



**GEETHANJALI INSTITUTE OF SCIENCE AND TECHNOLOGY – NELLORE
(AUTONOMOUS)**

B.TECH COURSE STRUCTURE
for
DEPARTMENT OF CSE (AI&ML)
2022-2026 BATCH
REGULATION: RG22



GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY

Unit of USHODAYA EDUCATIONAL SOCIETY

An ISO 9001:2015 certified Institution: Recognized under Sec. 2(f)& 12(B) of UGC Act, 1956
3rd Mile, Bombay Highway, Gangavaram (V), Kovur(M), SPSR Nellore (Dt), Andhra Pradesh, India- 524137
Ph. No. 08622-212769, E-Mail: geethanjali@gist.edu.in, Website: www.gist.edu.in

Semester-0				
S.No	Course No	Course Name	Category	L-T-P-C
1		Physical Activities—Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2		Career Counselling	MC	2-0-2-0
3		Orientation to all branches—career options, tools etc	MC	3-0-0-0
4		Orientation on admitted batch—corresponding labs, tools and platforms	EC	2-0-3-0
5		Proficiency units & Productivity tools	ES	2-1-2-0
6		Assessment on basic aptitude and mathematical skills	MC	2-0-3-0
7		Remedial training in Foundation courses	MC	2-1-2-0
8		Human Values and Professional Ethics	MC	3-0-0-0
9		Communication Skills – Focus on Listening, Speaking, Reading, Writing Skills	BS	2-1-2-0
10		Concepts of Programming	ES	2-0-2-0



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Semester-3 (Theory-6, Lab-3, SC-1, MC-1)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	BSC	22A0016T	Probability & Statistics	3	0	0	3
2	PCC	22A0506T	Computer Organization	3	0	0	3
3	PCC	22A0514T	Python Programming	3	0	0	3
4	ESC	22A0410T	Digital Electronics and Micro Processors	3	0	0	3
5	PCC	22A0521T	Design and Analysis of Algorithms	3	0	0	3
6	HSC	22A0022T	Managerial Economics & Financial Analysis	3	0	0	3
7	PCC(Lab)	22A0517P	Python Programming Lab	0	0	3	1.5
8	ESC(Lab)	22A0411P	Digital Electronics and Micro Processors Lab	0	0	3	1.5
9	PCC(Lab)	22A0524P	Design and Analysis of Algorithms Lab	0	0	3	1.5
10	SC	22A0511	Skill Oriented Course Basic Web Design	1	0	2	2
11	MC	22A0030T	Mandatory Course Constitution of India	2	0	0	0
				Total credits			24.5

Category	Credits
Basic Science Course (BSC)	3
Professional Core Courses (PCC)	12
Engineering Science Courses (ESC)	4.5
Humanities and Social Science Course (HSC)	3
Skill Oriented Course (SC)	2
Total	24.5



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Semester-4 (Theory-5, Lab-3, SC-1, MC-1)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	BSC	22A0017T	Discrete Mathematical Structures	3	0	0	3
2	PCC	22A0512T	Database Management Systems	3	0	0	3
3	PCC	22A0507T	Object Oriented Programming Through JAVA	3	0	0	3
4	PCC	22A3301T	Artificial Intelligence	3	0	0	3
5	HSC	22A0021T	Universal Human Values	3	0	0	3
6	PCC(LAB)	22A0515P	Database Management Systems Lab	0	0	3	1.5
7	PCC(LAB)	22A0509P	Object Oriented Programming Through JAVA Lab	0	0	3	1.5
8	PCC(LAB)	22A3302P	Artificial Intelligence Lab	0	0	3	1.5
9	SC	22A0518	Skill Oriented Course Linux Programming	1	0	2	2
10	MC	22A0028T	Mandatory Course Environmental Science	2	0	0	0
				Total credits			21.5

Category	Credits
Basic Science Course (BSC)	3
Humanities and Social Sciences Course (HSC)	3
Professional Core Courses (PCC)	13.5
Skill oriented Course(SC)	2
Total	21.5



