and Sustainability**					
Course Objective	The objective of the course is **'SKILL DEVELOPMENT'** of the student by using **'PARTICIPATIVE LEARNING'** techniques					
Course Outcomes	On successful completion of this course the students shall be able to: 1. Describe the issues related to natural resources, ecosystems and biodiversity 2. Identify environmental hazards affecting air, water and soil quality 3. Recognize the importance of healthy environment and finding the sustainable methods to protect the environment 4. Convert skills to address immediate environmental concerns through changes in environmental processes, policies, and decisions					
Course Content:						
Module 1	**derstanding Environment, Natural Resources, and Sustainability**					
Topics: Classification of natural resources, issues related to Population growth and their overutilization, and strategies for their conservation. Water, air, soil, mineral, energy and food source. Effect of human activities on natural resources. Concept of sustainability- Sustainable Development Goals (SDGs)- targets and indicators, challenges and strategies for SDGs; Sustainable practices in managing resources, including deforestation, water conservation, Desalination – types, energy security, and food security issues, Life Cycle thinking and Circular Economy.						
Module 2	**osystems, Biodiversity, and Sustainable Practices**					
Topics: **Ecosystems and ecosystem services:** Various natural ecosystems, Major ecosystem types in India and their basic characteristics; forests, wetlands, grasslands, agriculture, coastal and marine; Ecosystem services- classification and their significance. The importance of biodiversity, Types of biodiversity, Biodiversity and Climate Change, the threats it faces, hotspots, and the methods used for its conservation. Strategies for in situ and ex situ conservation, mega diverse nation.						
Module 3	**vironmental Pollution, Waste Management, and Sustainable Development**					

Topics:

Types of pollution- Chemical, - Biological, Biomedical, noise, air, water, soil, thermal, radioactive and marine pollution, and their impacts on society. Urbanization and Urban environmental problems; effects, and mitigation.

Causes of pollution, such as global climate change, ozone layer depletion, the greenhouse effect, and acid rain, with a particular focus on pollution episodes in India. Importance of adopting cleaner technologies; Solid waste management;

Sustainable Materials and Technologies: Biodegradable and compostable materials, Recycled and reclaimed materials (E-waste management), Sustainable manufacturing processes.

Module 4	**Social Issues, Legislation, and Practical Applications**				

Topics:

Overview of key environmental legislation and the judiciary's role in environmental protection, including the Water (Prevention and Control of Pollution) Act of 1974, the Environment (Protection) Act of 1986, and the Air (Prevention and Control of Pollution) Act of 1981. Hazardous waste Rule 1989, Biomedical Waste handling 1998, Fly Ash Rule 1999, Municipal Solid Waste Rule 2000, Battery Rules 2001, E- Waste Rules 2011, Plastic waste management Rules 2016, Construction Demolition waste Rules 2016 National Biodiversity Action Plan (NBAP)

Major International Environmental Agreements: Convention on Biological Diversity (CBD), The Biological Diversity (Amendment) Act, 2023, United Nations Framework Convention on Climate Change (UNFCCC); Kyoto Protocol; Paris Agreement.

Major International organisations and initiatives: United Nations Environment Programme (UNEP), United Nations Educational, Scientific and Cultural Organization (UNESCO), Intergovernmental Panel on Climate Change (IPCC).

Targeted Application & Tools that can be used:

Application areas are Energy, Environment and sustainability

Tools: Online Tools – NPTEL and Swayam.

Project work/Assignment:

Assessment Type

- Online exams (MCQs) will be conducted by the department of Chemistry

Online Link*:

1) Lecure by Dr. Samik Chowdhury, Dr. Sudha Goel, NPTEL course: Environmental Science, https://nptel.ac.in/courses/109105203, 2024.
2) Lecture by Dr. Padmavati, Dr Narendran Thiruthy, NPTEL Course: Biodiversity Protection, Farmers and Breeders Rights, https://nptel.ac.in/courses/129105008, 2024.

* Other source links are available in below Resources link.

Text Book

1. G. Tyler Miller and Scott Spoolman (2020), Living in the Environment, 20th Edition, Cengage Learning, USA
2. Poonia, M.P. Environmental Studies (3rd ed.), Khanna Book Publishing Co.
3. Bharucha, E. Textbook of Environmental Studies (3rd ed.) Orient Blackswan Private Ltd.
4. Dave, D., & Katewa, S. S. Text Book of Environmental Studies. Cengage Learning India Pvt Ltd.
5. Rajagopalan, R. Environmental studies: from crisis to cure (4th ed.). Oxford University Press.
6. Basu, M., & Xavier Savarimuthu, S. J. Fundamentals of environmental studies. Cambridge University Press.
7. Roy, M. G. Sustainable Development: Environment, Energy and Water Resources. Ane Books.
8. Pritwani, K. Sustainability of business in the context of environmental management. CRC Press.
9. Wright, R.T. & Boorse, D.F. Environmental Science: Toward A Sustainable Future (13th ed,). Pearson.

Reference Books

1. Varghese, Anita, Oommen, Meera Anna, Paul, Mridula Mary, Nath, Snehlata (Editors) (2022), Conservation through Sustainable Use: Lessons from India. Routledge.
2. William P. Cunningham and Mary Ann Cunningham (2020), Principles of Environmental Science: Inquiry & Applications, 9th Edition, McGraw-Hill Education, USA.
3. Richard A. Marcantonio, Marc Lame (2022). Environmental Management: Concepts and Practical Skills. Cambridge University Press.
4. Manahan, S.E. (2022). Environmental Chemistry (11th ed.). CRC Press. https://doi.org/10.1201/9781003096238
5. Theodore, M. K. and Theodore, Louis (2021) Introduction to Environmental Management, 2nd Edition. CRC Press

Resources:

1. https://nptel.ac.in/courses/109105203
2. https://archive.nptel.ac.in/courses/120/108/120108004/
3. https://nptel.ac.in/courses/127105018
4. https://onlinecourses.nptel.ac.in/noc23_lw06/preview
5. https://onlinecourses.swayam2.ac.in/ini25_bt02/preview
6. https://archive.nptel.ac.in/courses/120/108/120108002/
7. https://onlinecourses.swayam2.ac.in/ini25_bt02/preview
8. https://nptel.ac.in/courses/102104088
9. https://nptel.ac.in/courses/124107165
10. https://nptel.ac.in/courses/109106200
11. https://archive.nptel.ac.in/content/storage2/courses/120108004/module1/lecture1.pdf
12. https://onlinecourses.swayam2.ac.in/nou25_ge19/preview
13. https://onlinecourses.swayam2.ac.in/ini25_hs01/preview
14. http://kcl.digimat.in/nptel/courses/video/105105184/L32.html
15. https://nptel.ac.in/courses/105105169

Topics relevant to Skill Development:

1. An attitude of enquiry.
2. Write reports

The topics related to Environment and Sustainability :

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

Course Code: CIV1200	**Course Title: Foundations of Integrated Engineering** **Type of Course: ESC**	**L- T-P- C**	2	0	0	2
Version No.	1.0					
Course Pre-requisites	**NIL**					
Anti-requisites	**NIL**					
Course Description	This interdisciplinary course introduces first-year engineering students to foundational principles and practices across key engineering domains, emphasizing real-world problem-solving, sustainability, and ethical innovation. Students explore how civil, mechanical, electrical, and IT systems intersect with emerging technologies like IoT, AI, and geomatics to address global challenges. Through case studies, learners gain deeper understanding of smart infrastructure, prototyping mechanical/electronic systems, and securing IT solutions. Topics include bioinformatics for environmental monitoring, GIS-enabled urban planning, renewable energy integration, and cybersecurity fundamentals. The course cultivates a holistic understanding of engineering's role in sustainable development, safety, and ethical decision-making, preparing students to contribute meaningfully to multidisciplinary projects in a technology-driven world.					
Course Objective	The objective of the course is skill development of student by using Participative Learning techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: 1] Recall key principles of Agile, DevOps, and bioinformatics used in interdisciplinary engineering contexts. 2] Explain the role of GIS, LiDAR, and sustainable materials in designing smart infrastructure and disaster management systems. 3] Describe core components of mechanical systems and their real-world applications. 4] Describe the functionality of IoT-enabled wearable devices, embedded systems, and renewable energy integration in smart grids. 5] List foundational IT concepts such as cloud computing architectures, cybersecurity threats, and blockchain applications.					
Course Content:						
Module 1	**Foundations of Engineering Practice**	Assignment	Case studies	**6 Sessions**		
Real-world problem-solving using data logic and practical applications, Collaboration and Innovation through multi-domain project, Engineering Ethics & Environmental Impact Emerging Fields: Automation, and Introduction to bioinformatics and its application Sustainability & Safety: Circular economy principles, carbon footprint analysis.						
Module 2	**Civil Engineering & Geomatics**	Assignment	Article Review	**6 Sessions**		
Smart Infrastructure & Geomatics: GIS mapping, LiDAR, drone surveys for urban planning, Geospatial data analysis for disaster management. Sustainable Construction: 3D-printed structures, self-healing concrete, Digital twins for infrastructure monitoring. Green Innovations: Net-zero energy buildings, rainwater harvesting systems.						
Module 3	**Mechanical Engineering in Action**	Assignment & Quiz	Data Collection	**6 Sessions**		
Advanced Manufacturing: Collaborative robots (cobots), additive manufacturing and 3D printing, Reverse engineering and prototyping. Energy Systems: Solar/wind energy harvesting, piezoelectric applications. Biomechanics: Prosthetics design, ergonomic product lifecycle.						

Module 4	**Electrical & Electronics Engineering**	Assignment & Quiz	Data Collection and visualization	**6 Sessions**
Smart Devices & Systems: Embedded systems, Wearable technology, Edge computing and hardware platforms Energy Innovations: EV charging infrastructure, wireless power transfer, Smart grid integration with renewables.				
Module 5	**Fundamentals of IT**	Assignment & Quiz	Case studies	**6 Sessions**
Core IT Topics: Networking basics, Cloud computing Cybersecurity & Data: Encryption, phishing prevention, zero-trust models, Database management. Emerging Tech: Blockchain for supply chains, AI/ML basics, IoT integration with cloud platforms				

Targeted Application & Tools that can be used:

Application Areas include Interdisciplinary problem-solving, Smart city planning, disaster management, Robotics prototyping, renewable energy systems, Wearable health tech, smart grids, Secure cloud systems.

Tools: 3D Printers, Autocad, Tinkercad, ArcGIS / QGIS, Arduino/Raspberry Pi

Text Book:

1. William Oakes & Les Leone, "Engineering Your Future: An Introduction to Engineering", Oxford University Press, 9th Edition, 2021
2. Barry F. Kavanagh, “Introduction to Geomatics”, Pearson, 5th Edition, 2021
3. Ian Gibson, David Rosen, & Brent Stucker, “Additive Manufacturing Technologies”, Springer, 3rd Edition, 2021
4. Sudip Misra, "The Internet of Things: Enabling Technologies, Protocols, and Use Cases", Wiley, 2nd Edition, 2022
5. James Kurose & Keith Ross, “Computer Networking: A Top-Down Approach”, Pearson, 8th Edition, 2020

References

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

Web-resources:

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

Course Code: CHE2501	**Course Title:** Chemistry of Smart Materials **Type of Course:** Theory - BSC	**L-T- P- C**	**3**	0	0	3
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	**NIL**					
Course Description	The objective of the course is to introduce the students to concepts and applications of chemistry of smart materials. The course also aims to enhance the knowledge of smart materials associated with memory system, display devices, , sensors, energy devices and environment. It will also cultivate an ability to identify chemistry in each of smart engineered materials and interpret solutions for the challenges connected to memory, display, energy, smart, green and sustainable technologies. It targets to strengthen the fundamental concepts behind chemistry of smart materials and then builds an interface with their industrial applications. **This course is designed to cater to Environment and Sustainability**					
Course Objective	The objective of the course is '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.** Relate the knowledge of chemistry to computational approaches to identify materials functionalities and properties **2.** Recognize and interpret solutions for the challenges connected to memory, display, smart, green and sustainable technologies. **3.** Explain the quality parameters of engineering materials associated with environment and sensors. 4. Interpret the knowledge of sustainable chemistry for E- waste management. 5. Analyse the importance of various electrochemical sources in energy systems.					
Course Content:						
Module 1	**Computational Chemistry**	Assignment	Data Collection and analysis	**09 classes**		
Topics: Fundamental particles of atom – their mass, charge and location – atomic number and mass number, Stabilizing interactions: Bonded and non-bonded interactions. Chemistry of weak interactions – van der Waals force and hydrogen bonding, Density functional theory. 3D co-ordinate generation for small molecules, geometry optimization by Molview. Chemical Databases: Chemoinformatics, MSDS ***Self- learning topics:*** Scope, cost and efficiency of computational modeling.						
Module 2	**Materials for Memory and Display Systems**	Assignment	Data Collection and analysis	**09 Classes**		

Topics: Memory Systems : Introduction, classification of electronic memory devices- Transistor, capacitor, charge -transfer and Resistor, types of materials - organic, polymeric and hybrid materials, and applications, manufacturing of semiconductor chips. **Display Systems:** photo and electroactive materials , materials for display -Principle, Properties and applications: Liquid crystals for LCD-Liquid crystals display, Basics of LED: OLED-organic light emitting diode and light emitting electrochemical cells. ***Self- learning topics:*** Green computing: Biocomposite based memory devices				
Module 3	**nomaterials based Smart Sensors and Devices**	Assignment	Data Collection and analysis	**09 Classes**
Topics: Nanomaterials- Introduction, classification based on dimensionality, quantum confinement. Size dependent properties, Synthesis, Properties of CNT and Graphene and their application as **Materials for data analysis and packaging** -RFID and IONT. **Sensors:** Introduction, types, Principle and applications- electrochemical sensor: nanomaterials for sensing applications - Glucose, VOC sensing. **Self-learning topics:** Fullerene, biomolecules in sensing, Strain sensors				
Module 4	**Sustainable Materials and Development**	Quiz/Seminar	Data Collection and analysis	**09 Classes**
pics: E waste: Introduction, E waste Hazards, E- waste management, Recovery of precious metal- Cu by Hydrometallurgy. **Green Chemistry**: Fundamentals and 12 principles with examples, Carbon footprint and sequestration **Sustainable Chemistry:** -Introduction to Biomaterials- PLA , polymers in bio-compatible and bio-degradable materials - Poly(3-hydroxybutyrate-co-3-hydroxyvalerate) PHBV, synthesis and applications in drug delivery. ***Self-learning topics:*** circular economy- case studies.				
Module 5	**Energy Science**	Quiz/Seminar	Data Collection and analysis	**09 Classes**
Topics: Battery technology: Fundamentals of electrochemistry, Introduction to electrochemical storage devices: battery (Lithium-ion battery- $LiMnO_2$, $LiCoO_2$, metal air batteries- LiO_2) and supercapacitors-Introduction, Principle, Types - EDLC, pseudo and asymmetric capacitor. **Photovoltaics:** Solar cells - Construction and working principle; types- Inorganic, Organic and quantum dot sensitized (QDSSC's). ***Self -learning topics:*** Battery technology for e-mobility, Green hydrogen				
Targeted Application & Tools that can be used: Application areas are Data storage and analysis, logistics, Biomedicine, Energy, Environment and sustainability **Tools:** Molview, chemdraw, excel etc				
Project work/Assignment:				
ssessment Type • Midterm exam • Assignment (review of digital/ e-resource from PU link given in references section - mandatory to submit screenshot accessing the digital resource.) • Quiz/Student Seminar				

- End Term Exam
- Self-learning

xt Book

10. Wiley, “Engineering Chemistry”, Wiley.
11. G.A. Ozin and A.C. Arsenault, Nanochemistry: A chemical approach to nanomaterials, Royal Society of Chemistry, 2009

ference Books

1. Functional and smart materials, Chander Prakash, Sunpreet Singh, J. Paulo Davim, 2020, CRC Press,
2. ISBN: 978-036-727-510-5.
3. E-waste recycling and management: present scenarios and environmental issues, Khan, Anish, and
4. Abdullah M. Asiri. 2019, Springer, Vol. 33. ISBN: 978-3-030-14186-8.
5. Essentials of computational chemistry: theories and models, Christopher J Cramer, 2013, John Wiley &
6. Sons. ISBN: 978-0-470-09182-1.
7. Energy storage and conversion devices: Supercapacitors, batteries and hydroelectric cells, Anurag Gaur,
8. L. Sharma, Anil Arya. 2021, CRC press, 1st edition, ISBN: 978-1-003-14176-1.
9. Fundamentals of analytical chemistry: An introduction, Douglas A. Skooget etal., 2004 Thomson Asia pte
10. Ltd., 8th, ISBN: 978-0-495-55828-6
11. Functional and smart materials, Chander Prakash, Sunpreet Singh, J. Paulo Davim, 2020, CRC Press,
12. ISBN: 978-036-727-510-5.
13. Electrical and electronic devices, circuits and materials: Technological challenges and solutions. Tripathi,
14. L., Alvi, P. A., & Subramaniam, U, 2021, John Wiley & Sons, ISBN: 978-0367564261.
15. F. Jensen, Introduction to Computational Chemistry, 3rd edition, Wiley, 2017.

E resources

1. https://presiuniv.knimbus.com/user#/searchresult?searchId=computational%20chemistry&_t=1738054970142
2. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_48504
3. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_147967
4. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_130301
5. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_87297
6. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_67006
7. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_137261
8. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_86712

II Sets topics in theory component are relevant to Environment and Sustainability.

Course Code: CSE2200	**Course Title: Program Solving Using C** **Type of Course: Theory - PCC**	**L- T-P-C**	2	0	0	2
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 SolvingUsing 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 programmingconstructs 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	**6 Sessions**
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	**6 Sessions**
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	**6 Sessions**

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	**6 Sessions**
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	**6 Sessions**
Topics: Files: Defining and Opening a File – Closing a File – Input / Output Operations on File – Random Access 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: CSE2201	**Course Title: Program Solving Using C Lab** **Type of Course: Lab - PCC**	**L- T-P-C**	0	0	4	2
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 SolvingUsing 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 programmingconstructs 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:						

List of Practicals:
Lab Sheet 1: 10 Sessions

Program 1: Sum of Two Numbers
Program 2: Find the Greatest of Three Numbers
Program 3: Check Even or Odd using Conditional Operator
Program 4: Print Multiplication Table using Loop
Program 5: Count Digits in a Number using While Loop
Program 6: Demonstration of Preprocessor Directives
Program 7: Simple Calculator using Switch Case

Lab Sheet 2: 10 Sessions
Program 1: Check Whether a Number is Positive, Negative or Zero
Program 2: Find the Sum of First N Natural Numbers
Program 3: Check Whether a Number is Prime or Not
Program 4: Find Factorial of a Number
Program 5: Reverse a Number
Program 6: Simple Number Guessing Game

Lab Sheet 3: 10 Sessions
Program 1: Linear Search in a One-Dimensional Array
Program 2: Bubble Sort on an Integer Array
Program 3: Matrix Addition (2D Arrays)
Program 4: Count Vowels in a String
Program 6: Selection Sort on an Array

Lab Sheet 4: 10 Sessions
Program 1: Sum of Two Numbers Using User-Defined Function
Program 2: Factorial Using Recursion
Program 3: Swap Two Numbers Using Call by Value (No Swap)
Program 4: Swap Two Numbers Using Call by Reference (With Swap)
Program 5: Pointer Basics - Access and Modify Variable via Pointer
Program 6: Accessing Array Elements Using Pointers

Lab Sheet 5: 10 Sessions
Program 1: Basic Structure Usage
Program 2: Input and Display Array of Structures
Program 3: Array Inside Structure (Student Marks)
Program 4: Structure with Nested Structures (Date of Birth)
Program 5: Union Example and Member Access

Lab Sheet 6: 10 Sessions
Program 1: Write to a File (Text Mode)
Program 2: Read from a File (Text Mode)
Program 3: Append Data to a File
Program 4: Count Characters, Words and Lines in a File
Program 5: Write and Read Structure to/from a Binary File
Program 6: Random Access in File (Update a Record)

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):

6. **Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.**
7. **ReemaThareja, "Programming in C", Oxford University Press, Second Edition, 2016.**
8. **Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015**
9. **Schildt Herbert, "C: The Complete Reference", Tata McGraw Hill Education, 4th Edition, 2014.**
10. **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/

ENG2501	**Advanced English**	**L- T- P- C**	2	0	0	2
Version No.	2.0					
Course Pre-requisites	ENG1900 - English for Technical Communication					
Anti-requisites	**NIL**					
Course Description	This course is designed to equip students to enhance their communication abilities in Listening, Speaking, Reading, and Writing. The curriculum covers interpersonal communication principles, the art of speech writing and delivery (including impromptu speaking), strategic approaches to critical reading, the identification of logical fallacies, and persuasive writing. Furthermore, the course will introduce students to the potential of AI tools and the techniques of prompt engineering to elevate their communication skills in the digital age. Upon course completion, students will be well-prepared to communicate effectively and critically in both academic and professional environments.					
Course Out Come	On successful completion of the course the students shall be able to: 1. Recognize the elements of interpersonal and cross-cultural communication to address communication challenges effectively. 2. Demonstrate the ability to deliver structured and impromptu speeches using effective speaking techniques. 3. Interpret textual and visual materials using critical reading strategies to evaluate arguments, logic, and persuasion. 4. Produce persuasive and analytical essays using effective argumentation techniques and structured writing strategies.					

Course Content:

Module 1	**Foundations of Effective Communication**	**Case Studies/ Role play**	**Cross-Cultural Competency**	**12 Classes**

Topics:

- Fundamentals of Interpersonal Communication
- Verbal, Non-verbal, and Paraverbal communication.
- Cultural dimensions theory (Hofstede's Cultural Dimensions).
- Active Listening Techniques
- Common Errors in Communication

Activities:

- Instagram/YouTube Vocabulary Activity
- Charades with a Twist/Tone and Emotion Experiment/Mixed Messages Challenge/Role Reversal Conversations/Observation Exercise

Module 2	**Mastering Speech Delivery**	**JAM**	**Public Speaking Confidence**	**12 Classes**

Topics:

- Introduction to Prompt Engineering
- Speech Preparation and Organization
- Techniques for Effective Impromptu Speaking
- Practice Speech Delivery

Activities:

- Speech Writing
- Impromptu Speech

Module 3	**Critical Reading and Logical Analysis**	**Worksheet**	**Critical Thinking and Analysis**	**12 Classes**

Topics:

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

Activities:

- Critical Reading Worksheet/Identifying Bias in News Articles

Module 4	**Writing Effective Arguments**	**Assignment**	**Clear and Coherent Writing**	**9 Classes**

Topics**:**

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

Activities:

- Causes or Effects/Appeal Mash-Up/Debates on Controversial Topics
- Opinion Writing

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

ferences

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

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

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

Course Code: EEE1200	**Course Title: Basics of Electrical and Electronics Engineering.** **Type of Course: Theory - ESC**	**L-T-P-C**	**3**	**0**	**0**	**3**
Version No.	**2.0**					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This is a fundamental Course which is designed to know the use of basics of electrical and electronics engineering principles occurs in various fields of Engineering. The course emphasises on the characteristics and applications of electrical and electronic devices. The course also emphasizes on the working, analysis and design of electrical circuits using both active & passive components. Additionally, this course creates a foundation for the future courses such as Electrical machines, power system, power electronics Linear Integrated Circuits, Analog Communication and Digital Communication etc.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Basics of Electrical and Electronics Engineering and attain Skill Development through Participative Learning techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: Apply basic laws of Electrical Engineering to compute voltage, currents and other parameters in the circuits. Discuss various fundamental parameters appearing in the characteristics of semiconductor devices and their applications. Summarize the operations of different biasing configurations of BJTs and amplifiers. Discuss the performance characteristics and applications of various electrical Machines.					
Course Content:						
Module 1	Introduction to Electrical Circuits	Assignment/ Quiz	Numerical solving Task	10 Sessions		
DC Circuits: Concept of Circuit and Network, Types of elements, Network Reduction Techniques- Series and parallel connections of resistive networks, Star–to-Delta Transformations, Mesh Analysis, Nodal Analysis, Numerical examples. AC Circuits: Fundamentals of single phase circuits - Series RL, RC and R-L-C Circuits, Concept of active power, reactive power and Power factor, Numerical examples. Introduction to three phase system and relation between line and phase values in Star & Delta connection, Numerical examples.						
Module 2	Semiconductor and Diode applications	Assignment/ Quiz	Memory Recall based Quizzes	10 Sessions		

Mass Action Law, Charge densities in a semiconductor, Types of SC, Junction diodes -Ideal and practical behaviour, Modelling the Diode Forward Characteristic, and Diode applications like rectifiers, Zener diode, characteristics and its applications like voltage regulator.

Module 3	Transistors and its Applications	Assignment/ Quiz	Memory Recall-based Quizzes	10 Sessions

Transistor characteristics, Current components, BJT Configurations (CB, CC, CE configurations) and their current gains. Operating point, Biasing, Fixed Bias, and load line analysis. Single Stage amplifier. JFET (Construction, principal of Operation and Volt – Ampere characteristics). Pinch- off voltage, Comparison of BJT and FET. MOSFET (Construction, principal of Operation and symbol), MOSFET characteristics in Enhancement and Depletion modes.

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

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

Self-Learning Topics:

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

Targeted Application & Tools that can be used:

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

Project Work/ Assignment:

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

Mechanism and Results etc. in appropriate format

Text Book(s):

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

Reference Book (s):

- John Hiley, Keith Brown and Ian McKenzie Smith, "HUGHES Electrical and Electronic Technology", 10th Edition (Indian Edition published by Dorling Kindersley), Pearson,2011
- Samarajit Ghosh, "Fundamentals of Electrical and Electronics Engineering", 2nd Edition, Prentice Hall India, 2007.
- K Uma Rao, A Jaya Lakshmi, "Basic Electrical engineering" IK International publishing house Pvt. Ltd
- R. L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education India 7th Edition.
- A K. Maini, V. Agrawal, "Electronic Devices & Circuits", Wiley, 2nd Edition
- A.S Sedra, K. C. Smith, "Microelectronic Circuits", Oxford University Press, 6th Edition
- Online Resources (e-books, notes, ppts, video lectures etc.):
- https://presidencyuniversity.linways.com
- https://www.digimat.in/nptel/courses/video/108105112/L01 "Fundamentals of Electrical Engineering-Basic Concepts, Examples"
- Seminar Topic: https://nptel.ac.in/courses/108/105/108105153/ "Electrical Measurements"
- Video lectures on "Electronic Devices" by Prof. Dr. A. N. Chandorkar, IIT Bombay http://www.satishkashyap.com/2013/03/video-lectures-on-electron-devices-by.html
- Video lectures on "Analog Electronics" by Prof. S.C. Dutta Roy, IIT Delhi https://nptel.ac.in/courses/108/102/108102095/
- Video lectures on "Diodes", by Prof. Chitralekha Mahanta, IIT Guwahati,
- https://nptel.ac.in/courses/117/103/117103063/
- E-content:
- "Introduction to Electrical Machines https://nptel.ac.in/courses/108/102/108102146/"
- M. -Y. Kao, H. Kam and C. Hu, "Deep-Learning-Assisted Physics-Driven MOSFET Current Voltage Modeling," in IEEE Electron Device Letters, vol. 43, no. 6, pp. 974-977, June 2022, doi: 10.1109/LED.2022.3168243
- https://ieeexplore-ieee-org-resiuniv.knimbus.com/document/9758727

- F. Bonet, O. Aviñó-Salvadó, M. Vellvehi, X. Jordà, P. Godignon and X. Perpiñà, "Carrier
- Concentration Analysis in 1.2 kV SiC Schottky Diodes Under Current Crowding," in IEEE Electron Device Letters, vol. 43, no. 6, pp. 938-941, June 2022, doi: 10.1109/LED.2022.3171112. https://ieeexplore-ieeeorg-presiuniv.knimbus.com/document/9764749
- M. Chanda, S. Jain, S. De and C. K. Sarkar, "Implementation of Subthreshold Adiabatic Logic for Ultralow-Power Application," in IEEE Transactions on Very Large Scale Integration (VLSI) Systems, vol. .23, no. 12, pp. 2782-2790, Dec. 2015.
- https://ieeexplore.ieee.org/document/7018053
- R. Raut and O. Ghasemi, "A power efficient wide band trans-impedance amplifier in submicron
- CMOS integrated circuit technology," 2008 Joint 6th International IEEE Northeast Workshop on Circuits and Systems and TAISA Conference, 2008, pp. 113-116, doi: 0.1109/NEWCAS.2008.4606334. https://ieeexplore.ieee.org/document/4606334

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

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

	Level 1: Conduct an experiment to perform and verify the impedance, current and power of Series RL and RC circuits **Level 2:** Conduct an experiment to perform and verify the impedance and current of RLC series circuits. **Experiment No 3:** Calculation of power and power factor of the given AC Circuit. **Level 1:** Conduct an experiment to measure the power and power factor for given resistive load. **Level 2:** Conduct an experiment to measure the power and power factor for given inductive load. **Experiment No 4:** Perform the experiments on given Transformer. **Level 1:** Verify the EMF equation of a transformer and compute the voltage transformation ratio. **Level 2:** Study the effect of load on the secondary side of the transformer and verify the EMF equation under load conditions. **Experiment No 5:** Load test on DC shunt motor **Level 1:** Conduct load test on DC shunt motor and find its efficiency at different loads **Level 2:** Conduct load test on DC shunt motor and plot the performance characteristics. **Experiment 6:** Study of PN-Junction Diode Characteristics in Forward and Reverse Bias Conditions. **Level 1:** Carry out an experiment to plot VI Characteristics and hence find the cut-in voltage on forward characteristics for the Silicon P-N Junction diode. **Level 2:** Carry out an experiment to plot VI Characteristics of Zener diode and hence find the zener voltage on reverse characteristics for the Silicon P-N Junction zener diode. **Experiment No. 7:** To observe the output waveform of half wave and full wave rectifier circuit and compute ripple factor and efficiency **Level 1:** Identify the components required for a rectifier circuit, rig up the circuit, and sketch the output waveforms without filter. **Level 2:** Rig up the rectifier circuit with RC filter, observe the output waveforms, determine the efficiency and ripple factor. **Experiment 8:** To construct clipping and clamping circuits for different reference voltages and to verify the responses. **Level 1:**Identify the components required for building a Clipper / Clamper circuit. Rig up the circuit according to the circuit diagram given and sketch the output waveform. **Level 2:** Given a sinusoidal input of 10 V p-p, implement a positive / negative clipper with output clipped at 2 V. **Experiment 9:** To calculate various parameters of emitter follower circuit using BJT **Level 1:** Identify the components required to implement an emitter follower circuit. Rig up the circuit and observe the variations in output waveform with respect to the variations in input waveform. **Level 2:** Determine the values of Z_{in} input impedance and Z_{out} output impedance for Emitter Follower. **Experiment 10:** To Implement RC Coupled amplifier using a BJT and sketch the

	frequency response. **Level 1**: Identify the components required to implement an RC coupled amplifier circuit. Rig up the circuit and sketch the frequency response. **Level 2**: From the frequency response curve determine the value of the mid band gain and the bandwidth.

Targeted Application & Tools that can be used:

Targeted Applications: Application Area includes all electrical and electronic circuits (power supply unit, regulator unit, embedded devices, hardware electronics etc.). The students will be able to join a profession which involves basics to high level of electronic circuit design.

Professionally Used Software: Multisim/ P Spice

Besides these software tools hardware equipment such as Multimeters, Function Generators, Power Supplies, Oscilloscopes etc., can be used to perform component/circuit testing and analysis.

Course Material

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

Text Book:

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

Reference Books:

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

Online Learning Resources:

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

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

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: **PPS1026**	**Course Title: Industry Readiness Program – II (Audited Course)** Type of Course: Practical Only Course	L- T - P- C	0	0	2	0
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	NIL					
Course Description	This course is designed to enable students learn styles of communication, team building and use empathy in leadership. The course will benefit learners in preparing themselves effectively through various activities and learning methodologies.					
Course Objective	The objective of the course is to **familiarize the learners with the concepts of "Industry Readiness for Young Professionals" and attain SKILL DEVELOPMENT through PARTICIPATIVE LEARNING techniques.**					
Course Out Comes	**On successful completion of this course the students shall be able to:** CO 1 **Apply** different communication skills for success in workplace CO 2 **Practice team building skills** for career success CO3 **Demonstrate** ethical leadership skills in workplace					
Course Content						

Module 1	**Effective Communication**	Classroom activities	**10 Hours**
Topics: Practice effective communication skills (Verbal, Non-verbal, Written and Visual) **Activity:** Use social media prompts to prepare self-introduction videos			
Module 2	**Team Building**	Group Activity	**10 Hours**
Topics: Skills of an effective team player **Activity:** Student group activity to build class networking			
Module 3	**Leadership**	Case study	**10 Hours**
Topics: Types of leadership, using empathy in leadership **Activity:** Individual presentation by students on corporate leaders.			

Faculty : L&D
Targeted Application & Tools that can be used: 4. TED Talks 5. You Tube Links 6. Activities
Assignment proposed for this course Assignment 1: One minute reel Assignment 2: Team building assignment
Continuous Individual Assessment Module 1: L-S-R-W class assessment Module 2: Team Presentation Module 3: Individual Assessment
The topics related to skill development: Students acquire knowledge on effective communication skills, team building skills and how to prepare themselves to be leaders in workplace using empathy and implement various skill sets during the course of their time in the university.

Course Code: ECE1511	**Course Title: Design Workshop** **Course Type : ESC**	**L- T-P- C**	1	0	2	2
Version No.						
Course Pre-requisites	NIL					
Anti-requisites						
Course Description	This course is designed to provide an in-depth understanding of Arduino, microcontrollers Raspberry pi and their application in various real time projects involving sensors. Throughout the course, students will learn the fundamentals of Arduino and Raspberry Pi programming and gain hands-on experience with a wide range of sensors. Students will explore how to connect and interface sensors with Arduino and Raspberry Pi boards, read sensor data, and use it to control various output devices This course is suitable for beginners who are interested in exploring the world of electronics and developing practical applications using Arduino, Raspberry Pi and sensors.					
Course Objective	The objective of the course is **Employability Skills** of student by using **PARTICIPATIVE LEARNING** techniques.					
Course Outcomes	**On successful completion of the course the students shall be able to** 1. Explain the main features of the Arduino & the Raspberry Pi prototype board. 2. Demonstrate the hardware interfacing of the peripherals to Arduino and Raspberry Pi system. 3. Understand the types of sensors and its functions 4. Demonstrate the functioning of live projects carried out using Arduino and Raspberry Pi system**.**					
Course Content:						

Module 1	**Basic concepts of Microcontrollers**	Hands-on	Interfacing Task and Analysis	**3 Sessions**
Topics: Introduction to Arduino, ESP and Node MCU Pin configuration and architecture, Device and platform features, Concept of digital and analog ports, Familiarizing with Arduino Interfacing Board, API's , Introduction to Embedded C and Arduino platform, Arduino Datatypes and variables, Arduino i/o Functions, Arduino Communications, Arduino IDE, Various Cloud Platforms.				
Module 2	**Sensory Devices**	Hands-on	Interfacing Task and Analysis	**3 Sessions**
Arduino Sensors: Humidity Sensor, Temperature Sensor, Water Detector / Sensor, PIR Sensor, Ultrasonic Sensor, Connecting Switches and actuators, sensor interface with Arduino. Introduction to 3D Printer: 3D Printer technology and its working Principles, Applications. Introduction to online Simulators: Working with AutoCAD/Fusion 360 Simulator.				
Module 3	**Introduction to Micro python**	Hands-on	Interfacing Task and Analysis	**4 Sessions**
Topics: Introduction to MicroPython, Comparison with other programming languages, Setting up the MicroPython development environment, Basics of MicroPython syntax and structure.				
Module 4	**Working with Raspberry-pi**	Hands-on	Interfacing Task and Analysis	**5 Sessions**
Introduction to raspberry pi boards, pin-diagram, different types of raspberry pi boards and its application,				

LED and switch control. Mastering Modules, Setup Raspberry - PuTTY SSH,VNC Viewer to interface with more complicated sensors and actuators. Various Libraries and its functions.

ɔ: Name of the Experiments:

1. **Introduction Lab 1:**

Level 1: Overview on Arduino based Micro-controller, and sensors.

Level 2: Interfacing of Arduino and ESP boards with sensors and other components.

2. **Lab 2: Smart Plant Monitoring**

Level 1- Push button-controlled LED.

Level 2- Automatic Irrigation and monitoring System using Arduino

3. **Lab 3: Robotics with Arduino**.

Level 1- Servo Motor control using Arduino

Level 2: DC Motor Control Using Arduino for Robotics.

4. **Lab 4: Environmental pollution using ESP.**

Level 1 - IoT based air Pollution Monitoring System.

Level 2- IoT Based water pollution system

5. **Introduction Lab for raspberry pi:**

Level 1: Overview on Different Raspberry Pi Boards, and sensors.

Level 2: Configuring the Raspberry Pi and Interfacing with sensors and other components.

6. **Lab 7:** Raspberry Pi based Object Detection using TensorFlow and OpenCV.
7. **Lab 8:** Speech Recognition on Raspberry Pi for Voice Controlled Home Automation.
8. **Lab 9:** Design the website using HTML and CSS, and host the website on Raspberry Pi.
9. **Introduction Lab for 3D printing:**

Overview of 3D printing. Design of 3D structure using the CAD. Understand the steps of fabrication of simple rectangular box using 3D printer.

10. **Lab 10:** Design and print of Hollow Cylindrical structure using 3D CAD and 3D printer.
11. **Lab 11** Demonstration of Jetson nano board and its capability. **(OPTIONAL)**
12. **Lab 12:** Revision
13. **Lab 13:** Revision
14. **Lab 14:** Mini Project
15. **Lab 15:** Mini Project Evaluation.

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

rgeted Application & Tools that can be used:

plication Area:

me Automation, Environmental Monitoring, Agriculture and Farming, Industrial Automation, Internet of Things (IoT), Robotics, Wearable Devices, Security Systems, Education and Learning. These are just a few examples of the many application areas where Arduino, Raspberry Pi and sensors can be applied. The flexibility and affordability of Arduino, and Raspberry Pi combined with the wide range of sensors available, allow for endless possibilities in creating innovative projects.

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

oject 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 .

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

xtbook(s):

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

ferences

ference Book(s)

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

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

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

ontent:

1. Cattle Health Monitoring System Using Arduino and IOT (April 2021| IJIRT | Volume 7 Issue 11 | ISSN: 2349-6002)
2. M H Hemanth Kumar, Ravi Pratap Singh, Nishu Sharma, Pragya Singh" IOT BASED SMART SECURITY SYSTEM USING ARDUINO" 2021 JETIR August 2021, Volume 8, Issue 8,
3. R. Maheswar, P. Jayarajan, S. Vimalraj, G. Sivagnanam, V. Sivasankaran and I. S. Amiri, "Energy Efficient Real Time Environmental Monitoring System Using Buffer Management Protocol," 2018, pp. 1-5, doi: 10.1109/ICCCNT.2018.8494144. **https://ieeexplore.ieee.org/document/8494144**.
4. Yaser S Shaheen,Hussam., " Arduino Mega Based Smart Traffic Control System ," December 2021 Asian Journal of Advanced Research and Reports 15(12): 43-52, 2021(15(12): 43-52, 2021):15(12): 43-52, 2021.
5. Basil, Eliza Sawant, S.D. "IoT based traffic light control system using Raspberry Pi " DOI 10.1109/ICECDS.2017.8389604
6. Supriya S, 2Dr. Aravinda " Green leaf disease detection and identification using Raspberry Pi https://www.irjet.net/archives/V9/i8/IRJET-V9I847.
7. Dr. E.N. Ganesh., "Health Monitoring System using Raspberry Pi and IOT" DOI : http://dx.doi.org/10.13005/ojcst12.01.03

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

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

Module 3	**Linear Transformations**		***(15 lectures)***
Linear Transformations, Algebra of transformations, The Null Space and Range, Isomorphisms, Matrix Representation of Linear Transformations, Similarity Eigenvalues and Eigenvectors, Eigen values and Eigen vectors, Diagonalization. Inner Product Spaces, The Dot Product on R^n and Inner Product Spaces, Orthonormal Bases, Orthogonal Complements, Application: Least Squares Approximation, Diagonalization of Symmetric Matrices, Application: Quadratic Forms. Singular Value Decomposition: Singular values, computing singular value decomposition, and Introduction to principal component analysis.			
Module 4	**Vector Calculus**	**Assignment**	***(15 lectures)***
Vector & Scalar Functions and Fields, Derivatives, Curve, Arc length, Curvature & Torsion, Gradient of Scalar Field, Directional Derivative, Divergence of a Vector Field, Curl of a Vector Field, Physical interpretation, solenoidal and irrotational vector fields. Problems. Line Integrals, Path Independence of Line Integrals, Green`s Theorem in the plane, Surface Integrals, Divergence Theorem of Gauss, Stokes`s Theorem.			
Targeted Application & Tools that can be used: • Solve systems of linear equations using various methods including Gaussian and Gauss Jordan elimination and inverse matrices. • Perform matrix algebra, invertibility, and the transpose and understand vector algebra in R^n. • Determine relationship between coefficient matrix invertibility and solutions to a system of linear equations and the inverse matrices. • Find eigenvalues and eigenvectors and use them in applications. • Find the dimension of spaces such as those associated with matrices and linear transformations. • Understand real vector spaces and subspaces and apply their properties. • Compute inner products in a real vector space and compute angle and orthogonality in inner product spaces. • Create orthogonal and orthonormal bases: Gram-Schmidt process and use bases and orthonormal bases to solve application problems. • Prove basic results in linear algebra using appropriate proof-writing techniques such as linear independence of vectors; properties of subspaces; linearity, injectivity and subjectivity of functions; and properties of eigenvectors and eigenvalues.			
Assignment:			
Preparation of power-point slides, which include videos, animations, pictures, graphics for better erstanding the applications of Linear Algebra and Vector Calculus to engineering applications – The faculty allocate chapters/ parts of chapters to groups of students so that the entire syllabus of Linear Algebra and tor Calculus is covered.			

Text Book

1. Gilbert Strang, Linear Algebra and its applications, Wellesley-Cambridge Press,U.S.; 6th edition.

2. B. S. Grewal (2017), Higher Engineering Mathematics by, 44th Edition, Khanna Publishers.

References:

1. Introduction to Linear Algebra with Application, Jim Defranza, Daniel Gagliardi, Tata McGraw-Hill

2. Elementary Linear Algebra, Applications version, Anton and Rorres, Wiley India Edition.

3. Advanced Engineering Mathematics, Erwin Kreysig, Wiley Publication.

4. Elementary Linear Algebra, Ron Larson, Cengage Learning .

5. Linear Algebra and its Applications, David C. Lay, Pearson Education.

E-resources/ Web links:

1. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_9607

2. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_143156

3. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=CUSTOM_PACKAGE_EBSCO_29052023_270975

4. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_94555

5. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_243864

6. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_224531

7. NPTEL Video Lectures Matrices and Linear Algebra:

8. https://nptel.ac.in/courses/111106051/

9. NPTEL Video Lectures Differential Equations:

10. https://nptel.ac.in/courses/111106100/

11. NPTEL Vector Calculus:

12. https://nptel.ac.in/courses/111/105/111105122/

13. https://www.math.hkust.edu.hk/~maqian/ma006_0607F.html 14. https://www.scu.edu.au/study-at-scu/units/math1005/2022/
Topics relevant to SKILL DEVELOPMENT: The course focuses on the concepts of Vector calculus and Linear Algebra with reference to specific engineering problems. The course is of both conceptual and analytical type in nature through Problem Solving**.** This is attained through the assessment component mentioned in the course handout.

Course Code: **CSE2251**	**Course Title:** Data Communications and Computer Networks **Type of Course:** **Theory / PCC**	**L- T-P- C**	3	**0**	0	**3**
Version No.	1.0					
Course Pre-requisites						
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 Outcomes	On successful completion of the course, the students shall be able to: 1] Ilustrate 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	**7 Sessions**		
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 Sessions**		
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 –CO3	Assignment	Problem Solving	**10 Sessions**		
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 Sessions**

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.

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

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

Reference(s):
1.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
6. https://puniversity.informaticsglobal.com/login

Course Code: **CSE2252**	**Course Title:** Data Communications and Computer Networks Lab **Type of Course: Lab / PCC**	**L- T-P- C**	0	**0**	2	**1**
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	**NIL**					
Course Description	This lab-based course provides hands-on experience in the principles and practices of data communications and computer networking. It is designed to complement theoretical concepts covered in the associated lecture course. Through a series of structured experiments and practical exercises, students will gain proficiency in configuring, analyzing, and troubleshooting computer networks. Key topics include network topology design, IP addressing and subnetting, Ethernet and LAN technologies, routing and switching, TCP/IP protocol suite, and basic network security measures. Students will work with industry-standard tools and equipment, including routers, switches, protocol analyzers, and network simulation software such as Cisco Packet Tracer or Wireshark.					
Course Objective	The objective of this lab course is to provide students with practical, hands-on experience in the configuration, operation, and troubleshooting of data communication systems and computer networks. Through guided experiments and real-world scenarios, students will reinforce theoretical knowledge, develop essential technical skills, and gain a deeper understanding of networking concepts, protocols, and devices used in modern communication systems.					
Course Outcomes	On successful completion of the course, the students shall be able to: 1. Design and configure basic network topologies using routers, switches, and end devices to meet specified requirements. 2. Analyze and troubleshoot network connectivity and performance issues using tools such as Wireshark and network simulators. 3. Demonstrate understanding of key networking protocols (e.g., TCP/IP, ARP, ICMP, DHCP) through practical implementation and observation. 4. Apply IP addressing and subnetting techniques to efficiently allocate and manage network resources in various networking scenarios.					
Course Content:						
Module 1,2,3,4	Physical Layer, Network Layer, Transport Laye	Lab Assignment	Problem Solving	**24 Sessions**		

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

Text Book(s):

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

Reference(s):

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**
6. **https://puniversity.informaticsglobal.com/login**

Course Code: CSE2253	**Course Title:** Data Structures **Type of Course: Theory**	**L-T- P- C**	3	0	0	3
Version No.						
Course Pre-requisites						
Anti-requisites						
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 SKILL DEVELOPMENT of student by using EXPERIENTIAL LEARNING techniques					
Course Out Comes	**On successful completion of the course the students shall be able to:** **CO1 :**Describe the concept of basic data structure, stacks, queues, and arrays and their operations. **[Understand]** **CO2:** Utilize linked lists for real-time scenarios. **[Apply]** **CO3:** Apply an appropriate non-linear data structure for a given scenario. **[Apply]** **CO4:** Demonstrate different searching and sorting techniques. **[Apply]**					
urse Content:						
Module 1	**troduction to Data Structure and Linear Data Structure – Stacks and Queues**	Assignment	Program activity			**9 Hours**
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	**near Data Structure - Linked List**	Assignment	Program activity			**12 Hours**
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.						
Module 3	**n-linear Data Structures - Trees**	Assignment	Program activity			**12 Hours**
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 , .Heaps , Expression Tree ,Red Black Tree - AVL Trees ,Binary Serach Tree				
Module 4	**Non-linear Data Structures - Graphs and Hashing**	Assignment	Program activity	**6 Hours**
Topics: Graphs: Basic Concept of Graph Theory and its Properties, Representation of Graphs . ADT, Elementary graph operations, Minimum Cost spanning trees, Shortest path and Transitive closure. **Hashing**: Introduction, Static Hashing, Dynamic Hashing				
Module 5	**Searching & Sorting**	Assignment	Program activity	**6 Hours**
Topic: Sorting & Searching - Sequential and Binary Search, Sorting – Selection and Insertion sort, Quick sort, Merge Sort, Bubble sort.				

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 on Stack application – Evaluation of postfix

Lab sheet -5

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

Level 2: -

Lab sheet -6

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 -7

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

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

Lab sheet -8

Level 1: Programming Exercises on factorial of a number

Level 2: Programming the tower of Hanoi using recursion

Lab sheet -9

Level 1: -

Level 2: Programming the tower of Hanoi using recursion

Lab sheet -10

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

Level 2: -

Lab sheet -11

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 -12

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

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

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 Insertion Sort

Lab sheet -14 (Beyond syllabus activity)

Level 1: Program to Construct AVL Tree

Level 2:

Lab sheet -15 (Beyond syllabus activity)

Level 1: Program to Construct RED BLACK Tree

Targeted Application & Tools that can be used

Use of PowerPoint software for lecture slides and use of Modern IDE like VS Code and Eclipse for lab programs to execute.

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 Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures in C, 2nd Edition, Universities Press, reprint 2018.

T2 Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014.

References

R1 Data structures and program design in C by Robert Kruse, Tondo C L, Bruce Leung, Pearson education publishers, 2017.

R2 Programming and Data Structure by Jackulin C Salini etal., Ane books publishers, 2019.

Web resources:

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

Topics relevant to development of "Skill Development":

ked list and stacks

ics relevant to development of "Environment and sustainability: Queues

Course Code: CSE2254	**Course Title:** Data Structures Lab **Type of Course: Lab**	**L-T- P- C**	0	0	2	1
Version No.	1.0					
Course Pre-requisites						
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 SKILL DEVELOPMENT of student by using EXPERIENTIAL LEARNING techniques					
Course Out Comes	**On successful completion of the course the students shall be able to:** **CO1 :**Describe the concept of basic data structure, stacks, queues, and arrays and their operations. **[Understand]** **CO2:** Utilize linked lists for real-time scenarios. **[Apply]** **CO3:** Apply an appropriate non-linear data structure for a given scenario. **[Apply]** **CO4:** Demonstrate different searching and sorting techniques. **[Apply]**					
Course Content:						
Module 1	**Introduction to Data Structure and Linear Data Structure – Stacks and Queues**	Assignment	Program activity			**9 Hours**
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	**near Data Structure - Linked List**	ignment	Program activity			**12 Hours**
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.						
Module 3	**n-linear Data Structures - Trees**	ignment	Program activity			**12 Hours**
pics: 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 traversalBinary , .Heaps , Expression Tree ,Red Black Tree - AVL Trees ,Serach Tree

dule 4	**n-linear Data Structures - Graphs and Hashing**	ignment	gram activity	**Hours**

Topics: Graphs: Basic Concept of Graph Theory and its Properties, Representation of Graphs . ADT, Elementary graph operations, Minimum Cost spanning trees, Shortest path and Transitive closure.
Hashing: Introduction, Static Hashing, Dynamic Hashing

Module 5	**Searching & Sorting**	Assignment	Program activity	**6 Hours**

Topic: Sorting & Searching - Sequential and Binary Search, Sorting – Selection and Insertion sort, Quick sort, Merge Sort, Bubble sort.

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 on Stack application – Evaluation of postfix

Lab sheet -5
Level 1: Programming Exercises on Queues and its operations with conditions
Level 2: -

Lab sheet -6
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 -7
Level 1: Programming Exercises on Circular Linked list and its operations.
Level 2: Programming Exercises on Circular Linked list and its operations with various positions

Lab sheet -8
Level 1: Programming Exercises on factorial of a number
Level 2: Programming the tower of Hanoi using recursion

Lab sheet -9
Level 1: -
Level 2: Programming the tower of Hanoi using recursion

Lab sheet -10

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

Level 2: -

Lab sheet -11

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 -12

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

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

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 Insertion Sort

Lab sheet -14 (Beyond syllabus activity)

Level 1: Program to Construct AVL Tree

Level 2:

Lab sheet -15 (Beyond syllabus activity)

Level 1: Program to Construct RED BLACK Tree

Targeted Application & Tools that can be used

Use of PowerPoint software for lecture slides and use of Modern IDE like VS Code and Eclipse for lab programs to execute.

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 Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures in C, 2nd Edition, Universities Press, reprint 2018.

T2 Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014.

ferences

R1 Data structures and program design in C by Robert Kruse, Tondo C L, Bruce Leung, Pearson education publishers, 2017.

R2 Programming and Data Structure by Jackulin C Salini etal., Ane books publishers, 2019.

Web resources:

3. For theory :https://onlinecourses.nptel.ac.in/noc20_cs85/preview
4. https://puniversity.informaticsglobal.com/login

Topics relevant to development of "Skill Development":

ked list and stacks

ics relevant to development of "Environment and sustainability: Queues

Course Code: CSE2255	**Course Title:** Object Oriented Programming Using Java **Type of Course: Theory - PCC**	**L-T- P- C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	Nil					
Anti-requisites	Nil					
Course Description	This course introduces the core concepts of object-oriented programming. This course has theory and lab component which emphasizes on 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:** **CO1:** Describe the basic programming concepts. [Understand] **CO2:** Apply the concept of classes, objects and methods to solve problems. [Application] **CO3:** Apply the concept of arrays and strings. [Appy] **CO4:** Implement inheritance and polymorphism building secure applications. [Apply] **CO5:** Apply the concepts of interface and error handling mechanism. [Apply]					
Course Content:						
Module 1	**Basic Concepts of Programming and Java**	Assignment	Problem Solving			**9 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**	Assignment	Problem Solving			**10 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**	Assignment	Problem Solving			**8 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**	Assignment	Problem Solving			**10 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	Assignment	Problem Solving	8 Sessions

Input/output Operation in Java(java.io Package), Streams and the new I/O Capabilities, Understanding Streams, working with File Object, 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.

Text Book

T1 Herbert Schildt, "The Complete Reference Java 2", Tata McGraw Hill Education, 11th Edition,2019.

References

R1. Cay S Horstmann and Cary Gornell, "CORE JAVA volume I-Fundamentals", Tenth Edition, Pearson 2015.

R2: James W. Cooper, "Java TM Design Patterns – A Tutorial", Addison-Wesley Publishers.4th Edition, 2000.