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Semester-5(Theory-5,Lab-2,SC-1, MC-1)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	PCC	22A3303T	Automata and Compiler Design	3	0	0	3
2	PCC	22A0508T	Software Engineering	3	0	0	3
3	PCC	22A0528T	Machine Learning	3	0	0	3
4	PEC	22A0534c 22A0520T 22A0522c	Professional Elective-I: 1. Big Data Technologies 2. Computer Networks 3. No SQL	3	0	0	3
5	OEC	22A0430T 22A0214Ta 22A0149T 22A0321Ta	Open Elective-I: 1. Principles of Communication Systems 2. Power Electronics 3. Building Materials 4. Automobile Engineering	3	0	0	3
6	PCC(Lab)	22A0510P	Software Engineering Lab	0	0	3	1.5
7	PCC(Lab)	22A0532P	Machine Learning Lab	0	0	3	1.5
8	SC	22A0029P	Skill Advanced Course: Soft Skills	1	0	2	2
9	MC	22A0526T	Mandatory Course: Design Thinking and Innovation	2	0	0	0
Summer Internship 2Months(Mandatory) after second year(to be evaluated during V semester)				0	0	0	1.5
				Total credits			21.5
Honors / Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)				4	0	0	4

Category	Credits
Professional Core Courses(PCC)	12
Professional Elective Courses(PEC)	3
Open Elective Courses(OEC)	3
Skill Advanced Course(SC)	2
Summer Internship	1.5
Total	21.5



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Semester-6(Theory-5,Lab-3,SC-1MC-1)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	PCC	22A3304T	Natural Language Processing	3	0	0	3
2	PCC	22A0535c	Deep Learning	3	0	0	3
3	PCC	22A0529T	Cloud Computing	3	0	0	3
4	PEC	22A0522b 22A0530c 22A0530c	Professional Elective-II: 1. Mobile Computing 2. Design Patterns 3. Introduction to IoT	3	0	0	3
5	OEC	22A0413T 22A0213Ta 22A0150T 22A0327Tb	Open Elective-II: 1. Micro Controllers And Applications 2. Control Systems 3. Environmental Economics 4. Introduction to Composite Materials	3	0	0	3
6	PCC(Lab)	22A3305P	Natural Language Processing Lab	0	0	3	1.5
7	PCC(Lab)	22A3306P	Deep Learning Lab	0	0	3	1.5
8	PCC(Lab)	22A0533P	Cloud Computing Lab	0	0	3	1.5
9	SC	22A0525	Skill Oriented Course: R Programming	1	0	2	2
10	MC	22A0032T	Mandatory Course: Research Methodology	2	0	0	0
			Total credits				21.5
Honors / Minor courses (The hours distribution can be 3-0-2or 3-1-0also)				4	0	0	4
Industrial/Research Internship(Mandatory)2Months during summer vacation							



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Semester-7(Theory-6,SC-1)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1	HSC	22A0023T 22A0024T 22A0025T	Humanity Science Elective – I: 1. Management Science 2. Entrepreneurship and Innovation 3. Business Environment	3	0	0	3
2	PEC	22A3307T 22A0534b 22A3308T	Professional Elective-III: 1. Recommender Systems 2. High Performance Computing 3. Intelligent Information Retrieval Systems	3	0	0	3
3	PEC	22A0535a 22A3309T 22A3310T	Professional Elective-IV: 1. Block Chain Technology 2. Reinforcement Learning 3. Social Network Analysis	3	0	0	3
4	PEC	22A0536a 22A3311T 22A0536c	Professional Elective-V: 1. Image Processing 2. Knowledge Representation and Reasoning 3. Full Stack Web Development	3	0	0	3
5	OEC	22A0241Ta 22A0432T 22A0151T 22A0327Tc	Open Elective-III: 1. Smart Grid 2. Basic VLSI Design 3. Disaster management 4. Measurements and Mechatronics	3	0	0	3
6	OEC	22A0232Ta 22A0433T 22A0152T 22A0331Tc	Open Elective-IV: 1. Electric Vehicles 2. Industrial Electronics 3. Construction Management 4. Introduction to Robotics	3	0	0	3
7	SC	22A0537	Skill Advanced Course: Mobile Application Development	1	0	2	2
Industrial / Research Internship 2 Months (Mandatory) after Third year(to be evaluated during VII semester)				0	0	0	3
			Total credits				23

Honors / Minor courses (The hours distribution can be 3-0-2or3-1-0also)	4	0	0	4
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Category	Credits
Professional Elective Courses (PEC)	9
Humanities and Social Science Course (HSC)	3
Open Elective Courses (OEC)	6
Skill Advanced Course (SC)	2
Industrial/Research Internship	3
Total	23

Department of CSE (AI&ML)

*RG 22
Regulation*



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Semester-8(Project-1)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1	Major Project	22A3311	Project work, Seminar And Internship in industry	0	0	24	12
INTERNSHIP(6MONTHS)							
Total credits							12

GEETHANJALI INSTITUTE OF SCIENCE AND TECHNOLOGY – NELLORE

(AUTONOMOUS)