R3. E. Balagurusamy, "Programming with Java", Tata McGraw Hill Education, 6th Edition, 2019.

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 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 assessment component mentioned in course handout.

Course Code: CSE2256	**Course Title:** Object Oriented Programming Using Java Lab **Type of Course: Lab - PCC**	**L-T- P- C**	0	0	2	1
Version No.	2.0					
Course Pre-requisites	Nil					
Anti-requisites	Nil					
Course Description	This course introduces the core concepts of object-oriented programming. This course has theory and lab component which emphasizes on 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:** **CO1:** Demonstrate basic programming concepts. [Apply] **CO2:** Apply the concept of classes, objects and methods to solve problems. [Application] **CO3:** Apply the concept of arrays and strings. [Appy] **CO4:** Implement inheritance and polymorphism building secure applications. [Apply] **CO5:** Apply the concepts of interface and error handling mechanism. [Apply]					
Course Content:						
Module 1	**Basic Concepts of Programming and Java**	Assignment	Problem Solving	**12 Sessions**		
Download Eclipse IDE to run Java programs, Sample programs on 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**	Assignment	Problem Solving	**14 Sessions**		
Problem solving using Classes, Objects and Methods: defining a class, adding data members and methods to the class, access specifiers, instantiating objects, reference variable, accessing class members and methods. Use 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**	Assignment	Problem Solving	**10 Sessions**		
Using Arrays and Strings : 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**	Assignment	Problem Solving	**12 Sessions**		
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**	Assignment	Problem Solving	**12 Sessions**

Input/output Operation in Java(java.io Package), Streams and the new I/O Capabilities, Understanding Streams, working with File Object, 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.

P1: Programming Exercises on Basic Concepts.
LEVEL 1: Discuss about datatypes and variables.
LEVEL 2: Demonstrate a simple java program
P2: Programming Exercises on Basic Concepts.
LEVEL 1: Discuss about datatypes and variables.
LEVEL 2: Demonstrate a simple java program
P3: Programming Exercises on operators, expressions based on a given scenario.
LEVEL 1: Explain operators, expressions.
LEVEL 2: Demonstrate operators
P4: Programming Exercises Command Line Arguments based on a given scenario.
LEVEL 1: Explain command line arguments
LEVEL 2: Demonstrate command line arguments
P5: Programming Exercises on basic Input/ Output functions and Control Statements: Branching
LEVEL 1: Explain Input/ Output functions
LEVEL 2:Demonstrate Control Statements: Branching
P6: Programming Exercises on Control Statements: Looping
LEVEL 1: Explain variour loops.
LEVEL 2:Demonstrate Control Statements: Looping
P7: Programming Exercises on Creating Objects, classes on a given scenario.
LEVEL 1: Illustrate class, object and methods.
LEVEL 2: Execute java program using class and objects
P8: Programming Exercises on Adding methods and Constructors to the class based on a given scenario.
LEVEL 1: Illustrate methods and constructors
LEVEL 2: Execute java program using methods and constructors
P9: Programming Exercises on methods based on a given scenario.
LEVEL 1: Illustrate method overloading
LEVEL 2: Apply method overloading for the given scenario.
P10: Programming Exercises on methods based on a given scenario.
LEVEL 1: Illustrate constructors overloading
LEVEL 2: Apply constructor overloading for the given scenario
P11: Programming Exercises on methods for static members bassed on a given scenario.
LEVEL 1: Benefits of usage static members
LEVEL 2: Usage of Static Members for the given scenario
P12: Programming Exercises on static methods based on a given scenario.
LEVEL 1: Benefits of usage static methods
LEVEL 2: Usage of Static Methods for the given scenario.
P13: Programming Exercises on nested Classes based on a given scenario.
LEVEL 1: Benefits of usage nested classes
LEVEL 2: Apply the concept of usage of nested classes for the given scenario
P14: Programming Exercises on Arrays and its built-in functions based on a given scenario.
LEVEL 1: Illustrate one dimensional arrays and its functions.
LEVEL 2: Demonstrate programs with single-dimensional arrays and operations.
P15: Programming Exercises on Arrays and its built-in functions based on a given scenario.
LEVEL 1: Illustrate multi dimensional arrays and its functions.
LEVEL 2: Demonstrate programs with multi-dimensional arrays and operations.
P16: Programming Exercises on String Class and its built-in functions based on a given scenario.
LEVEL 1: Explain about String class and String methods.

LEVEL 2: Execute simple java applications for String and StringBuffer operations
P17: Programming Exercises on String Buffer Class and its built-in functions based on a given scenario.
LEVEL 1: Explain about StringBuffer class and String methods.
LEVEL 2: Execute simple java applications for String and StringBuffer operations
P18: Programming Exercises on String Builders and its built-in functions based on a given scenario.
LEVEL 1: Explain about String Builders.
LEVEL 2: Execute java applications for String Builders
P19: Programming Exercises on single, multi level Inheritance and super keyword based on given scenario.
LEVEL 1: Explain single and multi level inheritance.
LEVEL 2: Demonstrate simple applications for the different types of inheritance
P20: Programming Exercises hierarchical Inheritance and super keyword based on given scenario.
LEVEL 1: Explain hierarchical inheritance.
LEVEL 2: Demonstrate simple applications for hierarchical inheritance
P21: Programming Exercises on Overriding.
LEVEL 1: Differentiate method overloading and method overriding.
LEVEL 2: Demonstrate simple program with dynamic method dispatch.
P22: Programming Exercises on Final based on given scenario.
LEVEL 1: Implement programs using concept of final.
LEVEL 2: Use final keyword for the given problem
P23: Programming Exercises on Abstract keyword based on given scenario.
LEVEL 1: Implement programs using concept of Abstract.
LEVEL 2: Use abstract keyword for the given problem
P24: Programming Exercises on Interface based on a given scenario.
LEVEL 1: Differentiate abstract class about interface
LEVEL 2: Implement interfaces in the given problem
P25: Programming Exercises on Exception Handling based on a given scenario.
LEVEL 1: Explain exception handling
LEVEL 2: Solve the given problem using exception handling mechanism.
P26: Programming Exercises on Character Stream Classes based on a given scenario.
LEVEL 1: Explain Character Stream Classes
LEVEL 2: Solve the given problem using Character Stream Class.
P27: Programming Exercises on Read/Write Operations with File Channel based on a given scenario.
LEVEL 1: Explain Read/Write Operations with File Channel
LEVEL 2: Solve the given problem using Read/Write Operations with File Channel.
P28: Programming Exercises on Read/Write Operations with File Channel based on a given scenario.
LEVEL 1: Explain Read/Write Operations with File Channel
LEVEL 2: Solve the given problem using Read/Write Operations with File Channel.
P29: Programming Exercises on Read/Write Operations with File Channel based on a given scenario.
LEVEL 1: Explain Read/Write Operations with File Channel
LEVEL 2: Solve the given problem using Read/Write Operations with File Channel.
P30: Programming Exercises on Read/Write Operations with File Channel based on a given scenario.
LEVEL 1: Explain Read/Write Operations with File Channel
LEVEL 2: Solve the given problem using Read/Write Operations with File Channel.

Targeted Application & Tools that can be used : JDK /Eclipse IDE/Visual Studio Code / net Beans IDE.

Text Book

T1 Herbert Schildt, "The Complete Reference Java 2", Tata McGraw Hill Education, 11th Edition,2019.

References

R1. Cay S Horstmann and Cary Gornell, “CORE JAVA volume I-Fundamentals”, Tenth Edition, Pearson 2015.

R2: James W. Cooper, “Java TM Design Patterns – A Tutorial”, Addison-Wesley Publishers.4th Edition, 2000.

R3. E. Balagurusamy, “Programming with Java”, Tata McGraw Hill Education, 6th Edition, 2019.

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 development of “Skill Development”:

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

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

Course Code: CSE2501	**Course Title:** Computer Organization and Architecture **Type of Course:** PCC	**L- T-P- C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	nil					
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.					
Course Outcomes	On successful completion of the course the students shall be able to: 1] Describe the basic components of a computer and their interconnections. [Remember] 2] Explain Instruction Set Architecture and Memory Unit[Understand] 3] Apply appropriate techniques to carry out selected arithmetic operations [Apply] 4] Explain the organization of memory and processor sub-system [Understand]					
Course Content:						
Module 1	Basic Structure of Computer	Assignment	Data Analysis task	**12 Sessions**		
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.						
Module 2	Instruction Set Architecture and Memory Unit	Assignment	Analysis, Data Collection	**12 Sessions**		
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.						
Module 3	Arithmetic And Input/output Design	Case Study	Data analysis task	**10 Sessions**		
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						
Module 4	BPU and Pipelining	Assignment	Analysis, Data Collection	**11 Sessions**		
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.						
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 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

ject work/Assignment:

ch batch of students (self-selected batch mates – up to 4 in a batch) will be allocated case studies/assignments

xtbook(s):

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, "Computer Organization", Sixth Edition, McGraw-HillHigher Education, 2023 reprint.
2. William Stallings, "Computer Organization & Architecture – Designing for Performance", 11th Edition, Pearson Education Inc., 2019.

ferences

1. David A. Patterson & John L. Hennessy, "Computer Organization and Design MIPS Edition- The Hardware/Software Interface", 6th Edition, Morgan Kaufmann, Elsevier Publications, November 2020.
2. Web References:
3. NPTEL Course on "Computer architecture and organization" IIT Kharagpur By Prof. Indranil Sengupta, Prof. Kamalika Datta. https://nptel.ac.in/courses/106105163
4. NPTEL Course on "Computer Organization", IIT Madras By Prof. S. Raman.
5. https://nptel.ac.in/courses/106106092
6. 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 Developmentthrough Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code: CSE2258	**Course Title: Web Technologies**	**L-T- P- C**	2	0	0	2
Version No.	1.0					
Course Pre-requisites						
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:					
Module 1	**Introduction to XHTML**	Quizzes and Assignments	Quizzes on various features of XHTML, simple applications		**20 Sessions**
	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, Demonstration of applications using XHTML for Responsive web pages.				
Module 2	**Advanced CSS**	Quizzes and assignments	Comprehension based Quizzes and assignments; Application of CSS in designing webpages		**20 Sessions**
	Advanced CSS: Layout, Normal Flow, Positioning Elements, Floating Elements, Constructing Multicolumn Layouts, Approaches to CSS Layout, Responsive Design, CSS Frameworks				
XML: Basics, Demonstration of applications using XML with XSLT.					
Module 3	**PHP – Application Level**	Quizzes and assignments	Application of PHP in web designing		**20 Sessions**
PHP: Introduction to server-side Development with PHP, Arrays, Superglobal Arrays, $GET and $ POST, $_SERVER Array, $_Files Array, Reading/Writing Files, PHP Classes and Objects, Object Oriented Design, Working with Databases, SQL, Database APIs, Managing a MySQL Database. Accessing MySQL in PHP, Applications.					
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: CSE2259	**Course Title: Web Technologies Lab**	**L-T- P- C**	0	0	2	1
Version No.	1.0					
Course Pre-requisites						
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:		

Module 1	**Introduction to XHTML Features**	Quizzes and Assignments	Quizzes on various features of XHTML, simple applications		**8 Sessions**
	Standard XHTML Document Structure, Basic Text Markup such as headings, paragraphs, lists, tables, forms, and semantic tags.				
Module 2	**CSS Styling**	Quizzes and assignments	Comprehension based Quizzes and assignments; Application of CSS in designing webpages		**10 Sessions**
	Apply CSS3 to style HTML elements, including layout techniques, color schemes, typography, and responsive design principles.				
XML: Basics, Demonstration of applications using XML with XSLT.					
Module 3	**PHP – Application Level**	Quizzes and assignments	Application of PHP in web designing		**12 Sessions**
PHP: Introduction to server-side Development with PHP, Arrays, Superglobal Arrays, $GET and $ POST, $_SERVER Array, $_Files Array, Reading/Writing Files, PHP Classes and Objects, Object Oriented Design, Working with Databases, SQL, Database APIs, Managing a MySQL Database. Accessing MySQL in PHP, Applications.					

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": 4. Web, WWW, Web browsers, Web servers, Internet. 5. CSS, PHP. 6. 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: 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.
3. Premvir Kapoor, Professional Ethics and Human Values, Khanna Book Publishing, New Delhi, 2022.

Reference Books

1. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
2. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986.
3. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
4. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
5. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
6. A N Tripathy, 2003, Human Values, New Age International Publishers.
7. E G Seebauer& Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press
8. M Govindrajran, S Natrajan& V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
9. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
6. William P. Cunningham and Mary Ann Cunningham (2020), Principles of Environmental Science: Inquiry & Applications, 9th Edition, McGraw-Hill Education, USA.

Resources:

1. https://onlinecourses.swayam2.ac.in/imb25_mg195/preview
2. https://onlinecourses.nptel.ac.in/noc25_mg141/preview
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 7. https://onlinecourses.swayam2.ac.in/imb25_mg196/preview
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.

Course Code: APT4002	**Course Title: Introduction to Aptitude (Audited)**	**L-T- P- C**	0-2-0-0
Version No.	1.0		
Course Pre-requisites	Students should know the basic Mathematics & aptitude along with understanding of English		
Anti-requisites	Nil		
Course Description	The objective of this course is to prepare the trainees to tackle the questions on various topics and various difficulty levels based on Quantitative Ability, and Logical Reasoning asked during the placement drives. There will be sufficient focus on building the fundamentals of all the topics, as well as on solving the higher order thinking questions. The focus of this course is to teach the students to not only get to the correct answers, but to get there faster than ever before, which will improve their employability factor.		
Course Objective	The objective of the course is to familiarize the learners with the concepts of Aptitude and attain Skill Development through Problem Solving techniques.		
Course Outcomes	On successful completion of the course the students shall be able to: CO1] **Recall** all the basic mathematical concepts they learnt in high school. CO2] **Identify** the principle concept needed in a question. CO3] **Solve** the quantitative and logical ability questions with the appropriate concept. CO4] **Analyze** the data given in complex problems. CO5] **Rearrange** the information to simplify the question		
Course Content:			

Module 1	Quantitative Ability	Assignment	Bloom's Level : Application	**12 Hours**
Topics: Introduction to Aptitude, working of Tables, Squares, Cubes				

Module 2	Logical Reasoning	Assignment	Bloom's Level : Application	**18 Hours**
Topics: Linear & Circular Arrangement Puzzle, Coding & Decoding, Blood Relations, Directions, Ordering and Ranking, Clocks and Calendars, Number Series, Wrong number series, Visual Reasoning				
Targeted Application & Tools that can be used: Application area: Placement activities and Competitive examinations. Tools: LMS				
Text Book 1. Quantitative Aptitude by R S Aggarwal 2. Verbal & Non-Verbal Reasoning by R S Aggarwal				
References 1. www.indiabix.com 2. www.youtube.com/c/TheAptitudeGuy/videos				
Topics relevant to Skill development: Quantitative and reasoning aptitude for Skill Development through Problem solving Techniques. This is attained through assessment component mentioned in course handout.				

Course Code: MAT2404	**Course Title: Discrete Mathematics** **Type of Course: Theory - ESC**	**L-T- P- C**	**3**	**1**	**0**	**4**
Version No.	1.0					
Course Pre-requisites	MAT2302					
Anti-requisites	**NIL**					
Course Description	The course explores the study of mathematical structures that are fundamentally discrete (not continuous), focusing on concepts like set theory, logic, graph theory, combinatorics, and number theory, with applications primarily in computer science fields like algorithms, software development, and cryptography; it covers topics such as propositional logic, proof techniques, relations, functions, counting principles, and basic graph algorithms, providing a foundation for analyzing discrete problems and structures within computer science.					
Course Objective	The main objective of the course is that students should learn a particular set of mathematical facts and how to apply them. It teaches students how to think logically and mathematically through five important themes: mathematical reasoning, combinatorial analysis, discrete structures, algorithmic thinking, and applications and modeling. A successful discrete mathematics course should carefully blend and balance all five themes.					
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 - Deploy the counting techniques to tackle combinatorial problems					

	CO3 - Comprehend the basic principles of set theory and different types of relations. CO4 - Apply different types of structures of trees for developing programming skills		
Course Content:			
Module 1	**Fundamentals of Logic**		**(10 Classes)**
Basic Connectives and Truth Tables, Propositional Logic, Applications of Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy.			
Module 2	**Principle of Counting**	**Assignment**	**(15 Classes)**
The Well Ordering Principle – Mathematical Induction The Basics of Counting, Permutations and Combinations, Binomial Coefficients and Identities, Generalized Permutations and Combinations, Generating Permutations and Combinations Advanced Principle Counting: The Principle of Inclusion and Exclusion, Generalizations of the Principle, Derangements – Nothing is in its Right Place, Rook Polynomials.			
Module 3	**Relations and Functions**		**(10 Classes)**
Cartesian Products and Relations, Functions, One-to-One, Onto Functions. The Pigeon-hole Principle, Function Composition and Inverse Functions. Relations, Properties of Relations, Computer Recognition – Zero-One Matrices and Directed Graphs, Partial Orders, Lattice, Hasse Diagrams, Equivalence Relations and Partitions.			
Module 4	**Recurrence Relations and Generating Functions**		**(10 Classes)**
Homogeneous and inhomogeneous recurrences and their solutions - solving recurrences using generating functions - Repertoire method - Perturbation method - Convolutions - simple manipulations and tricks.			
Module 5	**Graph Theory & Algorithms on Networks**	**Assignment**	**(15 Classes)**
Definitions and basic results - Representation of a graph by a matrix and adjacency list - Trees - Cycles - Properties - Paths and connectedness - Sub graphs - Graph Isomorphism - Operations on graphs - Vertex and edge cuts - Vertex and edge connectivity, Euler and Hamilton Paths, Shortest-Paths. Tree - Definitions, Properties, and Examples, Routed Trees, Binary search tree, Decision tree, spanning tree: BFS, DFS. Algorithms on Networks - Shortest path algorithm- Dijikstra's algorithm, Minimal spanning tree- Kruskal algorithm and Prim's algorithm.			
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.			
Assignment:			
Assignment 1: Logic Equivalences and Predicate calculus. **Assignment 2: Equivalence Relations and Lattices** **Assignment 3: Recurrence Relations**			
Text Book 1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", McGraw-Hill,s 8th Edition,2019. 2. Harary – Graph Theory, Addison-Wesley Publishing Company.			
References: 1. Arthur Gill, "Applied Algebra for Computer Science", Prentice Hall. 2. K.D. Joshi, "Discrete Mathematics", Wiley Eastern Ltd.			

3. Ralph. P. Grimaldi., “Discrete and Combinatorial Mathematics: An Applied Introduction”, 4th Edition, Pearson Education Asia.

E-resources/ Web links:

https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id SCO95_30102024_54588

https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id SCO95_30102024_375

https://www.math.hkust.edu.hk/~maqian/ma006_0607F.html

https://www.scu.edu.au/study-at-scu/units/math1005/2022/

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

Course Code: **CSE2502**	**Course Title:**Cryptography and Network Security **Type of Course:** Theory - PCC	**L- T-P- C**	3	**0**	0	**3**
Version No.	2.0					
Course Pre-requisites						
Anti-requisites	**NIL**					
Course Description	The Course deals with the principles and practice of cryptography and network security, focusing in particular on the security aspects of the web and Internet					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Cryptography and Network Security above and attain Skill Development through Problem Solving methodologies.					
Course Outcomes	On successful completion of this course the students shall be able to: 1. Describe the basic concept of Cryptography 2. Classify different types of Cryptographic Algorithms 3. Solve Mathematical problems required for Cryptography 4. Illustrate Network Security concepts					
Course Content:						

Module 1	Introduction to Cryptography	Assignment	Recognize the techniques	**7 Sessions**
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 : Play-fair and Hill Cipher, Vigenere cipher, Introduction to Block Cipher and Stream Cipher, Feistel Structure, ECB modes of block cipher.				
Module 2	Symmetric Encryption Algorithm	Assignment	Analysis of solutions	9 Sessions
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, Ei-gamal Encryption, Elliptic curve cryptography overview.				
Module 3	Public Key Cryptography	Assignments	Analysis of solutions	9 Sessions
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, Ei-gamal Encryption, Elliptic curve cryptography overview				
Module 4	Network Security	Assignment	Analysis of solutions	05 Sessions
Topics: Network Security fundamentals, Network Security applications: Authentication: Kerberos, PKI, Network Security applications: e-mail security: PGP, MIME, Network Security applications: IP Security: IPSec architecture, Network Security applications: DNS 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.				
Text Book(s): T1 William Stallings, "Cryptography and Network Security - Principles and Practices", 7th Edition, Pearson publication, ISBN: 978-93-325-8522-5, 2017				

Reference(s):

R1 Bruice Schneier, “Applied Cryptography – Protocols, Algorithms and Source code in C”, Second Edition, Wiley

Publication, ISBN: 978-81-265-1368-0, 2017

R2 Cryptography and Network Security, Express Learning, ITL Education Solution Limited.

R3 e-pg pathshala UGC lecture series

Web references:
https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2233842&site=ehost-live

https://nptel.ac.in/courses/106105031.

Topics relevant to “Skill Development”: Topics relevant to “Skill Development”:

1. Play-fair and Hill Cipher

2. Euclidean and Extended Euclidean Algorithm

3. Secure Hash Algorithm

4. Diffie-Helman Key exchange

5. Totient Function.

6. Fermat’s little theorem

Course Code: CSE2269	**Course Title: Operating Systems**		**L-T- P- C**	3	0	0	3
Version No.	1.0						
Course Pre-requisites	Nil						
Anti-requisites	**NIL**						
Course Description	This course introduces the 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:
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.
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

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

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

References
Silberschatz A, Galvin P B and Gagne G, "Operating System Concepts", 10th edition Wiley, 2018.
William Stallings, "Operating Systems",Ninth Edition, By Pearson Paperback ,1 March 2018.
Sundaram RMD, Shriram K V, Abhishek S N, B Chella Prabha, " Cracking the Operating System skills", Dreamtech, paperback, 2020
Remzi H. Arpaci-Dusseau Andrea C. Arpaci-dusseau , "Operating Systems: Three Easy Pieces, Amazon digital Services", September 2018.

E-resources/Weblinks
https://www.os-book.com/OS9/
https://pages.cs.wisc.edu/~remzi/OSTEP/
https://codex.cs.yale.edu/avi/os-book/OS10/index.html

Course Code: CSE2270	**Course Title: Operating Systems Lab**	**L-T- P- C**	0	0	2	1
Version No.	1.0					
Course Pre-requisites	Nil					
Anti-requisites	**NIL**					
Course Description	This laboratory course provides hands-on experience with the core concepts of operating systems through practical assignments, simulations, and case studies. It covers foundational aspects such as system calls, process and thread management, inter-process communication, synchronization, deadlocks, memory management, and file systems. Students will implement and simulate real-time OS components and scheduling algorithms, fostering deeper understanding of OS architecture and design. The lab also introduces modern OS tools, programming interfaces, and the basics of open-source OS environments.					
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] Demonstrate system-level programming using system calls and OS structures. [**Apply**] 2] Simulate process scheduling and multithreading techniques. [**Apply**] 3] Apply various tools to handle synchronization problems using semaphores and shared memory. [**Apply**] 4] Demonstrate memory management and file system concepts using simulation or scripting. **[Apply]**					
Course Content:						

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:

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.

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.

List of Laboratory Tasks:

Lab sheet -1

L1: Write a program to demonstrate the use of fork() and exec() system calls in process creation.

L2: A system has limited memory and high-priority real-time processes. Design a scheduling algorithm that ensures responsiveness while preventing starvation.

Lab sheet -2

L1: Implement First-Come-First-Serve (FCFS) process scheduling using C or Python.

L2: You are designing a server that handles thousands of client connections. Compare multithreading and multiprocessing for this task and implement a basic server model.

Lab sheet -3

L1: Implement Round Robin Scheduling with a fixed time quantum.

L2: In a banking system, concurrent access to accounts leads to data corruption. Design a synchronization solution to avoid race conditions.

Lab sheet -4

L1: Write a program to create threads using Pthreads or Python's threading module.

L2: You're tasked with building a file access tracker in an OS. Implement a system to log file access patterns and identify frequent accesses.

Lab sheet -5

L1: Demonstrate inter-process communication (IPC) using pipes.

L2: A simulation tool needs to emulate process suspension and resumption. Design and implement such a mechanism using signals or condition variables.

Lab sheet -6

L1: Simulate the Producer-Consumer problem using semaphores.

L2: You're developing a system where sensor devices (producers) generate temperature readings, and data processors (consumers) store and process these readings. To prevent race conditions and ensure buffer safety, implement a synchronization mechanism using semaphores.

Lab sheet -7

L1: Implement Dining Philosophers Problem using threads and synchronization.

L2: In a multi-threaded cafeteria simulation, five philosophers sit around a circular table, each alternating between thinking and eating. To eat, a philosopher must hold two forks (represented by shared resources). Your task is to avoid deadlock and ensure no philosopher starves using thread synchronization techniques.

Lab sheet -8

L1: Write a program to simulate First Fit, Best Fit, and Worst Fit memory allocation strategies.

L2: A system with limited memory blocks needs to allocate memory to processes arriving with various size requests. Your task is to implement three classic memory allocation strategies—First Fit, Best Fit, and Worst Fit—to allocate memory to each process efficiently. Simulate and compare how memory gets allocated in each strateg

Lab sheet -9

L1: Demonstrate paging using a simple page table simulation.

L2: A program has a logical address space divided into pages. The system's memory is divided into equal-sized frames. When a program executes, its pages are loaded into available frames in main memory. Simulate the address translation process using a page table and demonstrate how a logical address is converted to a physical address.

Lab sheet -10

L1: Write a program to simulate page replacement algorithms like FIFO and LRU.

L2: In a virtual memory system, a process accesses pages in a specific order. The memory can only hold a limited number of pages (frames). When a page is needed and the memory is full, a page replacement algorithm is used to decide which page to evict. Simulate and compare FIFO and LRU algorithms for a given page reference string.

Lab sheet -11

L1: Simulate file directory structure (single level/two level).

L2: A university campus computer lab has limited memory space available for each student

login session. When students open files or run programs, memory pages are loaded into available memory frames. Due to the limited number of frames, some pages must be replaced when new ones are needed. The lab system uses page replacement algorithms to decide which pages to evict when memory is full..

Lab sheet -12

L1: Write a shell script to demonstrate file handling commands in Linux.

L2: Design a command-line mini shell that can run background and foreground processes and handle basic built-in commands like cd, pwd, exit.

Project work/Assignment

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

Text Book

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

References

Silberschatz A, Galvin P B and Gagne G, "Operating System Concepts", 10th edition Wiley, 2018.
William Stallings, "Operating Systems",Ninth Edition, By Pearson Paperback ,1 March 2018.
Sundaram RMD, Shriram K V, Abhishek S N, B Chella Prabha, " Cracking the Operating System skills", Dreamtech, paperback, 2020
Remzi H. Arpaci-Dusseau Andrea C. Arpaci-dusseau , "Operating Systems: Three Easy Pieces, Amazon digital Services", September 2018.

E-resources/Weblinks

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

Course Code: CSE2260	**Course Title: Database Management Systems** **Type of Course: Theory only - PCC**	**L-T-P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	Foundational understanding of data types, data structures, basic programming knowledge, familiarity with operating systems and file management. Basic knowledge of set theory, logic, and discrete mathematics to understand relational algebra and query formulation.					
Anti-requisites	NIL					
Course Description	This course introduces the foundational principles of database management systems, including data models, schemas, and architectures. This course provides a solid foundation on the relational model of data and the use of relational algebra. It develops skills in SQL for data definition, manipulation, and control, enabling students to construct and execute complex queries. The course also introduces the concept of object oriented and object relational databases and modern database technologies like **NoSQL.** The also course allows the students to gain insights into data storage structures and indexing strategies for optimizing query performance.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Database Management 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 elements of relational database management systems. [Understand] 2. Examine databases using SQL query processing and Optimization. [Apply] 3. Design simple database systems applying the normalization constraints and demonstrate the database transaction processing, recovery, and security. [Apply] 4. Interpret the concept of advanced databases and its applications. [Apply]					
Course Content:						
Module 1	**Introduction to Database Modelling and Relational Algebra(Understand)**	Assignment	**Problem Solving**		**10 Sessions**	
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.						
Module 2	**Fundamentals of SQL and Query Optimization (Apply)**	Assignment	**Programming**		**11 Sessions**	

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 of expression, choosing evaluation plans, linear and bushy plans, dynamic programming algorithms.

Module 3	**Relational Database Design & Transaction Management (Apply)**	Assignment	**Problem Solving**	**12 Sessions**

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), Join Dependencies (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 interaction with concurrency control.

Module 4	**Advanced DBMS Topics (Apply)**	**Assignment**	**Case Study**	**12 Sessions**

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, Native XML databases (NXD), Document-oriented databases, Statistical databases.

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.

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 Books:
T1. Elmasri R and Navathe S B, “Fundamentals of Database System”, Pearson Publication, 7th Edition, 2018.
T2. RamaKrishna & Gehrke, “Database Management Systems” 3rd Edition, 2018, McGraw-Hill Education.
T3. 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
R1 Avi Silberschatz, Henry F. Korth, S. Sudarshan, “Database System Concepts”, McGraw-Hill ,7th Edition, 2019.
R2 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 design using 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: CSE2261	**Course Title: Database Management Systems Lab** **Type of Course: 1) Laboratory - PCC**	**L-T-P-C**	0	0	2	1
Version No.	1.0					
Course Pre-requisites	Foundational understanding of data types, basic programming knowledge, operating systems and file management.					
Anti-requisites	NIL					
Course Description	The Database Management Systems (DBMS) Laboratory is designed to provide students with hands-on experience in database design, implementation, and management using SQL and database management tools such as MySQL. The lab complements theoretical concepts learned in database courses by allowing students to practice database creation, querying, and optimization techniques. The DBMS Lab enables students to develop industry-relevant skills in database management, preparing them for careers in **software development, data engineering, and database administration**.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Database Management Systems and attain **Employability** through **Problem Solving** Methodologies.					
Course Out Comes	On successful completion of the course the students shall be able to: 5. Demonstrate the database concepts, practice, and SQL queries. [Apply] 6. Design and implement database schemas while applying normalization techniques to optimize structure. [Apply]] 7. Develop and implement stored procedures, triggers, and views for automation and efficiency. [Apply] 8. To Design and build database applications for real world problems. [Apply]					

Course Content:

List of Laboratory Tasks:
Create Employee, Student, Banking and Library databases and populate them with required data. Do the following 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 operations on 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. [Banking Database]

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]

7. To study and implement Functions, and Triggers in MySQL DB.

Level 1: Implement Oracle Functions and Triggers in Oracle on Employee database.

Level 2: Determine the requirement and construct Functions and Triggers. [Supply chain Database]

Labsheet-6 [4 Practical Sessions]

Experiment No. 8: [2 Sessions]

8. To implement the concept of forms and reports.

Level 1: Implement the concept of forms and reports.

Level 2: Examine the schema relationship.

Experiment No. 9: [2 Sessions]

9. Create the database using the given schema. (Flight Management)

Level 1: Implement a relational database based on the provided schema for the Flight Management system, including the creation of tables, relationships, and constraints.

Level 2: Demonstrate schema relationships by defining primary and foreign keys to ensure data integrity within the Flight Management database.

Labsheet-7 [4 Practical Sessions]

Experiment No. 10: [2 Sessions]

10. Create the database using the given schema. (Company database)

Level 1: Implement the database schema by defining tables, relationships, and constraints according to the given Company Database schema.

Level 2: Demonstrate the schema's relationships and data integrity by creating and linking tables as per the specified requirements.

Experiment No. 11: [2 Sessions]

11. Create the database using the given schema. (Student Library)

Level 1: Implement forms and reports based on the provided Student Library database schema, ensuring effective data entry and reporting mechanisms.
Level 2: Demonstrate the schema relationships within the Student Library database, demonstrating how these relationships influence the creation and functionality of forms and reports.

Labsheet-8 [1 Sessions]
12. Design a mini project based on the databases such as Inventory Management System, University Management 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 in italic.

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

Text Books:
T1. Elmasri R and Navathe S B, "Fundamentals of Database System", Pearson Publication, 7th Edition, 2018.
T2. RamaKrishna & Gehrke, "Database Management Systems" 3rd Edition, 2018, McGraw-Hill Education.
T3. 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
R1 Avi Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGraw-Hill ,7th Edition, 2019.
R2 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 design using 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: CCS2504	**Course Title:** Ethical Hacking	**L-T- P- C**	**2**	**0**	**0**	**2**
Version No.	1.3					
Course Pre-requisites	CSE2251					
Anti-requisites	NIL					

Course Description	This course introduces students to a wide range of topics related to ethical hacking. It also provides an in-depth understanding of how to effectively protect computer networks. These topics cover some of the tools and penetration testing methodologies used by ethical hackers and provide a thorough discussion of what and who an ethical hacker is and how important they are in protecting corporate and government data from cyber-attacks				
Course Objective	The objective of the course is to familiarize the learners with the concepts of Ethical Hacking and attain to improve the learners' Employability Skills by using Experiential Learning techniques.				
Course Out Comes	On successful completion of this course the students shall be able to: 1] Extrapolate the importance of ethical hacking. 2] Determine the various techniques for performing reconnaissance 3] Categorize various types of system scanners and their functions. 4] Identify the function of sniff on a network.				
Course Content:					
Module 1	**Introduction to Hacking**	Assignment		Programming activity	**7 Hours**
Topics: Introduction to Hacking-Important Terminologies - Asset - Vulnerability - Penetration Test - Vulnerability Assessments versus Penetration Test - Penetration Testing Methodologies - Categories of Penetration Test. **Assignment:** Different phase methodologies on penetration testing					
Module 2	**Linux Basics**	Assignment		Programming activity	**8 Hours**
Topics: Major Linux Operating Systems - File Structure inside of Linux - BackTrack - Changing the Default Screen Resolution - Some Unforgettable Basics. **Assignment:** Penetration testing distribution					
Module 3	**Information Gathering Techniques**	Assignment		Programming activity	**8 Hours**
Topics: Sources of Information Gathering - Copying Websites Locally - NeoTrace - Xcode Exploit Scanner - Interacting with DNS Servers - DNS Cache Snooping - DNS Lookup with Fierce - SNMP - SMTP.**Assignment:**Domain internet groper					
Module 4	**Target Enumeration and Port Scanning Techniques**	Assignment		Programming activity	**7 Hours**

Topics: Target Enumeration and Port Scanning Techniques - Host Discovery - Scanning for Open Ports and Services - Types of Port Scanning - Vulnerability Assessment.**Assignment:** Demonstrations for port scanning
Text Book 1.Rafay Baloch, 2014: "Ethical Hacking and Penetration Testing Guide" Apple Academic Press Inc**.**
References 1.Gary Hall, Rrin Watson, 2016: "Hacking: Computer Hacking, Security Testing,Penetration Testing, and Basic Security". 2.James Corley, Kent Backman, Michael Simpson, 2010: "Hands-On Ethical Hacking and Network Defense", 2nd Edition, Cengage Learning. **E-Resources**: (1) Ethical Hacking in 12 Hours - Full Course - Learn to Hack! - YouTube
Topics relevant to "EMPLOYABILITY SKILLS": CEH CertificationEthical hacking techniques for **Employability skills** through **Experiential Learning techniques**. This is attained through the assessment component mentioned in course handout.

Course Code: CCS2505	**Course Title:** Ethical Hacking Lab	**L-T- P- C**	**0**	**0**	**4**	**2**
Version No.	1.3					
Course Pre-requisites	CSE2251					
Anti-requisites	NIL					
Course Description	This course introduces students to a wide range of topics related to ethical hacking. It also provides an in-depth understanding of how to effectively protect computer networks. These topics cover some of the tools and penetration testing methodologies used by ethical hackers and provide a thorough discussion of what and who an ethical hacker is and how important they are in protecting corporate and government data from cyber-attacks					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Ethical Hacking and attain to improve the learners' Employability Skills by using Experiential Learning techniques.					
Course Out Comes	On successful completion of this course the students shall be able to: 1] Extrapolate the importance of ethical hacking. 2] Determine the various techniques for performing reconnaissance 3] Categorize various types of system scanners and their functions. 4] Identify the function of sniff on a network.					
Course Content:						

List of Laboratory Tasks:

Experiments:

1. Command Prompt
2. Wireshark
3. Netscantool
4. OWZAP
5. Neotrace
6. NMAP
7. AngryIPScanner
8. Maltigo
9. Readnotify
10. HTTRACK
11. Yougetsignal
12. CAPSA Portable Network Analyzer

13. Samspade
14. Shodan
15. Oputils
16. Brupsuit
17. Zenmap
18. OSINT
19. John the ripper

Targeted Application & Tools that can be used: Application Software and open source tools like SQL Injection and NIDS,HIDS.

Text Book

1.Rafay Baloch, 2014: "Ethical Hacking and Penetration Testing Guide" Apple Academic Press Inc**.**

References

1.Gary Hall, Rrin Watson, 2016: "Hacking: Computer Hacking, Security Testing,Penetration Testing, and Basic Security".

2.James Corley, Kent Backman, Michael Simpson, 2010: "Hands-On Ethical Hacking and Network Defense", 2nd Edition, Cengage Learning.

E-Resources:

(1) Ethical Hacking in 12 Hours - Full Course - Learn to Hack! - YouTube

Topics relevant to "EMPLOYABILITY SKILLS": CEH Certification

Ethical hacking techniques for **Employability skills** through **Experiential Learning techniques**. This is attained through the assessment component mentioned in course handout.

Course Code: CSE2262	**Course Title:** Analysis of Algorithms **Type of Course:** Theory PCC	**L- T-P- C**	3	1	0	4
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	Nil					
Course Description	This course introduces techniques for the design and analysis of efficient algorithms and methods of applications. This course discusses the classic approaches for algorithm design such as Divide and Conquer, Dynamic Programming, Greedy method. This course also describes other basic strategies searching solution space. The core concepts of analyzing algorithms and classifying them into various complexity classes is covered in the end.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Analysis of Algorithms** and attain **Skill Development** through **Problem Solving** Methodologies.					
Course Out Comes	On successful completion of the course the students shall be able to: 1. Compute efficiency of a given algorithm.[Apply] 2. Apply divide and conquer technique for searching and sorting Problems.[Apply] 3. Apply the Dynamic Programming technique for a given problem. [Apply] 4. Apply greedy technique for solving a Problem.[Apply] 5. Demonstrate Back tracking technique and limitations of Algorithms.[Apply]					
Course Content:						
Module 1	**Introduction**	Assignment	Simulation/Data Analysis	**10 Sessions**		
Introduction, Asymptotic Notations and its properties, Best case, worst case and average case- Sequential search, Sorting; Mathematical analysis for Recursive and Non-recursive algorithms: Substitution method and Master's Theorem.						
Module 2	**Divide-and-conquer**	Assignment	Simulation/Data Analysis	**08 Sessions**		
Introduction. Insertion Sort; Merge sort, Quick sort, Binary search.						
Module 3	**Dynamic programming**	Term paper/Assignment	Simulation/Data Analysis	**10 Sessions**		
Introduction with examples, Principles of Memoization, 0-1 Knapsack Problem, Bellman-Ford algorithm, Floyd-Warshall's Algorithms. Chain Matrix Multiplication.						
Module 4	**Greedy technique**	Term paper/Assignment	Simulation/Data Analysis	**09 Sessions**		
Introduction, Fractional Knapsack Problem, Minimal Spanning Tree: Prim's Algorithm and Kruskal's Algorithm, Single-source Shortest Path: Dijkstra's Algorithm						
Module 5	**Complexity Classes**	Term paper/Assignment	Simulation/Data Analysis	**08 Sessions**		
Complexity Classes- P,NP- NP Hard and NP Complete - Boolean Satisfiability Problem (SAT). Branch and Bound: Knapsack problem; Backtracking, - N-Queens problem.						
Text Book 1. Anany Levitin, *"Introduction to the Design and Analysis of Algorithms"*, 3rd edition, Pearson Education, 2018.						

2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, *"Introduction to Algorithms*", 4th edition, MIT Press, 2022.

References

1. J. Kleinberg and E. Tardos, "*Algorithm Design*", Addison-Wesley, 2005.
2. Tim Roughgarden, *"Algorithms Illuminated"* (books 1 through 3), "Operating Systems Design and Implementation", Soundlikeyourself Publishing, 2017-2019.
3. AV Aho, J Hopcroft, JD Ullman, *"The Design and Analysis of Algorithms"*, Addison-Wesley, 1974.
4. Donald E. Knuth, "*The Art of Computer Programming",* Volumes 1and 3 Pearson.

Web-Resources

1. NPTEL: https://onlinecourses.nptel.ac.in/noc19_cs47/preview
2. Coursera: Analysis of Algorithms by Princeton University
3. Algorithms Specialization in Coursera by Stanford University(Group of 4 courses).
4. Algorithms Coding Contest Links maintained by Prof Gerth Stølting Brodal of Aarhus University

Topics relevant to "SKILL DEVELOPMENT": knapsack, prim's, kruskal's algorithm, quick sort, binary search for **Skill Development** through **Problem Solving methodologies**. This is attained through assessment component mentioned in course handout.

Course Code: CSE2263	**Course Title: Analysis of Algorithms Lab** **Type of Course: Lab - PCC**	**L- T-P- C**	0	0	2	1
Version No.	1					
Course Pre-requisites	**Nil**					
Anti-requisites	NIL					
Course Description	This course introduces techniques for the design and analysis of efficient algorithms and methods of applications. This course discusses the classic approaches for algorithm design such as Divide and Conquer, Dynamic Programming, Greedy method. This course also describes other basic strategies searching solution space. The core concepts of analyzing algorithms and classifying them into various complexity classes is covered in the end.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Analysis of Algorithms** and attain **Skill Development** through **Experiential Learning** Methodologies.					
Course Out Comes	**On successful completion of the course the students shall be able to:** 1. Compute efficiency of a given algorithm. [Applying] 2. Apply divide and conquer technique for searching and sorting Problems.[Applying] 3. Apply the Dynamic Programming technique for a given problem. [Applying] 4. Apply greedy technique for solving a Problem.[Applying] 5. Demonstrate Back tracking technique and limitations of Algorithms.[Applying]					
Course Content						
Module 1	**Introduction**					**3 Sessions**
Measuring running time of an algorithm, Compare running time of algorithms, Implement sorting algorithms such as bubble sort, selection sort						
Module 2	**Divide-and-conquer**					**3 Sessions**
Compare searching algorithms: Linear Search, Binary Search; Compare Sorting algorithms: Insertion Sort, Merge Sort, QuickSort.						
Module 3	**Dynamic programming**					**3 Sessions**
Introduction and memorization: Factorial; Coin Change Problem ; Floyd-Warshall's Algorithm.						
Module 4	**Greedy technique**					**3 Sessions**
Fractional Knapsack Problem; Minimal Spanning Tree Algorithms-Prim's Algorithm, Kruskal's algorithm						
Module 5	**Complexity Classes**					**3 Sessions**
Branch and Bound: Knapsack problem; Backtracking, - N-Queens problem.						
	List of Laboratory Tasks:					

	1. Measuring running time of an algorithm **Objective: To experimentally determine the running time of basic algorithms for input size n=10, 100, 1000, etc. by taking difference of starting time and ending time.** **2. Compare running time of algorithms** **Objective: To execute two algorithms to solve the same problem, and to comparatively evaluate the better algorithm for large values of N.** **3. Implement sorting algorithms such as bubble sort, selection sort** **Objective: To implement comparison based sorting strategies.** **4. Compare searching algorithms** **Objective: To implement two searching strategies and compare their performance.** **5. Compare Sorting algorithms** **Objective: To implement searching strategies that follow top down design approach(Insertion sort, merge sort).** **6. Quick Sort** **Objective: To demonstrate Quick sort and its variants, and their impact on running time.** **7. Dynamic Programming** **Objective: To demonstrate Dynamic Programming approach with the help of Factorial algorithm.** **8. Coin Change Problem** **Objective: To implement an efficient algorithm for the Coin Change problem.** **9. Floyd-Warshall's Algorithm** **Objective: To demonstrate how dynamic programming is used with the help of Floyd-Warshall's algorithm.** **10. Fractional Knapsack Problem** **Objective: To demonstrate how greedy method can be used to solve the Fractional Knapsack Problem.** **11. Minimal Spanning Tree Algorithm** **Objective: To implement greedy strategy to solve the Minimal Spanning Tree problem using Prim's Algorithm.** **12. Kruskal's Minimal Spanning Tree Algorithm** **Objective: To implement greedy strategies to solve the Minimal Spanning Tree problem using Kruskal's Algorithm.** **13. Knapsack Problem** **Objective: To implement Knapsack problem using branch and bound technique.** **14. N-Queen's Problem** **Objective: To demonstrate backtracking method with the help of N-Queen's problem.** **15. Case Study** **Objective: To demonstrate how various techniques can be used to solve the same problem with the help of Knapsack problem.**
	Targeted Application & Tools that can be used 1. PyTorch/Jupyter Notebook – For Python programming
	Text Book **T1** Anany Levitin, *"Introduction to the Design and Analysis of Algorithms*", 3rd edition,

	Pearson Education, 2018. **T2** Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, *"Introduction to Algorithms*", 4th edition, MIT Press, 2022.
	References R1. J. Kleinberg and E. Tardos, "*Algorithm Design*", Addison-Wesley, 2005. R2. Tim Roughgarden, *"Algorithms Illuminated"* (books 1 through 3), "Operating Systems Design and Implementation", Soundlikeyourself Publishing, 2017-2019. R3. AV Aho, J Hopcroft, JD Ullman, *"The Design and Analysis of Algorithms"*, Addison-Wesley, 1974. R4. Donald E. Knuth, "*The Art of Computer Programming",* Volumes 1and 3 Pearson. Web Based Resources and E-books: W1. NPTEL: https://onlinecourses.nptel.ac.in/noc19_cs47/preview W2. Coursera: Analysis of Algorithms by Princeton University W3. Algorithms Specialization in Coursera by Stanford University(Group of 4 courses). W4. Algorithms Coding Contest Links maintained by Prof Gerth Stølting Brodal of Aarhus University
	Topics relevant to "EMPLOYABILITY SKILLS": The lab experiments and assessments enable the student to acquire Skill Development through Experiential Learning techniques

Course Code: **APT4004**	**Course Title: Aptitude Training-Intermediate** Type of Course: Practical Only Course	L- T - P- C	0	0	2	0
Version No.	1.0					
Course Pre-requisites	Students should have the basic concepts of Quantitative aptitude along with its applications in real life problems.					
Anti-requisites	NIL					
Course Description	This is a skill-based training program for the students. This course is designed to enable the students to enhance their skills in Quantitative Aptitude.					
Course Objective	**The objective of the course is to familiarize the learners with the concepts of Aptitude and attain Skill Development through Problem Solving techniques.**					

Course Out Comes	**On successful completion of this course the students shall be able to:** CO1: Recall all the basic mathematical concepts. CO2: Identify the principle concept needed in a question. CO3: Solve the quantitative and logical ability questions with the appropriate concept. CO4: Analyze the data given in complex problems.		
Course Content:			
Module 1	**Quantitative Ability 1**	Assignment	**16 Hours**
Topics: Number System, Percentage, Ratio and Proportion, Average, Mixture and Allegation, Time and Work, Profit and Loss			
Module 2	Quantitative Ability 2	Assignment	**14 Hours**
Topics: Time Speed and Distance, Boats and Streams, Simple Interest, Compound Interest, Probability, Permutation and Combination			
Targeted Application & Tools that can be used: Application area: Placement activities and Competitive examinations. Tools: LMS			
Continuous Evaluation:			
CA1 – Online Test CA2 – Online Test CA3 – Online Test Assignment			
Text Book: 1. Fast Track Objective by Rajesh Verma 2. R S Aggarwal 3. Rakesh Yadav **References:** **1. www.indiabix.com** **2. www.testbook.com** **3. www.youtube.com/c/TheAptitudeGuy/videos**			
Topics relevant to Skill Development: Quantitative aptitude for Skill Development through Problem solving Techniques. This is attained through components mentioned in course handout.			

Course Code: **CSE2266**	**Course Title:** **Theory** of Computation		**L- T-P-C**	3	**0**	0	**3**
Version No.	2.0					
Course Pre-requisites	nil					
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 Outcomes	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	**6 classes**		
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	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(s):

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

Reference(s):

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

Course Code: CCS2500	Course Title: Cyber Forensics	L- T-P- C	2 -0	0	2
Version No.	1.0				
Course Pre-requisites	CSE2251				
Anti-requisites	NIL				

<table>
<tr><td>Course Description</td><td colspan="4">The purpose of this course is to introduce to the students Cyber Forensic concepts. The course is both conceptual and analytical and is understood with various open-source software's. The course develops critical thinking like correctly collect and analyze computer forensic evidence, analyze and validate Forensics Data, study the tools and tactics associated with Cyber Forensics. The course involves quizzes, assignments with various open-source software.</td></tr>
<tr><td>Course Objective</td><td colspan="4">The objective of the course is to familiarize the learners with the concepts of Cyber Forensics and attain Skill Development through 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:
(1) understand various digital investigation terminologies and methods (knowledge)
(2) understand various file formats (knowledge)
(3) Recognize the importance of digital forensic duplication and various tools for analysis to achieve adequate perspectives of digital forensic investigation in various applications (Comprehension)
(4) Apply techniques for forensic investigation (Application)</td></tr>
<tr><td>Course Content:</td><td colspan="4"></td></tr>
<tr><td>Module 1</td><td>DIGITAL INVESTIGATION</td><td>Quiz</td><td>MCQ/Based on Investigation process</td><td>No. of Sessions: 09</td></tr>
<tr><td colspan="5">Digital Evidence and Computer Crime - History and Terminology of Computer Crime Investigation - Technology and Law - The Investigative Process -Investigative Reconstruction - Modus Operandi, Motive and Technology -Digital Evidence in the Courtroom.</td></tr>
<tr><td>Module 2</td><td>UNDERSTANDING INFORMATION</td><td>Quiz</td><td>MCQ/Based on file format</td><td>No. of Sessions: 09</td></tr>
<tr><td colspan="5">Methods of storing data: number systems, character codes, record structures, file formats and file signatures - Word processing and graphic file formats - Structure and Analysis of Optical Media Disk Formats - Recognition of file formats and internal buffers - Extraction of forensic artifacts– understanding the dimensions of other latest storage devices – SSD Devices.</td></tr>
<tr><td>Module 3</td><td>COMPUTER BASICS FOR DIGITAL INVESTIGATORS</td><td>Assignment</td><td>Writing task</td><td>No. of Sessions: 09</td></tr>
<tr><td colspan="5">Computer Forensic Fundamentals - Applying Forensic Science to computers - Computer Forensic Services - Benefits of Professional Forensic Methodology -Steps taken by computer forensic specialists.

Information warfare: Arsenal – Surveillance Tools – Hackers and Theft of Components – Contemporary Computer Crime-Identity Theft and Identity Fraud – Organized Crime &Terrorism. Computer forensic cases: Developing Forensic Capabilities – Searching and Seizing Computer Related Evidence –Processing Evidence and Report Preparation – Future Issues.
Assignment: Computer Crime</td></tr>
<tr><td>Module 4</td><td>Computer Forensic Evidence and Data Recovery</td><td>Assignment</td><td>Writing task</td><td>No. of Sessions: 09</td></tr>
</table>

Data Recovery Defined, Data Backup and Recovery, The Role of Backup in Data Recovery, The Data-Recovery Solution, Hiding and Recovering Hidden Data. Data Collection and Data seizure: why collect evidence? - Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Methods of Collection, Artifacts, Collection Steps, Controlling Contamination: The Chain of Custody. Reconstructing the Attack. Assignment: Data Recovery

Textbook(s): 1. John R. Vacca, "Computer Forensics: Computer Crime Scene Investigation", Cengage Learning, 2nd Edition, 2019
References 1. Ravi Kumar & B Jain,2006," Cyber Forensics - Concepts and Approaches", icfai university press 2. ChristofPaar, Jan Pelzl," Understanding Cryptography: A Textbook for Students and Practitioners", Springer's, Second Edition, 2010, 3. Ali Jahangiri," Live Hacking: The Ultimate Guide to Hacking Techniques & Countermeasures for Ethical Hackers & IT Security Experts", First edition, 2009 4. Computer Forensics: Investigating Network Intrusions and Cyber Crime", Ec-Council Press, 2010. 5. C. Altheide& H. Carvey," Digital Forensics with OpenSource Tools, Syngress", 2011, ISBN: 781597495868.,https://esu.desire2learn.com
NPTEL: https://onlinecourses.swayam2.ac.in/cec21_ge10/preview Udemy: https://www.udemy.com/topic/digital-forensics/ E-book Link(PU): **Links** http://182.72.188.195/cgi-bin/koha/opac-detail.pl?biblionumber=14073&query_desc=ti%2Cwrdl%3A%20CYBER%20FORENSIC
Topics relevant to "Skill Developemnt": Cyber Forensics techniques for **Skill development** through **Experiential Learning techniques.** This is attained through the assessment component mentioned in the course handout.

Course Code: CCS2501	**Course Title: Cyber Forensics** Lab	**L- T-P- C**	0-0-2-1
Version No.	1.0		
Course Pre-requisites	**CSE2251**		
Anti-requisites	NIL		
Course Description	The purpose of this course is to introduce to the students Cyber Forensic concepts. The course is both conceptual and analytical and is understood with various open-source software's. The course develops critical thinking like correctly collect and analyze computer forensic evidence, analyze and validate Forensics Data, study the tools and tactics associated with Cyber Forensics. The course involves quizzes, assignments with various open-source software.		

Course Objective	The objective of the course is to familiarize the learners with the concepts of **Cyber Forensics** and attain **Skill Development** through **Experiential Learning** techniques.
Course Outcomes	**On successful completion of this course the students shall be able to:** **(1) understand** various digital investigation terminologies and methods (knowledge) **(2) understand** various file formats (knowledge) **(3) Recognize** the importance of digital forensic duplication and various tools for analysis to achieve adequate perspectives of digital forensic investigation in various applications (Comprehension) **(4) Apply** techniques for forensic investigation (Application)
Course Content:	

List of Laboratory Tasks:

1. Case Studies of Opensource Forensic Tools
2. FTK Forensic Tool kit for taking mirror image

Disk Forensics-

3. Identify digital evidences
4. Acquire the evidence
5. Authenticate the evidence
6. Preserve the evidence
7. Analyze the evidence
8. Report the findings

Network Forensics:

9. Intrusion detection
10. Logging
11. Correlating intrusion detection and logging

Device Forensics

12. Mobile phone
13. Digital Music
14. Printer Forensics
15. Scanner Forensics
16. Credit Card Forensics
17. Telecommunications Forensics
18. Forensic Analysis of a Virtual Machine
19. Forensic analysis of Cloud storage and data remnants
20. RAM Dumping Tool

Targeted Application & Tools that can be used:

1. **FTK Forensic Toolkit**
2. **Encase**
3. **Kali Linux- Vinetto, galatta**
4. **Autopsy – Disk Forensics**

Project work/Assignment:
Each batch of students (self-selected batch mates) will identify projects based on the content and implement with the most suitable 2 or 3 antecedents.

Textbook(s):

2. John R. Vacca, "Computer Forensics: Computer Crime Scene Investigation", Cengage Learning, 2nd Edition, 2019

References

1. Ravi Kumar & B Jain,2006," Cyber Forensics - Concepts and Approaches", icfai university press 2. ChristofPaar, Jan Pelzl," Understanding Cryptography: A Textbook for Students and Practitioners", Springer's, Second Edition, 2010,
3. Ali Jahangiri," Live Hacking: The Ultimate Guide to Hacking Techniques & Countermeasures for Ethical Hackers & IT Security Experts", First edition, 2009
4. Computer Forensics: Investigating Network Intrusions and Cyber Crime", Ec-Council Press, 2010.
5. C. Altheide& H. Carvey," Digital Forensics with OpenSource Tools, Syngress", 2011, ISBN: 781597495868.,https://esu.desire2learn.com

NPTEL: https://onlinecourses.swayam2.ac.in/cec21_ge10/preview
Udemy: https://www.udemy.com/topic/digital-forensics/
E-book Link(PU):
Links
http://182.72.188.195/cgi-bin/koha/opac-detail.pl?biblionumber=14073&query_desc=ti%2Cwrdl%3A%20CYBER%20FORENSIC

Topics relevant to "Skill Developemnt": Cyber Forensics techniques for **Skill development** through **Experiential Learning techniques.** This is attained through the assessment component mentioned in the course handout.

Course Code: CCS2502	**Course Title:** Cyber threats for IOTand Cloud	**L- T-P- C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	Operating Systems					
Anti-requisites	**NIL**					
Course Description	The objective of the course is to understand the most important cyber threats for IOT and Cloud. Cyber attackers discover new possibilities in the areas of Internet of Things and cloud services. It mainly focuses on multiple security challenges facing the IoT and cloud computing especially concerns surrounding privacy and cyber security threats of the users and the how can the cyber risks relating to them be mitigated.					

Course Objectives	The objective of the course is to familiarize the learners with the concepts of Cyber threats for IOT and Cloud and attain **Skill Development** through **Participative Learning** techniques.
Course Out Comes	On successful completion of the course the students shall be able to: • Understand the different types of cyber threats for IOT and cloud • Develop a deeper understanding and familiarity with various types of cyber-attacks,cybercrimes, vulnerabilities and remedies thereto. • Plan, implement, and monitor cyber security mechanisms to ensure the protection ofinformation technology assets.
Course Content:	

Module 1	**Introduction to IOT and Cloud computing**	Assignment	Programming Task		**12 Sessions**

Topics

What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, IoT Challenges, IOT Architecture and protocols, Variousplatforms for IoT, Real-Time examples of IoT, Overview of IoT components and IoT communication Technologies. Introduction to Cloud Computing, The Vision of Cloud Computing, Defining a Cloud, Cloud Computing Reference Model, Characteristics and Benefits, Challenges Ahead, Distributed Systems, Virtualization, Service-Oriented Computing, Utility-Oriented Computing, Building Cloud Computing Environments, Application Development, Infrastructure and System Development, Computing Platforms and Technologies.

Module 2	**Cyber Threats**	Assignment		Programming Task	**8 Sessions**

Topics:

What are Cyber Security Threats? Common Sources of Cyber Threats, Types of Cyber security Threats- Malware attacks, Social Engineering attacks, Supply chain attacks, Man-in-the middle Attack, Threat Detection Tools, CyberDefense for Individuals.

Module 3	**Cyber Threats inInternet of Things**	Assignment		Programming/Data analysis task	**10 Sessions**

Topics:

IoT threats and vulnerabilities- IoT attack surface, Attack surface areas of the IoT, Types of IoT security threats- Botnets, Denial of service, Man-in-the-Middle, Identity and data theft, Social engineering, Advanced persistent threats, Ransomware, Remote recording, How does the IoT influence security?, Best practices to reduce risks andprevent threats. Security guidelines for IoT. Managing IoT Security Threats.

Module 4	**Cyber Threats in Cloud computing**	Assignment	Programming/Data analysis task	**9 Sessions**

Topics:

Cybersecurity Threats to Cloud Computing-Identity First Security, Cloud misconfiguration, Denial of Service, InsiderThreats, Reduced Infrastructure Visibility, Unauthorized use of Cloud workloads, Insecure API's, Compliance and regulation issues, Mitigating cyber risks in cloud computing

Assignment:

Text Books

T1. Sunit Belapure and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics AndLegal Perspectives" ,Wiley India Pvt Ltd,2013
T2. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1 st Edition, Pearson Education(Cisco Press Indian Reprint). (ISBN: 978- 9386873743)
T3. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi Mastering Cloud. Computing McGraw Hill Education

References

R1. Brooks, Charles J., Christopher Grow, Philip Craig, and Donald Short. Cybersecurity essentials. John Wiley &Sons,2018
R2. Ollie Whitehouse, "Security of Things: An Implementers' Guide to Cyber-Security for Internet of Things Devices and Beyond", NCC Group, 2014
R3. Securing The Cloud: Cloud Computing Security Techniques and Tactics by Vic (J.R.) Winkler (Syngress/Elsevier) - 978-1-59749-592-9

Weblinks:
https://www.coursera.org/learn/cloud-security-basics
https://www.imperva.com/learn/application-security/cyber-security-threats/
https://presiuniv.knimbus.com/user#/home

Topics relevant to "SKILL DEVELOPMENT":
Cyber threats in IoT and Cloud Computing for **skill development** through **Participative Learning t**echniques. This isattained through the assessment component mentioned in the course handout.

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

Course Content:

Module 1	Search Methods for Problem-Solving	Problem-Solving Tests	NPTEL Assignments	No. of Sessions: 13
Introduction – History of AI, Agents and Environment, Types of AI and Learning. State Space Search; General Formulation of Search Problems; Data Structures used in Searching. **Uninformed Search Algorithms** – Breadth First Search, Depth First Search, Uniform Cost Search, Generalized Uniform Cost Search (a.k.a Dijkstra's Single-Source Shortest Path), Iterative Deepening Depth-First Search, Time and Space Complexity Analysis of Uninformed Search Algorithms. **Heuristic Search Algorithms** – Heuristics and Admissibility, Greedy Best-First Search, A* Search and weighted A* Search.				
Module 2	Advanced Search Methods	Problem-Solving Tests	NPTEL Assignments	No. of Sessions: 12
Local Search – Local Search, Hill Climbing, Genetic Algorithms, Gradient Descent. **Adversarial Search** – Minimax Search, Alpha-Beta Pruning, Ideal Ordering. **Constraint Satisfaction** – Constraint Satisfaction Problems Definitions and Examples – Map Colouring, N Queens, Cryptarithmetic, Generalized CSP; Back-tracking Heuristics; Arc Consistency and Path Consistency				
Module 3	Knowledge-Based Logic Representation	Automated Theorem Proving using FOL Resolution	NPTEL Assignments	No. of Sessions: 10
Propositional Logic – Syntax and Semantics of Propositional Logic. Logical connectives. Inference Rules. Conjunctive and Disjunctive Normal Forms. **First Order Logic** – Syntax and Semantics of Propositional Logic. Logical connectives. Inference Rules. Conjunctive and Disjunctive Normal Forms. **Resolution** – Resolution Principle. Propositional and First Order Resolution. Applications for solving story problems using Resolution				

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

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

Targeted Application & Tools that can be used:

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

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

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

Textbook(s):

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

References:

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

Weblinks

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

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

Course Content: No. of Sessions: 15 (30 hours)

Experiment No. 1: File Handling
Level 1: Read text files using Python
Level 2: Parse text files using Python

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

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

Experiment No. 5: Implementation of Heuristic Search Algorithms
Level 1: Calculate the upper-bounds of admissible heuristics using Dijkstra's SSSP.

Level 2: Implement Greedy Best-First Search and A* Search Algorithms.

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

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

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

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

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

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

Targeted Application & Tools that can be used:

3. Google Colab
4. Python IDEs like PyCharm

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

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

tbook(s):

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

erences:

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

Course Code: CCS2510	Course Title: Security Assessment and Testing	L- T-P-C	2	0	0	2
Version No.	1					
Course Pre-requisites	CSE2251					
Anti-requisites	NIL					
Course Description	The purpose of this course is to introduce you to the field of penetration testing and its associated tools. It aims to provide exposure to the Metasploit exploitation tool, Linux exploits, and Windows exploits. Additionally, it focuses on building knowledge of web application security vulnerabilities, vulnerability analysis, and malware analysis.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Security Assessment and Testing** and attain **Skill Development** through **Experiential Learning** techniques.					
Course Out Comes	**On successful completion of the course the students shall be able to:** ● Define the ethical considerations and legal implications in conducting ethical hacking activities using appropriate tools. (**Remember**) ● Identify social engineering, physical penetration and insider attacks using automating penetration testing processes. (**Remember**) ● Explain report penetration tests effectively to develop and execute Linux and Windows exploits, bypassing memory protections. (**Understand**) ● Illustrate web application security vulnerabilities to conduct vulnerability analysis. (**Apply**)					
Course Content:						
Module 1	**Introduction**	Quiz		Comprehension based Quiz on web fundamentals		**13 Sessions**
Topics: **Introduction to Ethics of Ethical Hacking:** Why You Need to Understand Your Enemy's Tactics, Recognizing the Gray Areas in Security, Vulnerability Assessment and Penetration Testing. **Penetration Testing and Tools: Social Engineering Attacks:** How a Social Engineering Attack Works, Conducting a Social Engineering Attack, Common Attacks Used in Penetration Testing, Preparing Yourself for Face-to-Face Attacks, Defending Against Social Engineering Attacks.						
Module 2	**Physical Penetration Attacks**	Assignment		Comprehensive based assignment on Web authentication		**16 Sessions**
Topics: **Physical Penetration Attacks:** Need of Physical Penetration, Conducting a Physical Penetration, Common Ways into a Building, Defending Against Physical Penetrations. **Insider Attacks:** Conducting an Insider Attack, Defending Against Insider Attacks.						

Metasploit: The Big Picture, Getting Metasploit, Using the Metasploit Console to Launch Exploits, Exploiting Client-Side Vulnerabilities with Metasploit, Penetration Testing with Metasploit's Meterpreter, Automating and Scripting Metasploit, Going Further with Metasploit.

Module 3	**Web Application Security Vulnerabilities**	Quiz		Comprehension based Quiz on web security techniques.	**15 Sessions**

Topics:

Web Application Security Vulnerabilities: Overview of Top Web Application Security Vulnerabilities, Injection Vulnerabilities, Cross-Site Scripting Vulnerabilities, The Rest of the OWASP Top Ten, SQL Injection Vulnerabilities.

Module 4	**Malware Analysis**	Assignment		Comprehension based assignment on web vulnerabilities	**16 Sessions**

Topics:

Client-Side Browser Exploits: Why Client-Side Vulnerabilities are Interesting, Internet Explorer Security Concepts, History of Client- Side Exploits and Latest Trends, Finding New Browser-BasedVulnerabilities, Heap Spray to Exploit, Protecting Yourself from Client-Side Exploit.

Malware Analysis: Collecting Malware and Initial Analysis: Malware, Latest Trends in Honeynet Technology, Catching Malware: Setting the Trap, Initial Analysis of Malware

Project work/Assignment:

Assignment:

Group assignment to identify and write different web exploits to demonstrate vulnerabilities in web applications.

Text Book

T1 Gray Hat Hacking - The Ethical Hackers Handbook, Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gideon Lenkey, and Terron Williams, 5th Edition, Tata McGraw-Hill, 2018.

References

R1. The Web Application Hacker's Hand Book - Discovering and Exploiting Security flaws, Dafydd Suttard, Marcuspinto,2nd Edition, Wiley Publishing, 2011.

R2. Penetration Testing: Hands-on Introduction to Hacking, Georgia Weidman, 1st Edition, Notarch Press, 2014.

R3. The Pen Tester Blueprint - Starting a Career as an Ethical Hacker, L. Wylie, Kim Crawly,1st Edition, Wiley Publications, 2021.

Web resources:

NPTEL / Swayam Link : Introduction to Information Security I, IIT Madras https://nptel.ac.in/courses/106106129

PU Library Link : https://puniversity.informaticsglobal.com/login

Topics relevant to "EMPLOYABILITY SKILLS": The lab experiments and assessments enable the student to acquire Skill Development through Experiential Learning techniques

Course Code: CCS2511	Course Title: Security Assessment and Testing Lab	L- T-P- C	0	0	2	1
Version No.	1					
Course Pre-requisites	CSE2251					
Anti-requisites	NIL					
Course Description	The purpose of this course is to introduce you to the field of penetration testing and its associated tools. It aims to provide exposure to the Metasploit exploitation tool, Linux exploits, and Windows exploits. Additionally, it focuses on building knowledge of web application security vulnerabilities, vulnerability analysis, and malware analysis.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Security Assessment and Testing** and attain **Skill Development** through **Experiential Learning** techniques.					
Course Out Comes	**On successful completion of the course the students shall be able to:** ● Define the ethical considerations and legal implications in conducting ethical hacking activities using appropriate tools. (**Remember**) ● Identify social engineering, physical penetration and insider attacks using automating penetration testing processes. (**Remember**) ● Explain report penetration tests effectively to develop and execute Linux and Windows exploits, bypassing memory protections. (**Understand**) ● Illustrate web application security vulnerabilities to conduct vulnerability analysis. (**Apply**)					

List of Laboratory Tasks:

1. Monitoring Network Traffic

Objective: To analyze and capture network traffic to identify patterns, detect anomalies and assess overall network performance and security.

2. Host & Services Discovery using Nmap

Objective: To identify active hosts and the services they are running within a network using Nmap, enabling a comprehensive understanding of the network environment.

3. Vulnerability Scanning using OpenVAS

Objective: To perform a systematic assessment of networked systems using OpenVAS to identify potential vulnerabilities that could be exploited by attackers.

4. Internal Penetration Testing

a. Mapping
b. Scanning
c. Gaining Access through CVEs
d. Sniffing POP3/FTP/Telnet Passwords
e. ARP Poisoning

	f. DNS Poisoning **Objective: To perform a thorough internal penetration test that systematically assesses the security of the organization's network infrastructure by mapping network resources, scanning for vulnerabilities, exploiting known weaknesses and demonstrating attack techniques, including credential sniffing and poisoning attacks, in order to identify and mitigate potential security risks effectively.** **5. External Penetration Testing** **a. Evaluating External Infrastructure** **b. Creating Topological Map & Identifying IP Address of Target** **c. Lookup Domain Registry for IP Information** **d. Examining Use of IPv6 at Remote Location** **Objective: To conduct a comprehensive external penetration test aimed at evaluating the security of the organization's external infrastructure by assessing vulnerabilities, mapping the network topology, gathering IP and domain registry information, and examining the implementation of IPv6, ultimately identifying potential entry points and recommending measures to strengthen defenses against external threats.** **6. Different Types of Vulnerability Scanning** **Objective: To explore and compare various vulnerability scanning techniques and tools, assessing their effectiveness in identifying and prioritizing security risks.** **7. Vulnerability Scanning with Nessus** **Objective: To utilize Nessus for comprehensive vulnerability scanning, identifying security weaknesses in systems and providing recommendations for remediation.** **8. Web Application Assessment with Nikto & Burp Suite** **Objective: To evaluate web applications for security vulnerabilities using Nikto and Burp Suite, identifying issues such as misconfigurations and common vulnerabilities in web applications.**
	Targeted Application & Tools that can be used 2. Wireshark - Capturing and analyzing network traffic 2. Nmap - Discovering hosts, services, and vulnerabilities. 3. OpenVAS - Scanning for vulnerabilities on network and systems. 4. Metasploit - Exploiting vulnerabilities to gain access. 5. Whois Tool - For getting domain related info 6. Nessus – For Vulnerability Scanning 7. Nikto - Assessing web application security 8. Burp Suite - Assessing web application security
	Text Book T1 Gray Hat Hacking - The Ethical Hackers Handbook, Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gideon Lenkey, and Terron Williams, 5th Edition, Tata McGraw-Hill, 2018.
	References R1. The Web Application Hacker's Hand Book - Discovering and Exploiting Security flaws, Dafydd Suttard, Marcuspinto,2nd Edition, Wiley Publishing, 2011. R2. Penetration Testing: Hands-on Introduction to Hacking, Georgia Weidman, 1st Edition,

	Notarch Press, 2014. R3. The Pen Tester Blueprint - Starting a Career as an Ethical Hacker, L. Wylie, Kim Crawly,1st Edition, Wiley Publications, 2021. **Web resources:** NPTEL / Swayam Link : Introduction to Information Security I, IIT Madras https://nptel.ac.in/courses/106106129 PU Library Link : https://puniversity.informaticsglobal.com/login
	Topics relevant to "EMPLOYABILITY SKILLS": The lab experiments and assessments enable the student to acquire Skill Development through Experiential Learning techniques

Course Code: PPS4006	**Course Title: LOGICAL & CRITICAL THINKING Type of Course: HSMC**		**L- T-P- C**	0	0	2	1
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)					
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
	· Mid-Term & End Term
	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: **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: FIN1002	**Course Title: Essentials of Finance** **Type of Course: HSMC**	**L-T-P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	This course is designed to be accessible to all students, regardless of their prior financial knowledge.					
Anti-requisites						
Course Description	This course is designed to equip students with a **foundational understanding of key financial concepts and principles**. It will enable them to comprehend the **core functions of finance**, delve into the intricacies of **financial management within organizations**, and gain insights into the **fundamental aspects of taxation**. The course aims to develop students' abilities to **interpret financial statements, evaluate investment opportunities, understand capital structure decisions**, and navigate the **basics of tax implications**.					
Course Objective	Upon successful completion of this course, students will be able to: • **Understand the basic forms of business organization and their financial implications.** • **Understand the fundamental principles and concepts** that influence financial decision-making in various contexts. • **Analyse and interpret financial statements** to assess the financial health and performance of an organization. • **Identify income under various heads of income as per Income Tax Act, 1961 and determine the tax liability.**					
Course Outcomes	**List the course outcomes** **On successful completion of this course the students shall be able to:** 1. **Understand the basic concepts of finance and financial markets and organizations.** 2. **Apply and interpret financial information for business decision making.** 3. **Identify various heads of income and deduction under Income Tax Act, 1961.**					
Course Content:						
Module 1	**Introduction to Finance**	Assignment/ Quiz	Numerical solving Task	**0 Sessions**		
Definition and Scope of Finance, Areas of Finance: Corporate Finance, Investments, Financial Institutions, International Finance; Types of Financial Markets: Money Markets vs. Capital Markets, Primary vs. Secondary Markets; Forms of Business Organization and Financial Goals: Shareholder Wealth Maximization vs. Profit Maximization; Understanding Financial Statements: Balance Sheet and Income Statement- Simple Numerical.						
Module 2	**Financial Management**	Assignment/ Quiz	Numerical solving Task	**Sessions**		
Capital Budgeting Decisions: Payback Period, Net Present Value (NPV), Profitability Index (PI), Internal Rate of Return (IRR); Leverage- Basic Numerical; Capital						

Structure Decisions: Optimal Capital Structure, Trade-off Theory of Capital Structure; Cost of Capital: Equity, Debt, WACC; Dividend Policy: Factors influencing Dividend Policy.				
Module 3	**Taxation**	Assignment/ Quiz	Numerical solving Task	**7 Sessions**
Principles of a Good Tax System: Equity, Certainty, Convenience, Economy; Direct vs. Indirect Taxes; Residential Status of an Individual- Basic Problems; Heads of Income; Salary, House Property- Basic Numerical; Deductions under Chapter VI-A; Computation of Taxable Income and Tax Liability; E-Filing procedure.				
Targeted Application & Tools that can be used: Textbooks, PPT, Spreadsheet Software (e.g., Microsoft Excel), Official Website of Income Tax Department.				
Project Work/ Assignment:				
1. Presentation: There will be a group presentation, where the students will be given a topic. They will have to explain/demonstrate the working and discuss the applications for the same. 2. Case Study: - At the end of the course students will be given a 'real-world' cases like business models of successful companies or tax evasion by reputed companies on which they have to come up with detailed analysis and assessment.				
Text Book(s): 1. Dr. Vinod K. Singhania & Dr. Monica Singhania. (Latest Assessment Year Edition). *Students' Guide to Income Tax including GST*. Taxmann Publications. 2. Pandey, I. M. (2025). *Financial Management*. Vikas Publishing House.				
Reference Book (s): 1. Bhole, L.M., & Mahakud, J. (Current Edition). *Financial Institutions and Markets: Structure, Growth and Innovations*. McGraw Hill Education India. 2. Mehrotra, H.C., & Goyal, S.P. (Latest Assessment Year Edition). *Income Tax Law & Practice*. Sahitya Bhawan Publications. 3. Gordon, E., & Natarajan, K. (Current Edition). *Financial Markets and Services*. Himalaya Publishing House. Online Resources (e-books, notes, ppts, video lectures etc.): 1. https://presidencyuniversity.linways.com 2. https://onlinecourses.nptel.ac.in/noc24_ec01/preview 3. https://www.incometax.gov.in/iec/foportal/				
Topics relevant to "**SKILL DEVELOPMENT**": This course is designed to provide practical financial skills through participative learning techniques. Students will engage in performing suitable calculations to determine financial parameters (e.g., time value of money, investment returns, tax liabilities) and analysing financial statements to assess organizational performance and make informed decisions.				

Course Code: 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: **CSE2271**	Course Title: **Software Design and Development**	**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		**10 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	**12 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		**10 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	**13 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, 2012] B2. Bob hes, Mike Cotterell, Rajib Mall, “Software Project Management”, VI Edition, McGraw-Hill, 201

References

1. Rajib Mall, “Fundamentals of Software Engineering”, VI Edition, PHI learning private limited, 2015.
2. Ian Sommerville, “Software Engineering”, IX Edition, Pearson Education Asia, 2011.
3. 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: CCS2507	Course Title: Web Security	L- T-P- C	2	0	0	2
Version No.	1					
Course Pre-requisites	CSE2251					
Anti-requisites	NIL					
Course Description	The purpose of this course this course is to introduce you to the field of web security by understanding web functionality and various security validations. The web is our gateway to many critical services and is quickly evolving as a platform to connect all our devices. Web vulnerabilities are growing on a year-to-year basis and designing secure web applications is challenging. The course covers fundamental concepts of web security principles, web vulnerability and exploitation, various attacks on web applications, and a few basic topics on web encryption.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Web Security** andattain **Skill Development** through **Experiential Learning** techniques.					
Course Out Comes	**On successful completion of the course the students shall be able to:** • Define the fundamentals of web applications and validation [Knowledge] • Recognize the significance of password and authentication in webapplications [comprehension] • Explain the importance of session management in web [Comprehension] • Apply web attack techniques to find vulnerabilities in web applications [Application]					
Course Content:						
Module 1	**Introduction**	Quiz		Comprehension based Quiz onweb fundamentals		**10 Sessions**
Topics: Web Functionality, Encoding Schemes, Mapping the Application - Enumerating the Content and Functionality, Analyzing the Application Bypassing, Client-Side Controls: Transmitting Data Via the Client, Capturing User Data, Handling Client-Side Data Securely - Input Validation, Blacklist Validation - Whitelist Validation - The Defense in-Depth Approach - Attack Surface Reduction, Rules of Thumb, Classifying and Prioritizing Threats.						
Module 2	**Web Application Authentication**	Assignment		Comprehensive basedassignment on Web authentication		**11 Sessions**
Topics: Authentication Fundamentals- Two Factor and Three Factor Authentication, Web Application Authentication- Password Based, Built-in, HTTP, Single Sign-on, Custom Authentication, Validating credentials - Secured Password Based Authentication: Attacks against Password, Importance of Password Complexity - Design Flaws in Authentication Mechanisms - Implementation Flaws in Authentication Mechanisms - Securing Authentication.						
Module 3	**Session Management &Web Security Principles**	Quiz		Comprehension based Quiz onweb security techniques.		**11 Sessions**
Topics: Need for Session Management, Weaknesses in Session Token Generation, Weaknesses in Session Token Handling, Securing Session Management; Access Control: Access Control Overview, Common Vulnerabilities, Attacking Access Controls, Securing Access Control. Origin Policy, Exceptions, Browser security Principles- Cross Site Scripting and Cross Site Request Forgery, File Security Principles: Source Code Security, Forceful Browsing, Directory Traversals.						
Module 4	**Web Application Vulnerability**	Assignment		Comprehension basedassignment on web vulnerabilities		**10 Sessions**
Topics: Attacking data-stores and backend components- Injecting into Interpreted Contexts, injecting into SQL, NoSQL, XPath, LDAP, Injecting OS Commands, Manipulating File Paths, Injecting into XML Interpreters, Injecting into Back- end HTTP Requests, Injecting into Mail Services, Attacking application logic-real world logic flaws, Attacking users- Cross site scripting-varieties of XSS,XSS attacks in action, finding and exploiting XSS vulnerabilities, preventing XSS attacks, Other techniques-cookie based Attacks, HTTP Header Injection.						

List of Laboratory Tasks:

Task 01: Practical knowledge of known vulnerabilities in CGI, LAMP stacks, REST APIs cross-sitescripting
Task 02: HTTP and setting up stacks, the various types of databases Access Controls, Vulnerabilities
Task 03: SQL injection and prevention**Task 04:** Study of web authoring tools **Task 05:** Testing web applications
Task 06: Cross site request forgery attack lab
Task 07: Web tracking

Targeted Application & Tools that can be used

1. Wordpress tool can be used for building websites with possible vulnerabilities.
2. Tools such as Nmap and Nessus can be used for web attack demonstration.

Project work/Assignment:

Assignment:
Group assignment to identify and write different web exploits to demonstrate vulnerabilities in web applications.

Text Book

T1 Dafydd Stuttard, Marcus Pinto, "The Web Application Hacker's Handbook", Willey Publishing Inc.

References

R1 B. Sullivan, V. Liu, and M. Howard, "Web Application Security", A B Guide. New York: McGraw-HillEducation, 2011.
R2 Web Application Security: Exploitation and Countermeasure for Modern Web Applications, by AndrewHoffman
E book link R1: https://presiuniv.knimbus.com/user#/home
E book link R2 : https://presiuniv.knimbus.com/user#/home

Web resources:

NPTEL / Swayam Link : Introduction to Information Security I, IITMadras
https://nptel.ac.in/courses/106106129
PU Library Link : https://puniversity.informaticsglobal.com/login

Topics relevant to "EMPLOYABILITY SKILLS":
Session Management &Web Security Principles and Web Application vulnerability for **Skill Development** through**Experiential Learning Techniques.** This is attained through the assessment component mentioned in the course handout.

Course Code:CCS2508	Course Title: Web Security Lab Type of Course: Lab Course	L- T-P- C	0	0	2	1
Version No.	1.0					
Course Pre-requisites	CSE2251					
Anti-requisites	NIL					
Course Description	The purpose of this course is to introduce you to the field of web security by understanding web functionality and various security validations. The web is our gateway to many critical services and is quickly evolving as a platform to connect all our devices. Web vulnerabilities are growing on a year-to-year basis and designing secure web applications is challenging. The course covers fundamental concepts of web security principles, web vulnerability and exploitation, various attacks on web applications, and a few basic topics on web encryption.					

Course Objective		The objective of the course is to familiarize the learners with the concepts of Web Security and attain Skill Development through Experiential Learning techniques.
Course Outcomes		On successful completion of this course the students shall be able to: 1. **Define** the **fundamentals** of Web applications and validation. (Remember) 2. **Recognize** the significance of password and authentication in web applications. (Understand) 3. **Explain** the importance of session management in web. (Understand) 4. **Apply** web attack techniques to find vulnerabilities in web applications. (Apply)
Course Content:		

List of Laboratory Tasks:

1. Practical knowledge of known vulnerabilities in CGI, LAMP stacks, REST APIs cross-site scripting

Practical knowledge of known vulnerabilities in CGI, LAMP stacks, REST APIs cross-site scripting: Use the **Nessus tool** to scan the network for vulnerabilities.

i. Basic Network scanning
ii. Advanced scanning in general search
iii. Ntstat port scanning:
iv. Vulnerability Mapping
v. Policies:
vi. Plugins:
vii. General Scanning
viii. Port Scanning

Level 1: Identification of vulnerabilities
Level 2: Apply the concept

2. HTTP and setting up stacks, the various types of databases Access Controls, Vulnerabilities

HTTP and setting up stacks

i. Create a simple web application that can store information sent to it. For example, you could create a web application that will store to a text file anything provided in a URL parameter
ii. Write or modify an existing application that legitimately needs access to a sensitive resource ,but uses it at a time when it does not actually need it

Various types of databases Access Controls

Role-Based Access Control (RBAC)
iii. Mandatory Access Control (MAC)

Vulnerability: Study and work with KF Sensor

STEP1: Download **KF** Sensor tool Evaluation Setup File from KF Sensor Website.
STEP-2: Install with License Agreement and appropriate directory path.
STEP-3: Reboot the Computer now. The KF Sensor automatically starts during Windows boot.

STEP-4: Click Next to setup wizard.
STEP-5: Select all port classes to include and Click Next.
STEP-6: "Send the email and Send from email", enter the ID and Click Next.
STEP-7: Select the options such as Denial of Service[DOS], Port Activity,
Proxy Emulsion, Network Port Analyzer, Click Next.
STEP-8: Select Install as System service and Click Next.

Level 1: Identification of vulnerabilities
Level 2: Apply the concept

3. Study of web authoring tools (any 2-3 tools)

i. Study and work with Net Stumbler tool
ii. Study and work with Snort
iii. Study and work with Nmap

Level 1: Install the tools required
Level 2: Apply the concept

4. Testing web applications

Study and work with Word press tool

i. Create an Online Community website and test the website
ii. Showcase Your Work Online and test its worth
iii. Create a Local Business Website and test the website.

Level 1: Define the test cases
Level 2: Apply the concept to test the web application

5. SQL injection and prevention

From the given data set ,

i. Put limits on all result sets
ii. Cleanse and Validate Freeform User Input
iii. Remove Freeform User Input When Possible
iv. Validate Data Prior to Processing
v. Ensure Errors are Not User-Facing
vi. Use Stored Procedures to Abstract Business Logic and Control parameters
vii. Use LIKE Operators Carefully
viii. Limit Use of xp_cmdshell and Other Extended Stored Procedures
ix. Perform Penetration Tests
x. Code Review
xi. Minimizing the Impact of SQL Injection
xii. Principle of Least Privilege & Login Security
xiii. Secure Linked Servers and Data Sources

Level 1: Recognize and acquire the data
Level 2: Apply the concept

6. Cross site request forgery attack lab

With the usage of Virtual Machines

i. Configure the Virtual Machines:
ii. Observing HTTP Request in Victim VM
iii. CSRF Attack using GET Request
iv. CSRF Attack using POST Request
v. Implementing a countermeasure

	Level 1: Identify and acquire the data **Level 2:** Apply the concept 7. Web tracking Tracking the Web based scenario by • Environment Configuration • clear history and cookies • open a new private window in Firefox Task 1: Understand the basic working of the web tracking Task 2: Importance of cookie in Web tracking Task 3: Tracked user interests and data Task 4: How ads are displayed in a website Task 5: Tracking in a Private browser window Task 6: Real world tracking Task 7: Countermeasures **Level 1: Identify and acquire the data logs** **Level 2: Apply the concept**
	Targeted Application & Tools that can be used: **(1)** Word press tool can be used for building websites with possible vulnerabilities. **(2)** Tools such as Nmap and Nessus can be used for web attack demonstration. **(3)** KF Sensor advanced 'honeypot' intrusion and insider threat detection system for Windows networks **(4)** Snort can be used for network intrusion detection system and intrusion prevention system **(5)** Net Stumbler tool for Windows that facilitates detection of Wireless LANs using the 802.11b, 802.11a and 802.11g WLAN standards.
	Textbook(s): T1. Dafydd Stuttard, Marcus Pinto, “The Web Application Hacker’s Handbook”, Willey Publishing Inc. ,2008

Course Code: CCS2506	**Course Title: Intrusion Detection and Prevention System**	**L- T-P- C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	Fundamental knowledge in Operating Systems					
Anti-requisites	**NIL**					
Course Description	Objective of the course is to Understand when, where, how, and why to apply Intrusion Detection tools and techniques in order to improve the security posture of an enterprise. Apply knowledge of the fundamentals and history of Intrusion Detection in order to avoid common pitfalls in the creationand evaluation of new Intrusion Detection Systems and Analyze intrusion detection alerts and logs to distinguish attack types from false alarms.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of **Intrusion Detectionand Prevention System** and attain **Skill Development** through **Participative Learning** techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: • Understand about the intruders. • Define intrusion detection and prevention policies • Explain the fundamental concepts of Network Protocol Analysis and demonstrate the skill tocapture and analyze network packets. • Use various protocol analyzers and Network Intrusion Detection Systems as security tools todetect network attacks and troubleshoot network problems.					
Course Content:						

Module 1	**Introductionto IntrusionDetection and Prevention System**	Assignment	Programming Task		**10 Sessions**

Topics

Understanding Intrusion Detection – Intrusion detection and prevention basics – IDS and IPS analysis schemes, Attacks, Detection approaches –Misuse detection – anomaly detection – specification based detection – hybrid detection. Internal and external threats to data, Need and types of IDS, Information sources,Host based information sources, Network based information sources.

Assignment: Demonstrating the skills to capture and analyze network packets using network packet analyzer.

Module 2	**Intrusion Prevention System**	Assignment	Programming Task		**10 Sessions**

Topics:

Intrusion Prevention Systems, Network IDs protocol based IDs, Hybrid IDs, Analysis schemes, thinking about intrusion. A model for intrusion analysis, techniques, Responses, requirement of responses, Types of responses, mapping responses to policy Vulnerability analysis, credential analysis, non-credential analysis. Architecture models of IDs and IPs.

Assignment: Applying Intrusion detection in security applications.

Module 3	**Applications andtools**	Assignment	Programming/Data analysis task	**12 Sessions**

Topics:
Tool Selection and Acquisition Process – Bro Intrusion Detection – Prelude Intrusion Detection – Cisco Security IDS
– Snorts Intrusion Detection – NFR security. Introduction to Snort, Snort Installation Scenarios, Installing Snort, Running Snort on Multiple Network Interfaces, Snort Command Line Options. Step-By-Step Procedure to Compileand Install Snort Location of Snort Files, Snort Modes Snort Alert Modes

Assignment: Demonstrate the working with Snort Rules, Rule Headers, Rule Options and The Snort ConfigurationFile.

Module 4	Legal issues and organizations standards	Assignment	Programming/Data analysis task	**9 Sessions**

Law Enforcement / Criminal Prosecutions – Standard of Due Care – Evidentiary Issues, Organizations andStandardizations.

Assignment: Addressing common legal concerns and myths about Intrusion Detection system

Textbooks
T1. Carl Endorf, Eugene Schultz and Jim Mellander " Intrusion Detection & Prevention", 1st Edition, Tata McGraw-Hill, 2004.
T2. Earl Carter, Jonathan Hogue, "Intrusion Prevention Fundamentals", Pearson Education, 2006.

References

R1. Rafeeq Rehman : " Intrusion Detection with SNORT, Apache, MySQL, PHP and ACID," 1st Edition, Prentice Hall , 2003.
R2. Christopher Kruegel, Fredrik Valeur, Giovanni Vigna: "Intrusion Detection and Correlation Challenges and Solutions", 1st Edition, Springer, 2005.
R3. Paul E. Proctor, "The Practical Intrusion Detection Handbook ",Prentice Hall , 2001.

Weblinks:
https://www.youtube.com/watch?v=RYB4cG8G2xo
https://www.coursera.org/lecture/detecting-cyber-attacks/intrusion-detection-systems-UeDqJ

Topics relevant to "SKILL DEVELOPMENT": Agent development for intrusion detection for Skill Development through **Participative Learning techniques**. This is attained through assessment component mentioned in coursehandout.

Course Code: **CSE2274**	**Course Title:** Competitive Programming and Problem Solving	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: APT4005	**Course Title:** Aptitude For Employability **Type of Course:** Practical Only		**L- T-P- C**	0	0	2	1

Version No.		1.0
Course Pre-requisites		Students should have the basic concepts of Quantitative aptitude, Verbal ability along with its applications in real life problems.
Anti-requisites		Nil
Course Description		This course is designed to enable the students to enhance their skills in quantitative aptitude and verbal ability skills.
Course Objective		The objective of the course is to familiarize the learners with concepts in Quantitative Aptitude and Verbal ability through problem solving techniques suitable for their career development.
Course Outcomes		On successful completion of the course the students shall be able to: CO1] **Recall** all the basic mathematical concepts CO2] **Identify** the principle concept needed in a question CO3] **Solve** the quantitative and logical ability questions with the appropriate concept.
Course Content:		

Module 1	Quantitative Ability	Lab-10hrs		Platform Assessment-10hrs	**20 Hours**
	Topics: Number System, Percentage, Ratio and Proportion, Average, Mixture and Allegation, Time and Work, Profit and Loss, Time Speed and Distance, Simple Interest and Compound Interest, Probability, Permutation and Combination.				
Module 2	Verbal Ability	Lab-5hrs		Platform Assessment-5hrs	**10 Hours**
	Topics: - Parts of Speech, Subject Verb Agreement, Spotting Error, Cloze Test, Verbal Analogies, Reading Comprehension, Idioms & Phrases, Para Jumbles				
	Targeted Application & Tools that can be used: Application area: Placement activities and Competitive examinations. Tools: LMS				
Evaluation	**Continuous Evaluation** • Topic wise evaluation				

Text Book 1. Fast track objective by Rajesh Verma 2. R S Aggarwal 3. S.P Bakshi
References 1. www.indiabix.com 2. www.testbook.com 3. www.youtube.com/c/TheAptitudeGuy/videos
Topics relevant to Skill development: Quantitative and reasoning aptitude for Skill Development through Problem solving Techniques. This is attained through assessment component mentioned in course handout.

Course Code: PPS 3018	**Course Title: Preparedness for Interview** Type of Course: Practical Only Course	L- T- P- C	0	0	2	1

Version No.		1.0
Course Pre-requisites		Students are expected to understand Basic English. Students should have desire and enthusiasm to involve, participate and learn.
Anti-requisites		NIL
Course Description		This course is designed to enable students to understand soft skills concepts to be corporate ready. The modules are set to improve self-confidence, communicate effectively and Prepare for the Interview to assist in employability. It helps the students to get a glimpse of the acceptable corporate readiness and equip them with the fundamental necessities of being able to confidently deal with the highly competitive corporate environment and helps in crafting different types of resumes. The pedagogy used will be group discussions, flipped classrooms, continuous feedback, role-play and mentoring.
Course Objective		The objective of the course is to familiarize the learners with the concepts of "**Preparing for Interview**" and attain SKILL DEVELOPMENT through PARTICIPATIVE LEARNING techniques.
Course Out Comes		**On successful completion of this course the students shall be able to:** CO1: **Develop** professional Resumes CO2: **Illustrate** Resumes effectively CO3: **Apply** skills and knowledge learnt for active and effective Group Discussions and Interview
Course Content:		

Module 1	**Resume Building**	**Classroom activity**		10 Hours
	Topics: Resume structure, use of templates, Do's and Don'ts, ATS methods, Cover Letter and Video Resume **Activity:** Real world scenarios			

Module 2	**Group Discussion**	**Mock G D**		9 Hours
	Topics: -Group discussion as a placement process, GD techniques like Keyword. SPELT & POV of affected parties. Do & Don't of GD, Case-lets and topics for GD, practice session and evaluation **Activity:-** Real world scenarios			
Module 3	**Personal Interview**	**Grooming checks + Evaluation + Mock Interview+ Role Play**		9 Hours
	Topics: Placement process, Different interview rounds, HR interviews, Interview questions and desired answers, Different types of interviews, Do's and Don'ts. **Activity: -** Role Play & Real-world scenario			
Module 4	**Recap/Revision /Feedback Session**	**Practice sessions**		2 Hours
	Targeted Application & Tools that can be used: 1. TED Talks 2. You Tube Links 3. Role Play activities			
	Project work/Assignment: 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** Techniques. This is attained through assessment Component mentioned in course handout.			

Course Code: CSE7100	**Course Title:** Mini Project	**L- T-P- C**	0	0	0	4
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: CSE7300	**Course Title:** Capstone Project	**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: CCS3400	**Course Title:** Digital and Mobile Forensics	**L-T- P- C**	2-0-2-3
Version No.	2.0		

Course Pre-requisites	CSE2251			
Anti-requisites	Nil			
Course Description	This course demonstrates the use of Mobile phones and digital devices across the globe has increased dramatically. These devices are more susceptible to information security attacks and thus they also possess huge evidences which shall be used during crime scene investigation. This makes the Course on mobile and digital forensics an inevitable one for the security professionals. This Course on mobile and digital forensics will provide a better understanding on different forms of evidences in many digital devices, collection and interpretation of the same. Topics include: Wireless technologies and security-wireless protocols, wireless threats, cell phones and GPS, SMS and data interception in GSM. Mobile phone forensics - files present in SIM card, device data, external memory dump, Android forensics. Digital forensics: - evaluating digital evidence, Digital forensics examination principles			
Course Objective	The objective of the course is to familiarize the learners with the concepts of Database Management Systems and attain EMPLOYABILITY SKILLS through PARTICIPATIVE Learning techniques			
Course Outcomes	On successful completion of this course the students shall be able to: CO 1: Outline the basic concepts of Cybercrime and digital Forensics. (L1) CO 2: Employ various digital Forensic tools to perform Forensic investigation(L3) CO 3: Interpret security challenges and Forensic examination process of wireless devices. (L2) CO 4: Produce digital evidence through the usage of mobile device Forensic tools (L3)			
Course Content:				
Module 1	Cybercrime and Digital Forensic Principles	Assignment	Seminar	10 Sessions
Cybercrime: Definition, Nature and Scope of Cyber crime, Types of cyber crime, Categories of cyber crime, Investigating Cybercrime, Digital Evidence, Prevention of cyber crime, Overview of Digital Forensics, Phases of Digital Forensics, Digital devices in society, Evidential Potential of Digital Devices: closed and open systems, Digital investigation process models: Staircase Model, Evidence Flow Model, Increasing awareness of digital evidence, Case studies on Cyber Crimes.				
Module 2	Digital Forensics examination process	Case Studies	Case Study	11 Sessions
Language of Computer crime investigation, preparing a Digital Forensics Investigation, Chanllenging aspects of digital evidence, Presenting digital evidence, Device usage, Profiling and cyberprofiling, Contamination, Digital forensics examination principles: Previewing, Imaging, Continuity and hashing, Evidence locations, A seven-element security model, A developmental model of digital systems. .				
Module 3	Wireless technologies and Wireless threats	Quiz	GSM, Parben's Cell Seizure	12 Sessions
Overview of Modern Wireless Technology, Wireless Crime Prevention Techniques, War-Driving, War-Chalking, War Flying, Voice SMS, GSM and Identification Data Interception in GSM, Cell Phone Hacking and Phreaking, Who's Tracking You and Your Cell Phone? How Does Cellular Fraud Occur? Cell Phone Forensics, Forensic Rules for Cellular Phones, Cell Phone Flowchart Processes Using Paraben's Cell Seizure.				

Module 4	Mobile phone Forensics	Quiz	orensic Tools	10 Sessions
Importance and Motivation behind Mobile Forensics, Mobile Phone Forensics: Crime and Mobile Phones, the Evidence, Forensic Procedures of mobile phones, The SIM Card, Files Present in SIM Card, Device Data, SMS Spam, What Data Is Available from Mobile Phones?, Handling Instructions for Mobile Phones, Mobile Phone Forensics Tools and Methods, Social Media Forensics on Mobile Devices.				
Targeted Application & Tools that can be used: Wireless Security Digital Forensics Android Forensics				
Textbooks: T1 Gregory Kipper, "Wireless Crime and Forensic Investigation", Auerbach Publications, 1st Edition, September 19, 2019.				
References: R1 Losif I. Androulidakis, "Mobile phone security and forensics: A practical approach", Springer publications, 2nd Edition, 2016. R2 Andrew Hoog, "Android Forensics: Investigation, Analysis and Mobile Security for Google Android", Elsevier publications, 1st Edition, 15th June 2011. R3 Angus M. Marshall, "Digital forensics: Digital evidence in criminal investigation", John – Wiley and Sons, November 2008, p 180. **Web references:** **https://presiuniv.knimbus.com/user#/home**				
Topics relevant to "Employability": Prevention of cybercrime, preparing a Digital Forensics Investigation, Mobile Phone Forensics: Crime and Mobile Phones. Mobile Phone Forensics Tools for developing **Employability Skills** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout.				

Course Code: CCS3401	Course Title: Post-Quantum Cryptography	L- T - P- C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CSE2502					
Anti-requisites	NIL					
Course Description	This course explores the principles, algorithms, and challenges of **Post-Quantum Cryptography (PQC)—a** field dedicated to developing cryptographic systems that can resist attacks from quantum computers. As quantum computing advances, traditional encryption methods such as RSA and ECC become vulnerable, necessitating the adoption of quantum-resistant cryptographic techniques.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of post-quantum cryptographic algorithms to attain **Skill Development** through **Participative Learning** techniques.					

Course Outcomes	On successful completion of this course the students shall be able to: CO1: **Identify** the vulnerabilities of traditional cryptographic algorithms against quantum attacks. [Remember] CO2: **Explain** the principles and security assumptions behind post-quantum cryptographic algorithms. [Understand] CO3: **Implement** post-quantum cryptographic schemes using tools like Open Quantum Safe (OQS). [Apply]		
Course Content:			
Module 1	Introduction to post-quantum cryptography		13 hours
Topics: Is cryptography dead? - A taste of post-quantum cryptography - Challenges in post-quantum cryptography - Comparison to quantum cryptography - Quantum computing - Classical cryptography and quantum computing - The computational model - The quantum Fourier transform - The hidden subgroup problem - Search algorithms			
Module 2	Hash-based Digital Signature Schemes		15 hours
Topics: Hash-based Digital Signature Schemes - Merkle's tree authentication scheme - One-time key-pair generation using an PRNG - Authentication path computation - Tree chaining -Distributed signature generation - Security of the Merkle Signature Scheme - Code-based cryptography -			
Module 3	Lattice-based Cryptography		15 hours
Topics: Lattice-based Cryptography - Multivariate Public Key Cryptography – Introduction - The Basics of Multivariate PKCs- Examples of Multivariate PKCs - Basic Constructions and Variations - Standard Attacks – The Future. AlienVault OSSIM Implementation - AlienVault OSSIM Operation - Cisco Security: MARS Implementation - Cisco MARS Advanced Techniques			
Assignment:			
1. 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 . 2. Presentation: Group presentation, where the students will be given a topic. They will have to explain/demonstrate the working and discuss the applications for the same.			
Text Book(s): 1. Daniel J. Bernstein, Johannes Buchmann, "Post-Quantum Cryptography"Springer.			

Course Code: CCS3402	**Course Title: Identity and Access Management**	L- T - P- C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CSE2251					

Anti requisites	NIL
Course Description	This course introduces the principles and practices of Identity and Access Management (IAM), including authentication, authorization, access control models, and identity lifecycle management. Students will learn to implement IAM solutions using technologies like SSO, MFA, and directory services, gaining hands-on experience in securing user access and managing identities in compliance with organizational policies.
Course Objective	The objective of this course is to familiarize the learners with the concepts of security in IAM to attain **Skill Development** through **Participative Learning** techniques.
Course Outcomes	On successful completion of this course the students shall be able to: CO1: **Recall** key concepts of identity, authentication, authorization, and access control models. [Remember] CO2: **Explain** the components and workflow of IAM systems, including identity lifecycle management and federation protocols. [Understand] CO3: **Apply** IAM technologies such as Single Sign-On (SSO), Multi-Factor Authentication (MFA), and directory services to secure user access. [Apply]
Course Content:	

Module 1	Introduction to IAM and Access Control Models	15 hours
Topics: Fundamentals of Identity and Access Management - Key IAM Concepts: Authentication, Authorization, Accounting (AAA) - Identity lifecycle and governance - Access control models: DAC, MAC, RBAC, ABAC - Principles of least privilege and zero trust architecture		
Module 2	**IAM Technologies and Infrastructure**	13 hours
Topics: - Directory Services: LDAP, Active Directory - Authentication protocols: Kerberos, RADIUS, TACACS+ - Identity Federation: SAML, OAuth, OpenID Connect - Single Sign-On (SSO) and Multi-Factor Authentication (MFA) - Cloud IAM services (e.g., AWS IAM, Azure AD)		
Module 3	Implementation, Governance and Compliance	15 hours
Topic: IAM solution design and deployment strategies - Identity provisioning and de-provisioning - Role and policy management - IAM governance and risk compliance (GRC) - Auditing, access reviews, and reporting - Case studies and industry best practices		

Reference(s):	NIL
Reference Book(s):	
	1. **Daniel J. Bernstein, Johannes Buchmann, Erik Dahmen**, *Post-Quantum Cryptography*, Springer, 2009 2. **Nicolas Sendrier**, *An Introduction to Post-Quantum Cryptography*, NIST Reports, 2019 3. **Carlos Aguilar Melchor, Jean-Christophe Deneuville**, *Mathematical Foundations of Post-Quantum Cryptography*, Springer, 2021
Online Resources (e-books, notes, ppts, video lectures etc.):	
Weblinks:	1. https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=123875&site=ehost-live&ebv=EB&ppid= 2. https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2706929&site=ehost-live

Topics related to development of "FOUNDATION": Introduction to Post-Quantum Cryptography (PQC), Quantum Classical Cryptography

Topics related to development of "EMPLOYABILITY": Cryptanalysis and Security Evaluation, Industry Standards and Compliance

Assignment:

1. 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 .

Presentation: Group presentation, where the students will be given a topic. They will have to explain/demonstrate the working and discuss the applications for the same.

Text Book(s):

1. **Ertem Osmanoglu**, *Identity and Access Management: Business Performance Through Connected Intelligence*, Syngress, 2013.

Reference(s):

Reference Book(s):

1. **David B. Stirling**, *Effective Cybersecurity: A Guide to Using Best Practices and Standards*, Apress, 2020.

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

Weblinks:

1. https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=1223875&site=ehost-live&ebv=EB&ppid=pp_xiii
2. https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2706929&site=ehost-live

Topics related to development of "FOUNDATION": Introduction to IAM

Topics related to development of "EMPLOYABILITY": SSO & MFA

Course Code: CCS3403	Course Title: AI and ML for Cyber Security Type of Course: Theory	L- T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CSE2264					
Anti-requisites	**NIL**					
Course Description	This course provides an in-depth exploration of how Artificial Intelligence (AI) and Machine Learning (ML) techniques are applied to modern cybersecurity challenges. Students will learn about various cyber threats, attack classifications, and vulnerabilities while developing hands-on experience with ML-based threat detection and anomaly detection. The course covers supervised and unsupervised learning techniques for malware classification, time-series analysis for behavior monitoring, deep learning models for intrusion detection, and adversarial AI threats. Through case studies, research paper discussions, and practical implementations, learners will develop a solid foundation in AI-powered cybersecurity solutions.					
Course Objective	Machine Learning (ML) is increasingly used in sensitive and time-critical systems such as autonomous driving, cyber physical systems etc. to deliver higher performance and protect the confidentiality of the systems. Though ML based systems can be used to classify various malware attacks and develop intrusion detection systems,					

	these systems are also susceptible to several adversarial attacks. This course covers a systematic approach on developing ML based cybersecurity methodologies. It will also cover adversarial attacks which intentionally forces ML systems to behave unexpectedly.			
Course Out Comes	**On successful completion of the course the students shall be able to:** CO1:Students will be able to develop ML models to classify malwares. CO2:Able to implement simple intrusion detection systems using deep neural networks. CO3:They will be able to demonstrate the vulnerabilities in ML systems and state methods to address adversarial attacks.			
Course Content:				
Module 1		Assignment	Theory	**12 Sessions**
Topics: Overview on Machine Learning with use cases from cybersecurity, classification of threats, attacks, vulnerabilities, malware, trojans etc.				
Module 2		Assignment	Programming activity	**16 Sessions**
Topics: Classification of malware using supervised/unsupervised learning based on signatures and profiling. Decision Tree and context based malicious event detection				
Module 3		Assignment	Programming activity	**16 Sessions**
Topics: Time Series Analysis and Ensemble modelling to detect deviation from normal behaviour, case studies in Reconnaissance detection .				
Module 4		Assignment	Programming activity	**16 Sessions**
Topics: Efficient Network Anomaly detection; familiarize with various stages of network attack and address using deep neural networks, develop intrusion detection systems				
Module 5				
Topics: Adversarial attacks on ML systems, model poisoning, black box attacks, white box attacks, state-of-art research paper reading on deep learning systems				
Targeted Application & Tools that can be used Use of PowerPoint software for lecture slides and **Jupyter Notebook** – Interactive environment for coding and analysis. **Scikit-Learn** – Machine learning library for classification and anomaly detection. **Wireshark** – Network traffic analysis and packet inspection.				
Project work/Assignment:				
Assignment: AI-Based Intrusion Detection System (IDS). Phishing URL & Email Detection Using NLP. AI-Powered Fake News & Social Engineering Detection.				
Text Book				

T1. A. Hands-on Machine Learning for Cyber Security by Soma Halder, ISBN139781788992282

References :

1. Machine Learning and Security by David Freeman, Clarence Chio Publisher: O'Reilly Media, Inc. Release Date: February 2018 ISBN: 9781491979891
2. Malware Data Science by Joshua Saxe with Hillary Sanders, ISBN-10: 1-59327-859-4 ISBN-13: 978-1-59327-859-5 Publisher: William Pollock

Course Code: CCS3404	**Course Title: Incident Response with Threat Intelligence**	L- T - P- C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CSE2502					
Anti-requisites	NIL					
Course Description	This course covers the fundamentals of incident response and threat intelligence, focusing on identifying, analyzing, and mitigating cybersecurity threats. Students will learn the incident response lifecycle, threat actor profiling, and the use of tools like TheHive, Security Onion, and Velociraptor. The course also explores frameworks such as MITRE ATT&CK and emphasizes hands-on skills in evidence collection, threat hunting, and intelligence-driven response. By the end, learners will be equipped to manage incidents and enhance organizational security using actionable threat intelligence.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of security in IR&TI to attain **Skill Development** through **Participative Learning** techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: CO1: **Describe** key concepts of incident response, threat intelligence, and common cyber-attack techniques. [Understand] CO2: **Explain** the incident response lifecycle and threat intelligence concepts, including attacker tactics, techniques, and procedures (TTPs) [Understand] CO3: **Perform** appropriate tools and techniques to investigate, respond to, and document cybersecurity incidents. [Apply]					
Course Content:						
Module 1	Foundations of Incident Response and Threat Landscape	15 hours				
Topics: Threat Landscape and Cybersecurity Incidents - Concepts of Digital Forensics and Incident Response - Basics of the Incident Response and Triage Procedures - Applying First Response Procedures - Identifying and Profiling Threat Actors - Understanding the Cyber Kill Chain and the MITRE ATT&CK Framework						

Module 2	Strategic Planning and Program Development	13 hours
Topics: - Creating Incident Response Plans and Playbooks - Developing an Incident Response Program - Implementing and Using TheHive and Cortex for Incident Management		
Module 3	Tools, Techniques, and Threat Hunting	15 hours
Topic: Collecting Evidence with Velociraptor and KAPE - Integrating ELK Stack into Incident Response - Utilizing Security Onion for Network Monitoring and Detection - Threat Hunting with Sigma and YARA Rules - Automating Detection and Response with MITRE ATT&CK and TRAM		

Assignment:

1. 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 .

Presentation: Group presentation, where the students will be given a topic. They will have to explain/demonstrate the working and discuss the applications for the same.

Text Book(s):

1. Roberto Martínez, *Incident Response with Threat Intelligence: A practical guide to catching attackers and defending your organization,* Packt Publishing, 2022.

Reference(s):

Reference Book(s):

1. **Jason Luttgens, Matthew Pepe, and Kevin Mandia**, *Incident Response & Computer Forensics*, McGraw Hill, 2014.
2. **Chris Sanders and Jason Smith**, *Practical Packet Analysis: Using Wireshark to Solve Real-World Network Problems*, No Starch Press, 2017.

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

Weblinks:

1. https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=1223875&site=ehost-live&ebv=EB&ppid=pp_xiii
2. https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2706929&site=ehost-live

Topics related to development of "FOUNDATION": Introduction to incident response and thread intelligence

Topics related to development of "EMPLOYABILITY": `Tools, Techniques and Thread Hunting`

Course Code: CCS3405	Course Title: Vulnerability Assessment and Penetration Testing Type of Course: Theory Only Course	L- T-P-C	3 -0	0	3

Version No.	1.0			
Course Pre-requisites	CSE2502			
Anti-requisites	NIL			
Course Description	This course explores the tools that can be used to perform information gathering. This course also covers how vulnerability can be carried out by means of tools or manual investigation, and analysis of common attacks in data, mobile applications and wireless networks			
Course Objective	The objective of the course is to familiarize the learners with the concepts of Vulnerability Assessment and Penetration Testing and attain Employability through Problem Solving Methodologies.			
Course Out Comes	On successful completion of the course the students shall be able to: Understand the basic principles for information gathering and detecting vulnerabilities in the system. Determine the security threats and vulnerabilities in SDN networks and web applications. Able to use the exploits in mobile applications and wireless networks Understand the metasploit and metrepreter are used to automate the attacks and penetration testing techniques.			
Course Content:				
Module 1	Information Gathering, Host Discovery and Evading Techniques	Assignment	Theory	9 Sessions
Topics: Introduction - Terminologies - Categories of Penetration Testing - Phases of Penetration Test - Penetration Testing Reports - Information Gathering Techniques - Active, Passive and Sources of Information Gathering – Approaches, Host discovery - Scanning for open ports and services- Types of Port, Vulnerability Scanner Function, pros and cons - Vulnerability Assessment with NMAP - Testing, SCADA environment with NMAP				
Module 2	Vulnerability Scanner in SDN Networks and Web application	Quiz	Theory	10 Sessions
Topics: Nessus Vulnerability Scanner - Safe check – Silent dependencies - Port Range Vulnerability Data Resources, SDN Data plane, Control Plane, Application Plane. SDN security attack vectors and SDN Harderning, Authentication Bypass with Insecure Cookie Handling - XSS Vulnerability - File inclusion vulnerability - Remote file Inclusion -Patching file Inclusions - Testing a website for SSI Injection.				
Module 3	Mobile Application Security and wireless network Vulnerability analysis	Quiz	Theory	11 Sessions
Topics: Types of Mobile Application Key challenges in Mobile Application and Mobile application penetration testing methodology, Android and ios Vulnerabilities - OWASP mobile security risk - Exploiting WM - BlackBerry Vulnerabilities - Vulnerability Landscape for Symbian - Exploit Prevention -Handheld Exploitation, WLAN and its inherent insecurities Bypassing WLAN				

Authentication uncovering hidden SSIDs MAC Filters Bypassing open and shard authentication - Advanced WLAN Attacks Wireless eavesdropping using MITM session hijacking over wireless – WLAN Penetration Test Methodology.				
Module 4	Exploits	Quiz	Theory	8 Sessions
Topics: Architecture and Environment- Leveraging Metasploit on Penetration Tests, Understanding - Metasploit Channels, Metasploit Framework and Advanced Environment configurations – Understanding the Soft Architecture, Configuration and Locking, Advanced payloads and add on modules Global datastore, module datastore, saved environment Meterpreter.				
Targeted Application & Tools that can be used: This course helps the students to understand the threats and vulnerabilities using NMAP.				
Project work/Assignment:				
Project Assignment:				
Text Book Rafay Baloch, Ethical Hacking and Penetration Testing Guide, CRC Press, 2015. ISBN : 78-1-4822-3161-8. Dr. Patrick Engebretson, The Basics of Hacking and Penetration Testing Ethical Hacking and Penetration Testing made easy , Syngress publications, Elsevier, 2013. ISBN :978-0-12-411644-3. Mayor, K.K.Mookey, Jacopo Cervini, Fairuzan Roslan, Kevin Beaver, Metasploit Toolkit for Penetration Testing, Exploit Development and Vulnerability Research, Syngress publications, Elsevier, 2007. ISBN : 978-1-59749-074-0				
References Mastering Modern Web Penetration Testing By Prakhar Prasad,October 2016 PacktPublishing. SQL Injection Attacks and Defense 1st Edition, by Justin Clarke-Salt, Syngress Publication Web resources: https://onlinecourses.nptel.ac.in/noc19_cs68/preview - IIT Kharagpur, Prof. Indranil Sen Gupta				
Topics relevant to development of “EMPLOYABILITY SKILLS”: Exploitation, Penetration testing techniques, for development of Employability skills through the Participative Learning Techniques. This is attained through the assessment components mentioned in course handout.				

Course Code: CCS3406	Course Title: Cyber Digital Twin	L- T-P- C	3-0	0	3
Version No.	1.0				
Course Pre-requisites	CSE2502				
Anti-requisites	NIL				
Course Description	This course is designed to improve the learners ‘Skill Development’ by using modeling, optimizing, and risk management approach. The course objective is to get familiar with the Cyber digital twin-working principal, Development considerations, Data-Modelling Environment, Digital Twin Optimization, Risk Management and Applications.				
Course Objective	The objective of the course is to familiarize the learners with the concepts of Cyber Digital Twin and attain Employability through Participative Learning techniques.				

Course Out Comes	On successful completion of the course the students shall be able to: 1. Understand the basic concepts of Cyber Digital twin, and its working principle. [KNOWLEDGE] 2. Explain Data modeling and development consideration in digital twin model for cloud and IoT technology.[COMPREHENSION] 3. Observe digital twin-human behavior modeling in digital twin-optimization [COMPREHENSION] 4. Show Risk Assessment-Digital twin reference model-Implementation. [APPLICATION]			
Course Content:				
Module 1	Introduction	Assignment	Theory	No. of Classes:09
Introduction- Cyber Digital twin-definition-uses and benefits-need for digital twin-working principal Technology Digital thread-digital shadow-building blocks of digital twin-digital twin technology drivers and enablers.				
Module 2	Data Modelling Environment	Assignment	Theory	No. of Classes:10
Types of digital twin-Based on Product and Process-Based on Functionality-Based on Maturity. Development considerations-Overview of Data-Modelling Environment. Modelling-model and data management-Managing data-implementing the model- Cloud and IOT technologies.				
Module 3	Digital Twin Optimization	Assignment	Theory	No. of Classes:10
Cyber range vs digital twin-human behavior modeling in digital twin-optimization using digital twin-digital twin and cyber security-Techniques. Technologies-Industrial IOT and Digital Twin-simulation and digital twin-Machine learning and digital twin-virtual reality and digital twin-cloud technology and digital twin.				
Module 4	Risk Management and Applications	Assignment	Case Study	No. of Classes:10
Digital twin and Risk Assessment-Digital twin reference model-Implementation-Development of risk assessment plan-Development of communication and control system-Development of digital twin tools-Integration-platform validation-Difficulties-Practical implications. Applications: Digital Twin in Manufacturing-Digital Twin in Automotive-Digital Twin in Healthcare-Digital Twin in Utilities-Digital Twin in Construction				
Targeted Application & Tools that can be used: Ansys Twin Builder is a powerful solution for building, validation and deploying simulation-based systems and digital twins: Build, validate, and deploy digital twins. Digital twin models integrate real-world data. Increase efficiency with digital twins.				
Project work/Assignment:				
Project Assignment:				
Text Book Clint Bodungen, Bryan Singer, Aaron Shbeeb, Kyle Wilhoit, and Stephen Hilt," Hacking Exposed Industrial Control Systems: ICS and SCADA Security Secrets & Solutions",1st Edition, ISBN: 978-1259589713. Eric D. Knapp and Raj Samani," Applied Cyber Security and the Smart Grid: Implementing Security Controls into the Modern Power Infrastructure ",1st Edition. Kevin Mitnick," The Art of Invisibility",2017.				
References				

1. Michael E. AuerKalyan Ram B. Digital," Cyber-physical System and Digital Twins - Part of the Lecture Notes in Networks and Systems book series".
2. Nassim Khaed, Bibin Pattel and Affan Siddiqui," Development and Deployment on the Cloud", Elsevier, 2020

Weblinks:

1. https://puniversity.informaticsglobal.com/login?qurl=https://search.ebscohost.com%2flogin.aspx%3fdirect%3dtrue%26db%3dnlebk%26AN%3d1223875%26site%3dehost-live%26ebv%3dEB%26ppid%3dpp_xiii
2. https://www.udemy.com/course/digital-twin-a-comprehensive-overview/

Topics relevant to "EMPLOYABILITY SKILLS":Digital thread-digital shadow-building blocks of digital twin, Digital Twin in Manufacturing-Digital Twin in Automotive, Cyber range vs digital twin-human behavior modeling in digital twin-optimization for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code: CCS3407	Course Title: Quantum Cryptography Type of Course: Theory	L- P- T-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CSE2502					
Anti-requisites	NIL					
Course Description	This course offers a well-rounded exploration of theoretical concepts, practical applications, and security considerations in the field of quantum information theory and quantum communication. It covers topics from the basics of quantum information to the implementation of secure quantum-cryptographic networks in real-life scenarios.					
Course Outcomes	On successful completion of this course the students shall be able to: 1. Basic understanding about Quantum Information and Computation. (Remember) 2. Understand attack Strategies on QKD Protocols. (Understand) 3. Analyze and understand statistical analysis of QKD Networks in Real-Life Environment.(Analyse) 4. Apply Quantum-cryptographic networks.(Apply)					
Course Content:						
Module 1	Advancements in Quantum Secure Communication	Assignment			12 Classes	
Quantum Information Theory, Unconditional Secure Authentication, Entropy, Quantum Key Distribution, Quantum Channel, Public Channel, QKD Gain, Finite Resources						
Module 2	Adaptive Cascade Protocols	Assignment			12 Classes	
Adaptive Cascade Introduction, Error Correction and the Cascade Protocol, Adaptive Initial Block-Size Selection, Fixed Initial Block-Size, Dynamic Initial Block-Size, Examples						
Module 3	Security	Assignment			12	

	Challenges in Quantum Key Distribution (QKD) Protocols			Classes
Attack Strategies on QKD Protocols: Introduction, Attack Strategies in an Ideal Environment, Individual Attacks in an Realistic Environment QKD Systems: Introduction, QKD Systems. Statistical Analysis of QKD Networks in Real-Life Environment: Statistical Methods, Statistical Analysis QKD Networks Based on Q3P: QKD Networks, PPP, Q3P, Routing, Transport				
Module-4	Advancing Quantum Cryptographic Networks	Assignment		9 Classes
Quantum-Cryptographic Networks from a Prototype to the Citizen: The SECOQC Project, How to Bring QKD into the "Real" Life The Ring of Trust Model: Introduction, Model of the Point of Trust, Communication in the Point of Trust Model, Exemplified Communications, A Medical Information System Based on the Ring of Trust.				
Project work/Assignment:				
Assignment 1 Develop a clear understanding of the role of adaptive cascade protocols, the importance of block-size dynamics, and the challenges associated with error correction strategies. Assignment 2 Develop a clear understanding of the role of adaptive cascade protocols, the importance of block-size dynamics, and the challenges associated with error correction strategies.				
REFERENCE MATERIALS: TEXT BOOK: Kollmitzer C., Pivk M. (Eds.), Applied Quantum Cryptography, Lect. Notes Phys. 797 (Springer, Berlin Heidelberg 2010). REFERENCE BOOKS: 1. Gerald B. Gilbert, Michael Hamrick, and Yaakov S. Weinstein, Quantum Cryptography, World Scientific Publishing. 2. Gilles Van Assche, Quantum Cryptography and Secret-Key Distillation, Cambridge University Press. JOURNALS/MAGAZINES SWAYAM/NPTEL/MOOCs: Courses: "Terahertz Quantum Cryptography": https://ieeexplore.ieee.org/document/8976167 Introduction Post-Quantum' Cryptography Scheme Is Cracked on a Laptop: https://onlinecourses.nptel.ac.in/noc23_cs127/preview, Offers an overview of security concepts relevant to AI and CI applications. MOOCs: Quantum Computing:https://www.mooc-list.com/tags/quantum-computing . Quantum Cryptography:https://www.mooc-list.com/tags/quantum-cryptography				

Course Code: CCS3408	Course Title: Privacy and Security in Online Social Media	L-T-P-C	3	0	0	3

Version No.	1.0
Course Pre-requisites	CSE2502
Anti-requisites	NIL
Course Description	Objective of this course is to make students learn the basics of privacy and security in online social media and develop ability to understand the importance of privacy in anyone's life and their consequences if it is in peril. This course is both conceptual and analytical in nature that would help the student to predict the effects of any activity on Social Media. The students should have prior knowledge of some Social media platforms. After successful completion of the Course, the students would acquire knowledge to protect themselves from the online data theft on social media from attacker.
Course Objective	The objective of the course is to familiarize the learners with the concepts of Privacy and Security in Online Social Media and attain Employability through Participative Learning techniques.
Course Out Comes	On successful completion of the course the students shall be able to: 1] Recognize the significance of the Privacy and how to protect it [Knowledge] 2] Summarize the privacy and security Encryption for Peer to Peer Social Networks. [Comprehension] 3] Understand the function of stealing Reality and K-Anonymity. [Knowledge] 4]Use the Link Reconstruction attack in privacy Social Networks. [Application]

Course Content:

Module 1	ANALYSIS OF PRIVACY IN SOCIAL NETWORKS	Assignment	Knowledge	8 Sessions

Topics:
Three-Layered Framework-Characteristics Used to Analyze Social Web Privacy-Privacy Issues Related to Social Web Users-Privacy Issues Related to Service Providers-Security and Privacy for Digital Facets-Identifiable Facets-Private Facets.
Assignment: Find real world problems and suggest solutions.

Module 2	ENCRYPTION FOR PEER-TO-PEER SOCIAL NETWORKS	Assignment	Comprehension	8 Sessions

Topics:
Essential Criteria for the P2P Encryption Systems-Existing P2P OSN Architectures-Evaluations of Existing Encryption Schemes Based on Our Criteria-Broadcast Encryption-Predicate Encryption.
Assignment: - Survey of Unethical Behavior and Influencing factors.

Module 3	STEALING REALITY AND K-ANONYMITY	Quiz	Comprehension	11 Sessions

Topics:
Stealing Reality- Social Attack Model- Social Learnability- k-Anonymity- k-Degree Anonymity- k-Neighborhood
Anonymity- k- Automorphism- k-Isomorphism-L-diversity- Attack Model and Privacy Guarantee-Insights from an ℓ-Diversified Graph.

Module 4	PRIVACY IN SOCIAL NETWORKS- LINKS	Assignment/Case study	Application	11 Sessions

	RECONSTRUCTION ATTACK			

Privacy in Social Networks- Link Prediction- Feature Extraction- Communities Datasets- Electronic Currencies- Anonymity- The Bit coin System- The Transaction Network- The User Network- Anonymity Analysis- Integrating Off-Network Information. Use Case and the Threat Model- Use Case for Private Record Linkage- Use Case for Privacy-Preserving Record Linkage-
Assignment: - The Bit coin Faucet- Voluntary Disclosures- TCP/IP Layer Information- Context Discovery- Flow and Temporal Analyses.

Text Book / References

T1. Yaniv Altshuler, Yuval Elovici, Armin B. Cremers Nadav Aharony, Alex Pentland," Security and Privacy in Social Networks", Springer Publisher,2012,1st Edition

Online Resources: -

W1: https://presiuniv.knimbus.com/user#/searchresult?searchId=Privacy%20and%20Security%20in%20Online%20Social%20Media%20&curPage=0&layout=list&sortFieldId=none&topresult=false

W2: https://onlinecourses.nptel.ac.in/noc21_cs28/preview

Topics relevant to "EMPLOYABILITY SKILLS": Link Prediction, features extraction, for developing Employability Skills through Participative Learning Techniques. This is attained through the assessment component mentioned in the course handout.

Course Code: CCS3409	**Course Title: Machine Learning for Cyber Security.** **Type of Course: Theory**	**L- P- T-C**	**3**	**0**	**0**	**3**
Version No.	1.0					
Course Pre-requisites	CSE2264					
Anti-requisites	NIL					
Course Description	Advancements in Artificial Intelligence (AI) and Machine Learning (ML) have allowed for a surge in adoption of AI & ML solutions to address problems across numerous domains. With this rising reliance on AI & ML in many organizations, it is critical that such systems are protected from malicious activities. This course will discuss AI & ML cybersecurity issues, explore case studies of AI & ML cyber incidents, present AI & ML adversarial techniques, and demonstrate secure design approaches to protect AI & ML systems. With an emphasis on machine learning, the course will focus on secure machine learning systems development approaches and secure machine learning operations (MLOps). Students are expected to have knowledge of fundamental statistics and the ability to program in Python.						
Course Outcomes	On successful completion of this course the students shall be able to: • Articulate and explain which problems in Cyber Security may be solvable with Machine Learning(Remember) • Understand and implement machine learning algorithms and models for Cyber Security problems such as malware analysis, intrusion					

	detection, spam filtering, fraud detection, online behavior analysis etc(Apply) • Get basic hands on experience with supervised, unsupervised learning methods.(Apply) • Understand basic theory of classification and regression techniques(Remember) • Understand feature extraction from data (Understand) • Develop tools for cyber defense using machine learning (Apply)			
Course Content:				
Module 1	Introduction to cyber security and Machine Learning	Assignment		8 Classes
Cyber Security Problems and Machine Learning Based Solutions				
Module 2	**Foundations of Statistical Analysis: Probability, Estimation, Testing, and Regression**	Assignment		12 Classes
Binomial, Poisson, Normal, Exponential, other distributions , Sampling, Estimation, Hypothesis testing, Uni- and multi-variate regression, logistic regression				
Module 3	ML Fundamentals	Assignment		12 Classes
Supervised Learning :Linear Classifiers, Decision Trees, Ensemble Learning, Random Forest; UnSupervised Learning: Clustering, Manifold Discovery, Diffusion map, spectral embedding,				
Module-4	Detecting spam/phishing, intrusion, fraud, DDoS attacks, malware analysis.	Assignment		10 Classes
Spam/Phishing Detection : Training Models and Measuring Efficacy; Intrusion Detection: Network Intrusion Detection ; Fraud Detection: Machine Learning Models for Outlier detection; DDoS Detection: Models with Statistical regression combined with distance metric Anomaly detection, outliers; Malware Analysis; Static and Dynamic Analysis, Models that work well.				
Project work/Assignment:				
Assignment 1 Develop a machine learning model for the detection of malware in computer systems Assignment 2 Task students with building a machine learning system to detect anomalies in network traffic, signaling potential security breaches. Assignment 3				

Instruct students to create a machine learning model to identify phishing websites.
REFERENCE MATERIALS: TEXTBOOKS 1. Machine Learning and Security: Clarence Chio, David Freeman (2018) 2. "Machine Learning and Cybersecurity: Principles, Algorithms, and Applications" by Siddharth Bhatia and Himanshu Gupta(1st edition 2019) 3."An Introduction to Statistical Learning" by Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani is available in the (1st edition, 2022) REFERENCES • "Hands-On Unsupervised Learning using Python" by Ankur A. Patel. • "Supervised Machine Learning: A Review of Classification Techniques" by S. S. Salankar and M. S. Gaikwad. • "Pattern Recognition and Machine Learning" by Christopher M. Bishop JOURNALS/MAGAZINES 1. https://www.journals.elsevier.com/journal-of-information-security-and-applications/forthcoming-special-issues/machine-learning-techniques-for-cyber-security-challenges-and-future-trends. 2. International Journal of Machine Learning and Cybernetics: https://link.springer.com/journal/13042. 3. Machine Learning and Deep Learning Approaches for CyberSecurity: A Review: https://ieeexplore.ieee.org/document/9712274

Course Code: CCS3410	Course Title: Digital Watermarking and Steganography	L-T-P-C	3 -0	0	3
Version No.	1.1				
Course Pre-requisites	Fundamental knowledge in Operating Systems, Cryptography & Network Security and Computer Networks				
Anti-requisites	NIL				
Course Description	The purpose of this course is to enable the students to Comprehend the need for Digital Watermarking and Steganography and to develop the basic abilities of design and use Digital Watermarking and Steganography- information hiding technique. The course is both conceptual in nature and needs fair knowledge of Mathematical and computing. The course develops critical thinking and analytical skills. The course also enhances the abilities through assignments.				
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Digital Watermarking and Steganography and attain Employability through Participative Learning techniques.				
Course Out Comes	On successful completion of the course the students shall be able to: Discuss the Introduction of Digital Watermarking Classify the various Digital Watermarking techniques. Explain the Fundamentals of Steganography. Summarize the Steganographic Techniques.				

Course Content:				
Module 1	Introduction to digital watermarking	Assignment	Programming Task	7 Sessions
Topics :Introduction to Digital Watermarking, Digital Steganography differences, brief History, Watermarking Applications, Classification in Digital Water Marking- Classification based on Characteristics, Classification based on Applications.				
Module 2	Types and tools of digital watermarking	Assignment	Programming Task	14 Sessions
Topics: Digital Watermarking Fundamentals, Least Significant bit substitution, Discrete Fourier Transform, Discrete Cosine Transform, Discrete Wavelet Transform, Random Sequence Generation, Chaotic Map, Error Detection Code. Spatial domain watermarking, frequency Domain watermarking, Fragile Watermark, Robust Water Mark, Watermarking attacks and Tools, Image processing techniques, Water Mark (software Analysis).				
Module 3	Introduction to Steganography	Assignment	Programming/Data analysis task	8 Sessions
Topics: Steganography, Watermarking vs Steganography, Need for Steganography, Application of Steganography, Methods of Hiding, properties of Steganography, Performance measure of Steganography Approaches, Mathematical Notation and Terminology, Steganography Software (S-tools, StegoDos, EzStezo, JSteg,Jpeg,).				
Module 4	Techniques of Steganography	Assignment	Programming/Data analysis task	7 Sessions
Substitution Systems and Bit-plane Tools- Least Significant Bit Substitution, Pseudorandom Permutations, Image Downgrading and Covert Channels, Practical Approach towards Steganography, Embedding of a secret Message.				
Textbooks T1. Frank Y Shih. Digital Water marking and Steganography Fundamentals and Techniques, 2017, CRC Press, second edition. T2. Jsjit. S. Suri Shivendra Shivani, Suneeth Agarwal, Handbook on Image based Security Techniques, CRC Press, 2018.				
References R1. Abid Yahya, Steganography Techniques for Digital Images, Springer, 2019. Weblinks: W1. Digital Watermarking | ScienceDirect (informaticsglobal.com) W2. Digital Watermarking and Steganography | ScienceDirect (informaticsglobal.com)				
Topics relevant to "EMPLOYABILITY SKILLS": Building a data warehouse, data mining tools, for developing Employability Skills through Participative Learning Techniques. This is attained through assessment components mentioned in course handout.				

Course Code: CSE3411	Course Title: Security Information and Event Management (SIEM)	L- T - P- C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CSE2502					
Anti-requisites	NIL					
Course Description	This course provides a comprehensive understanding of Security Information and Event Management (SIEM), focusing on its role in real-time threat detection, incident response, and compliance monitoring. It covers key concepts such as log collection, event correlation, and security analytics, enabling students to detect and mitigate cyber threats effectively. Through hands-on experience with industry-leading SIEM tools like Splunk, IBM QRadar, and Elastic SIEM, students will learn to investigate security incidents and automate threat detection. The course also explores threat intelligence integration, regulatory compliance (GDPR, PCI-DSS, HIPAA), and SOC operations, equipping learners with the skills needed for enterprise security monitoring and cybersecurity defense.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Security Information and Event Management (SIEM)** solutions for **real-time threat detection, incident response, compliance monitoring** and attain **Skill Development** through **Participative Learning** techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: CO1: **Identify** the fundamental components and functions of **Security Information and Event Management (SIEM)** systems [Remember] CO2: Classify the process **of log collection, normalization, and event correlation** in a SIEM environment. [Understand] CO3: **Configure** a SIEM system to **ingest logs from various security devices** and generate alerts for suspicious activities [Apply]					
Course Content:						
Module 1	Introduction to SIEM: Threat Intelligence for IT Systems					13 hours
Topics: Introduction to SIEM: Threat Intelligence for IT Systems - Business Models - Threat Models - Regulatory Compliance						
Module 2	IT Threat Intelligence Using SIEM Systems					15 hours
Topics: SIEM Concepts: Components for Small and Medium-size Businesses - The Anatomy of a SIEM - Incident Response - Using SIEM for Business Intelligence						
Module 3	SIEM Tools	Case study	Kerberos configuration for ecosystem tools			15 hours

Topics: General, SIEM Architecture, SIEM Implementation and Operational Flow
Assignment:
1. 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 . 2. Presentation: Group presentation, where the students will be given a topic. They will have to explain/demonstrate the working and discuss the applications for the same.
Text Book(s): 2. **Security Information and Event Management (SIEM) Implementation** by **David R. Miller, Shon Harris, Allen Harper, Stephen VanDyke, and Chris Blask, McGrawHill.** 3. Ben Spivey, Joey Echeverria, "Hadoop Security Protecting Your Big Data Problem", O'Reilly Media, 2015.
Reference(s): Reference Book(s): 1. Joseph Muniz, Security Information and Event Management (SIEM) Fundamentals, Cisco Press. 2. Matthew Hubbard, The Security Analyst's Guide to SIEM, Apress. Online Resources (e-books, notes, ppts, video lectures etc.): Weblinks: 1. https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=1223875&site=ehost-live&ebv=EB&ppid=pp_xiii 2. https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2706929&site=ehost-live
Topics related to development of "FOUNDATION": Introduction to SIEM, Log Collection & ManagementTopics related to development of "EMPLOYABILITY": Configuring SIEM for Security Monitoring, Incident Response & Compliance

Course Code: CCS3412	Course Title: Blockchain Security	L- T - P- C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CSE2502					
Anti-requisites	NIL					
Course Description	This course explores the security challenges, risks, and solutions in blockchain technology, covering cryptographic principles, consensus mechanisms, and smart contract security. It addresses threats such as 51% attacks, Sybil attacks, and private key vulnerabilities, along with techniques for securing blockchain networks, transactions, and decentralized applications (DApps). Students will gain hands-on experience in auditing smart contracts, implementing security best practices, and understanding regulatory compliance. By the end, learners will be equipped to identify vulnerabilities, secure blockchain ecosystems, and design robust decentralized systems.					

Course Objective	The objective of the course is to familiarize the learners with the concepts of security in blockchain to attain **Skill Development** through **Participative Learning** techniques.	
Course Outcomes	On successful completion of this course the students shall be able to: CO1: Define key blockchain security concepts, including cryptographic techniques and consensus mechanisms. [Remember] CO2: Explain common blockchain threats such as **51% attacks, Sybil attacks, and private key vulnerabilities**. [Understand] CO3: Perform security best practices for securing blockchain transactions, smart contracts, and decentralized applications. [Apply]	
Course Content:		
Module 1	Introduction to Blockchain	15 hours
Topics: The history of blockchain and Bitcoin - Types of blockchain - Decentralization - Decentralization using blockchain - Methods of decentralization - Blockchain and full ecosystem decentralization		
Module 2	Symmetric Cryptography	13 hours
Topics: Introduction to Symmetric Cryptography - Cryptography - Confidentiality - Cryptographic primitives - Symmetric cryptography - Data Encryption Standard - Public Key Cryptography - Discrete logarithm problem in ECC - Hash functions - Financial markets and trading		
Module 3	Introducing Bitcoin	15 hours
Topics: Introducing Bitcoin - Digital keys and addresses – Blockchain - Bitcoin Network and Payments - Bitcoin Clients and APIs - Alternative Coins		
Assignment:		
1. 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** . Presentation: Group presentation, where the students will be given a topic. They will have to explain/demonstrate the working and discuss the applications for the same.		
Text Book(s): **2.** **Imran Bashir**, *Mastering Blockchain: Unlocking the Power of Cryptocurrencies, Smart Contracts, and Decentralized Applications*, Packt Publishing, 4th Edition, 2023.		
Reference(s): Reference Book(s): 1. **Andreas M. Antonopoulos and Gavin Wood**, *Mastering Ethereum: Building Smart Contracts and DApps*, O'Reilly Media, 2018. 2. **Joseph Bonneau, Andrew Miller, Jeremy Clark, Arvind Narayanan, Joshua Kroll, and Edward Felten**, *Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction*, Princeton University Press, 2016. 3. **Narayan Prusty**, *Blockchain for Enterprise: Build Scalable Blockchain Applications with Privacy, Interoperability, and Permissioned Features*, Packt Publishing, 2021.		

line Resources (e-books, notes, ppts, video lectures etc.): Weblinks: https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=1223875&site=ehost-live&ebv=EB&ppid=pp_xiii https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2706929&site=ehost-live
Topics related to development of "FOUNDATION": Introduction to blockchain security and bitcoin Topics related to development of "EMPLOYABILITY": Bitcoin Network and Payments - Bitcoin Clients and APIs - Alternative Coins

Course Code: CSS3413	Course Title: Security Auditing and Governance	L- T - P- C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CSE2502					
Anti-requisites	NIL					
Course Description	This course covers security auditing principles, governance frameworks, and compliance regulations essential for organizational cybersecurity. It includes risk assessment, vulnerability management, and security controls while aligning with standards like ISO 27001, NIST, PCI-DSS, and GDPR. Students will explore governance, risk, and compliance (GRC) models, audit methodologies, and hands-on log analysis, security assessments, and incident response. By the end, they will be equipped to conduct audits, ensure compliance, and strengthen enterprise security.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of security auditing and governance post-quantum cryptographic algorithms to attain **Skill Development** through **Participative Learning** techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: CO1: **Define** key concepts of **security auditing, governance, and compliance frameworks.** [Remember] CO2: **Explain risk assessment methodologies** and the role of governance in cybersecurity. [Understand] CO3: **Perform security audits, log analysis, and compliance checks** using industry standards. [Apply] CO4: **Assess vulnerabilities, security controls, and risk management strategies** in					

	IT environments. [**Analysis**]	
Course Content:		
Module 1	The Principles of Auditing	12 hours
Topics: The Principles of Auditing - Security Fundamentals: The Five Pillars - Building a Security Program - Security Controls - Managing Risk - The Auditing Process		
Module 2	Information Security and the Law	12 hours
Topics: IT Security Laws - Hacking, Cracking, and Fraud Laws - Intellectual Property Laws - CAN-SPAM Act of 2003 - State and Local Laws - Reporting a Crime - Regulatory Compliance Laws		
Module 3	Information Security Governance, Frameworks, and Standards	11 hours
Topics: Understanding Information Security Governance - Process: Security Governance Frameworks - Technology: Standards Procedures and Guidelines - Auditing Tools and Techniques - Evaluating Security Controls - Auditing Security Practices - Testing Security Technology - Security Testing Frameworks		
Module 4	Auditing	10 hours
Topics: Auditing Cisco Security Solutions - Policy, Compliance, and Management - Infrastructure Security		
Assignment:		
1. 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 . 2. Presentation: Group presentation, where the students will be given a topic. They will have to explain/demonstrate the working and discuss the applications for the same.		
Text Book(s): **3. Chris Jackson**, *Network Security Auditing*, Cisco Press, 2010		
Reference(s): Reference Book(s): 1. Russell Dean Vines, *Wireless Security Audit Methods and Tools*, McGraw-Hill, 2002. 2. Eric Cole, Ronald Krutz, and James Conley, *Network Security Bible*, Wiley, 2009. 3. Richard Bejtlich, *The Practice of Network Security Monitoring: Understanding Incident Detection and Response*, No Starch Press, 2013.		

4. William Stallings, *Network Security Essentials: Applications and Standards*, Pearson, 2020.

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

Weblinks:

https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=1223875&site=ehost-live&ebv=EB&ppid=pp_xiii

https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2706929&site=ehost-live

Topics related to development of "FOUNDATION": Information Security and the Law
Topics related to development of "EMPLOYABILITY": Security Governance, Frameworks, and Standards

Course Code: CCS3414	Course Title: Security In IOT Type of Course: Theory	L- T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CSE2251					
Anti-requisites	**NIL**					
Course Description	This course provides a comprehensive understanding of security challenges and solutions in the Internet of Things (IoT) and cloud computing environments. Students will explore IoT system design, hardware and software security, cryptographic approaches, cloud computing fundamentals, and security concepts related to virtualization. The course covers security threats specific to IoT devices and cloud infrastructure, along with countermeasures against cyberattacks, including system-specific vulnerabilities such as guest hopping, VM-based attacks, and hyper jacking. By the end of this course, students will gain practical knowledge of securing IoT ecosystems and cloud services while understanding emerging threats in these domains.					
Course Objective	To learn about the security issues in IoT and cloud computing. To learn about the cryptography solutions and issues in IoT. To learn about the security measures taken in IoT and Cloud systems to improve security.					
Course Out Comes	On completion of the course, student will be able to CO1 - Understand the fundamental security issues in Internet of things. CO2 - Demonstrate different Frameworks and Hardware Architecture of IoT Device. CO3 - Analyze different IoT Protocols and Layer Functioning. CO4 - Protect and secure the network connecting IoT devices to back-end systems on the internet. CO5 - Demonstrate different authentication mechanism such as digital certificates, biometrics, etc.					

Course Content:				
Module 1	**FUNDAMENTALS OF IoT ECOSYSTEM**	Assignment	Theory	**9 Sessions**
Topics: IoT security issues, how to design an IoT system, Hardware, software and network security related to IoT systems - Basics of cryptographic solutions to IoT systems.				
Module 2	OVERVIEW OF CLOUD COMPUTING AND ITS SERVICES	Assignment	Programming activity	**9 Sessions**
Topics: Cloud Computing Fundamental: Cloud computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS				
Module 3	CHALLENGES IN CLOUD COMPUTING	Assignment	Programming activity	**9 Sessions**
Topics: Benefits and challenges of cloud computing - Public vs. Private clouds, Role of virtualization in enabling the cloud.				
Module 4	SECURITY CONCEPTS IN CONTEXT TO IoT DEVICES	Assignment	Programming activity	**9 Sessions**
Topics: Security Concepts: Confidentiality, privacy, integrity, authentication, non-repudiation, Virtualization.				
Module 5	**IoT SECURITY THREATS AND COUNTERMEASURES**	Assignment	Programming activity	**9 Sessions**
Topics: System-Specific Attacks: Guest hopping, attacks on the VM (delete the VM, attack on the control of the VM, code or file injection into the virtualized file structure), VM migration attack, hyper jacking				
Targeted Application & Tools that can be used				
Project work/Assignment:				
Assignment:				
Text Book T1. David Etter, " IoT Security: Practical guide book " Create Space, 1st Edition, 2016.				
References : 1.Drew Van Duren, Brian Russell, "Practical Internet of Things Security", Packt, 1st Edition, 2016. 2. Sean Smith, "The Internet of Risky Things", O'Reilly Media, 1st Edition, 2017. 3. Brian Russell, Drew Van Duren, "Practical Internet of Things Security: Design a security framework for an Internet connected ecosystem", 2nd Edition, 2018.				

Course Code: CCS3415	Course Title: Cloud Security		L-T- P-C	3 -0	0	3
Version No.	1.0				
Course Pre-requisites	CSE2502				
Anti-requisites	NIL				
Course Description	This course provides ground-up coverage on the high-level concepts of cloud landscape, architectural principles, and techniques. It describes the Cloud security architecture and explores the guiding security for Infrastructure and Softwares.				
Course Objective	The objective of the course is to familiarize the learners with the concepts of Cloud Security and attain Employability through Participative Learning techniques.				
Course Outcomes	On successful completion of this course the students shall be able to: Describe fundamentals of cloud computing [Knowledge]. Explain cloud computing security architecture and associated challenges [Comprehension]. Discuss cloud computing software security essentials [Comprehension]. Apply infrastructure security and data security in cloud computing enviroment. [Application].				
Course Content:					
Module 1:	Fundamentals of Cloud Computing	Quiz	Knowledge based Quiz	10 Sessions	
Topics: Cloud Computing at a Glance, Building Cloud Computing Environments, Computing Platforms and Technologies, Cloud Computing Architecture: Cloud Delivery Models, The SPI Framework, Cloud Software as a Service (SaaS), Cloud Platform as a Service (PaaS), Cloud Infrastructure as a Service (IaaS), Cloud Deployment Models, Expected Benefits.					
Module 2:	Cloud Security Challenges and Cloud Security Architecture	Quiz	Comprehension based Quiz	10 Sessions	
Topics: Security Policy Implementation, Computer Security Incident Response Team, Virtualization Security Management. Architectural Considerations, Identity Management and Access Control, Autonomic Security.					
Module 3	Cloud Computing Software Security Essentials	Assignment	Batch-wise Assignments	9 Sessions	
Topics: Cloud Information Security Objectives, Cloud Security Services, Secure Cloud Software Requirements, Cloud Security Policy Implementation, Secure Cloud Software Testing, Cloud Computing and Business Continuity Planning/Disaster Recovery.					
Module 4:	Infrastructure Security and Data Security	Assignment and Presentation	Batch-wise Assignment and Presentations	9 Sessions	

Topics: Infrastructure Security: The Network Level, The Host Level, The Application Level. Data Security : Aspects of Data Security, Data Security Mitigation, Provider Data and its Security.
Targeted Application & Tools that can be used: Use of CloudSim simulator.
Project work/Assignment: Survey on Cloud Service Providers
Text Book Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, "Mastering Cloud Computing", McGraw Hill Education, July 2017. Roland L Krutz and Russell Dean Vines, "Cloud Security - A Comprehensive Guide to Secure Cloud Computing", Wiley Publishing, Inc. 2010.
References Sushil Jajodia, Krishna Kant, Pierangela Samarati, Anoop Singhal, Vipin Swarup, Cliff Wang, "Secure Cloud Computing", Springer, ISBN 978-1-4614-9278-8 (eBook). John Rittinghouse and James Ransome, "Cloud Computing, Implementation, Management and Security", CRC Press, 2010. Tim Mather, Subra Kumaraswamy and Shahed Latif", "Cloud Security and Privacy – An Enterprise Perspective on Risks and Compliance", Oreily Publication, 2009. WEB RESOURCES: https://presiuniv.knimbus.com/user#/home
Topics relevant to "EMPLOYABILITY SKILLS": Cloud computing architecture, Security policy implementation, Infrastructure security and Data security for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code: CCS3416	**Course Title:** **Cryptocurrency** Technologies	**L- T-P- C**	3 -0-0-3
Version No.	1		
Course Pre-requisites	CSE3078		
Anti-requisites			
Course Description	The course is designed to provide an introductory understanding of decentralized digital currencies (cryptocurrencies) such as bitcoin, a basic understanding of its underlying technology 'Blockchain' and why this new and innovative technology is so important, since it has the potential to disrupt a number of industries in the immediate near future. In particular, the course will survey the theory and principles by which cryptocurrencies operate, practical examples of basic cryptocurrency transactions, the likely interaction of cryptocurrencies with the banking, financial, legal and regulatory systems, and how cryptocurrencies could be viewed within a framework of innovation and development.		
Course Objective	The objective of the course is to familiarize the learners with the concepts of Cryptocurrency Technology and attain **Employability** through **Participative Learning** techniques.		

Course Out Comes	**On successful completion of the course the students shall be able to:** 1. Understand the technology components of blockchain-based digital currencies. [Comprehensive] 2. Explain the transactions from a digital currency wallet. [Comprehensive] 3. Understand alternatives to bitcoin, such as alt-coins, Ethereum and Bitcoin Cash. [Comprehensive] 4. Use cryptocurrencies in the context of disruptive innovations [Application]			
Course Content:				
Module 1	**Introduction to Cryptography**	Assignment	Data Interpretation	**8 Sessions**
Topics: Cryptography, Digital Signatures, Cryptographic Hash Functions. **Cryptographic Data Structures:** Hash Pointers, Append-Only Ledgers (BlockChains), Merkle Trees.				
Module 2	**Bitcoin's Protocol**	Assignment	Data Interpretation	**10 Sessions**
Topics: Bitcoin's Protocol Keys as Identities, Simple Cryptocurrencies, Decentralization through Distributed Consensus, Incentives, Proof of Work (Mining), Application-Specific Integrated Circuit (ASIC) Mining and ASIC-resistant Mining, Virtual Mining (Peer coin).				
Module 3	**Bitcoin Engineering**	Quiz	Questions Set	**10 Sessions**
Topics: Engineering Details, Bitcoin Blocks, Hot and Cold Storage, Splitting and Sharing Keys, Proof of Reserve Proof of Liabilities. **Anonymity, Pseudonymity, Unlinkability**: Statistical Attacks (Transaction Graph Analysis), Network-layer De-anonymization, Chaum's Blind Signatures, Single Mix and Mix Chains, Decentralized Mixing, Zero-Knowledge Proof Cryptocurrencies.				
Module 4	**Cryptocurrency Technologies**	Quiz	Questions Set	**10 Sessions**
Topics: Cryptocurrency Technologies, Smart Property, Efficient micro-payments, Coupling Transactions and Payment (Interdependent Transactions,) Public Randomness Source, Prediction Markets, Escrow transactions, Green addresses, Auctions and Markets, Multi-party Lotteries.				
Targeted Application & Tools that can be used: A cryptocurrency is a digital or virtual currency, it is secured by cryptography which makes it impossible to simulate or double-spend. Many cryptocurrencies are decentralized networks based on blockchain technology. Cryptocurrency caters to the promise of making the easier transaction of funds directly between two groups or parties without the need for any third party like bank or credit card company. Applications are Money transfer, Smart contracts, Internet of Things (IoT), Personal identity security, Healthcare, Logistics. Tools: Messari, Glass node, Lunar Crush, Coin Metrics, Coin Market Cal.				
Project work/Assignment:				
Assignment: 1. Beyond a method for payment, what are other functions of cryptocurrencies? 2. How are cryptocurrency transactions recorded? 3. What are the top cryptocurrencies? 4. What is the market capitalization of all cryptocurrencies and which ones make up largest % of that capitalization? 5. Explain briefly efficient micro-payments				
Text Books: **T1.** Narayanan, Arvind, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016. **T2.** Schar, Fabian, and Aleksander Berentsen. Bitcoin, Blockchain, and Cryptoassets: A Comprehensive Introduction. MIT press, 2020. **T3.** Karame, Ghassan O., and Elli Androulaki. Bitcoin and blockchain security. Artech House, 2016.				

References:

R1. Antonopoulos, Andreas M., and Gavin Wood. Mastering ethereum: building smart contracts and dapps. O'reilly Media, 2018.

R2. Antonopoulos, Andreas M. Mastering Bitcoin: unlocking digital cryptocurrencies. " O'Reilly Media, Inc.", 2014.

R3. Day, Mark Stuart. Bits to bitcoin: how our digital stuff works. MIT Press, 2018.

E book link R1: http://fincen.gov/statutes_regs/guidance/html/FIN-2013-G001.html

E book link R2: http://www.scribd.com/doc/212058352/Bit-Coin

Web resources:

W1. http://www.usv.com/posts/bitcoin-as-protocol
W2. http://startupboy.com/2013/11/07/bitcoin-the-internet-of-money/
W3. http://startupboy.com/2014/03/09/the-bitcoin-model-for-crowdfunding/
W3. http://www.hmrc.gov.uk/briefs/vat/brief0914.html

Topics relevant to "EMPLOYABILITY SKILLS": Cryptography, Digital Signatures, Hash Pointers, BlockChains, ASIC-resistant Mining, Hot and Cold Storage, Transaction Graph Analysis, Zero-Knowledge Proof Cryptocurrencies, Escrow transactions, Multi-party Lotteries.
for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code: CCS3417	**Course Title:** Security and Privacy in Cloud	**L-T- P-C**	2	0	2	3
Version No.	1					
Course Pre-requisites	CSE2502					
Anti-requisites	Nil					
Course Description	This course provides an in-depth understanding of the security and privacy challenges in cloud computing environments. It explores the fundamental principles, architectures, and service models of cloud computing while emphasizing the risks, vulnerabilities, and threats associated with cloud-based systems. Students will learn about key topics such as identity and access management, encryption techniques, secure cloud storage, data isolation, and compliance with privacy regulations. The course also covers emerging trends, industry standards, and security best practices for public, private, and hybrid cloud infrastructures. Through real-world case studies and practical exposure, students will develop the skills necessary to evaluate and implement secure cloud solutions.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Security and Privacy in Cloud and attain **Employability** through Experiential **Learning** techniques					
Course Out Comes	**On successful completion of the course the students shall be able to:** CO1: Understand the cloud concepts and fundamentals. CO2: Explain the security challenges in the cloud.					

	CO3: Define cloud policy and Identity and Access Management. CO4: Understand various risks and audit and monitor mechanisms in the cloud.			
Course Content:				
Module 1	**FUNDAMENTALS OF CLOUD SECURITY CONCEPTS**	Assignment	Understand	**7 Sessions**
Topics: Overview of cloud security- Security Services - Confidentiality, Integrity, Authentication, Nonrepudiation, Access Control - Basic of cryptography - Conventional and public-key cryptography, hash functions, authentication, and digital signatures.				
Module 2	**SECURITY DESIGN AND ARCHITECTURE FOR CLOUD**	Assignment	Apply	**6 Sessions**
Security design principles for Cloud Computing - Comprehensive data protection - End-to-end access control - Common attack vectors and threats - Network and Storage - Secure Isolation Strategies - Virtualization strategies - Inter-tenant network segmentation strategies - Data Protection strategies: Data retention, deletion and archiving procedures for tenant data, Encryption, Data Redaction, Tokenization, Obfuscation, PKI and Key				
Module 3	**ACCESS CONTROL AND IDENTITY MANAGEMEN**	Case Study	Understand	**10 Sessions**
Access control requirements for Cloud infrastructure - User Identification - Authentication and Authorization - Roles-based Access Control - Multi-factor authentication - Single Sign-on, Identity Federation - Identity providers and service consumers - Storage and network access control options - OS Hardening and minimization - Verified and measured boot - Intruder Detection and prevention				
Module 4	**CLOUD SECURITY DESIGN PATTERNS**	Assignment	Apply	**8 Sessions**
Topics: Introduction to Design Patterns, Cloud bursting, Geo-tagging, Secure Cloud Interfaces, Cloud Resource Access Control, Secure On-Premise Internet Access, Secure External Cloud Proactive activity monitoring - Incident Response, Monitoring for unauthorized access, malicious traffic, abuse of system privileges - Events and alerts -.				
Text Book 1. Raj Kumar Buyya , James Broberg, andrzejGoscinski, "Cloud Computing:‖, Wiley 2013 2. Dave shackleford, "Virtualization Security, SYBEX a wiley Brand 2013. 3. Mather, Kumaraswamy and Latif, "Cloud Security and Privacy‖, OREILLY 2011				
REFERENCES 1.Mark C. Chu-Carroll "Code in the Cloud‖,CRC Press, 2011 2. Mastering Cloud Computing 2.Foundations and Applications Programming RajkumarBuyya, Christian Vechhiola, S. ThamaraiSelvi				
Targeted Application & Tools that can be used: • Cloud Sim				

List of Experiments:

30 Sessions

1.Simulate a cloud scenario using Cloud Sim and run a scheduling algorithm not present in Cloud Sim

2. simulate resource management using cloud sim

3. simulate log forensics using cloud sim

4. simulate a secure file sharing using a cloud sim

5. Implement data anonymization techniques over the simple dataset (masking, kanonymization, etc)

6. Implement any encryption algorithm to protect the images

7. Implement any image obfuscation mechanism

8. Implement a role-based access control mechanism in a specific scenario

9. implement an attribute-based access control mechanism based on a particular scenario

10. Develop a log monitoring system with incident management in the cloud

Topics relevant to " Skill Development" Understanding Cloud, obfuscation

Topics related to " EXPERIENTIAL LEARNING ": implementations in software

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.					
Course Out Comes	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]					
Course Content:						
Module 1	Text Mining	Adversarial Quiz Tests	Module Tests	No. of Sessions: 09		
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).						
Module 2	Text Preprocessing	Adversarial Quiz Tests	Module Tests	No. of sessions: 06		
Introduction to Preprocessing. Tokenization. Stop Words Removal. Lemmatization and Stemming. PoS Tagging. Integer Encoding. Padding. One-Hot Encoding.						
Module 3	Text Representations	Adversarial Quiz Tests	Module Tests	No. of sessions: 08		
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.				
Module 4	Natural Language Processing with Keras	Adversarial Quiz Tests	Module Tests	No. of Sessions: 06
Word Embeddings vs. One-Hot Encoding. Contextual Bag of Words (CBOW). Skipgram. Deep Learning for Document Classification.				

List of Laboratory Tasks:

Experiment No. 1: File Handling
Level 1: Read text files using Python and extract meaningful content.
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.			
Course Objective	This course is designed to improve the learners EMPLOYABILITY SKILLS by using EXPERIENTIAL LEARNING techniques.			
Course Outcomes	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)			
Course Content:				
Module 1	Basics of Neural Networks	Assignment		18[8L+10P] Sessions
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.				
Module 2	TensorFlow Basics	Assignment		14[7L+7P] Sessions
Topics: Introduction to TensorFlow, TensorFlow dataset, Machine Learning with TensorFlow				
Module 3	Deep Learning methods with Tensor Flow and Keras	Assignment		14[6L+8P] Sessions
Topics: Main Features of TensorFlow, Keras basics, AI with Keras.				
Project work/Assignment:				
Assignment 1 on (Module 1 and Module 2) Assignment 2 on (Module 3)				
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					
Course Pre-requisites	MAT2402					
Anti-requisites	NIL					
Course Description	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.					
Course Out Comes	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					

Course Content:				
Module 1	Fundamentals of Deep Learning for Vision	Assignment	Practical	No. of Classes:8
Introduction to Deep Learning & Neural Networks, Convolutional Neural Networks (CNNs) Architecture Backpropagation & Optimization in CNNs, Transfer Learning & Pretrained Models.				
Module 2	Object Detection & Image Segmentation	Assignment	Practical	No. of Classes:14
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				
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.