DEPARTMENT OF CSE(AI&ML)

B. TECH SYLLABUS

I-II-III-IV-YEARS

REGULATION – RG22

FOR

2022 ADMITTED BATCH



GEETHANJALI INSTITUTE OF SCIENCE AND TECHNOLOGY
(AUTONOMOUS)
NELLORE – 524137 (A.P) INDIA

B. TECH Computer Science & Engineering (AI&ML)
Course Structure (RG22)

Semester 0

Induction Program: 3 weeks
(Common for All Branches of Engineering)

S. No	Course No	Course Name	Category	L-T-P-C
1		Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2		Career Counselling	MC	2-0-2-0
3		Orientation to all branches -- career options, tools, etc.	MC	3-0-0-0
4		Orientation on admitted Branch -- corresponding labs, tools and platforms	EC	2-0-3-0
5		Proficiency Units & Productivity Tools	ES	2-1-2-0
6		Assessment on basic aptitude and mathematical skills	MC	2-0-3-0
7		Remedial Training in Foundation Courses	MC	2-1-2-0
8		Human Values & Professional Ethics	MC	3-0-0-0
9		Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	BS	2-1-2-0
10		Concepts of Programming	ES	2-0-2-0



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Course Structure (RG22)

Semester - 1 (Theory-5, Lab-3)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1	BSC	22A0001T	Linear Algebra & Calculus	3	0	0	3
2	BSC	22A0005T	Applied Physics in Science and Engineering	3	0	0	3
3	HSC	22A0013T	Communicative English	3	0	0	3
4	ESC	22A0501T	Problem Solving using C	3	0	0	3
5	ESC	22A0302T	Engineering Drawing	1	0	4	3
6	BSC(LAB)	22A0010P	Applied Physics in Science and Engineering Lab	0	0	3	1.5
7	HSC(LAB)	22A0014P	Communicative English Lab	0	0	3	1.5
8	ESC(LAB)	22A0503P	Problem Solving using C Lab	0	0	3	1.5
				Total credits			19.5

Category	Credits
Basic Science Course (BSC)	7.5
Engineering Science Course (ESC)	7.5
Humanities and Social Science Course (HSC)	4.5
Total	19.5

LINEAR ALGEBRA & CALCULUS					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0001T	3: 0:0:0	3	CIE: 30 SEE:70	3 Hours	BSC
Course Objectives:					
This course will illuminate the students in the concepts of calculus and linear algebra. To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.					
Syllabus				Total Hours:45	
Unit - I	Matrices			9 Hrs	
Rank of a matrix by echelon form, normal form. Solving system of homogeneous and non-homogeneous equations linear equations. Applications: Finding the current in electrical circuits Eigen values and Eigenvectors and their properties, Cayley- Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalisation of a matrix.					
Unit - II	Mean Value Theorems			9 Hrs	
Rolle’s Theorem (Without Proof), Lagrange’s mean value theorem (Without Proof), Cauchy’s mean value theorem (Without Proof), related problems, Taylor’s and Maclaurin theorems with remainders (without proof) - related problems, Taylor’s and Maclaurin series (without proof) Expansions of functions by Taylors and Maclaurin’s series.					
Unit - III	Multivariable Calculus			9 Hrs	
Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.					
Unit - IV	Multiple Integrals			9 Hrs	
Double integrals, change of order of integration, change of variables. Evaluation of triple integrals, change of variables between Cartesian, cylindrical and spherical polar co-ordinates. Finding areas and volumes using double and triple integrals.					
Unit - V	Beta and Gamma functions			9 Hrs	
Beta and Gamma functions and their properties, relation between beta and gamma functions, evaluation of definite integrals using beta and gamma functions.					
Text Books:					
1. Higher Engineering Mathematics, B. S. Grewal, 44/e, Khanna Publishers, 2017.					
2. Linear Algebra & Calculus by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad S. Chand publication.					
3. Engineering Mathematics III by N.P. Bali, Dr. K.L. Sai Prasad, University Science Press.					
Reference Books:					
1. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley, India.					
2. B.V.Ramana, “Higher Engineering Mathematics”, Mc Graw Hill publishers.					
3. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad, S. Chand Publications.					

APPLIED PHYSICS IN SCIENCE AND ENGINEERING (Common to CSE, AI&ML, CS, DS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0005T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	BSC
Prerequisite: Student should know about fundamental and basic principles in physics.					
Course Objectives:					
This course will enable students to:					
• To make a bridge between the physics in school and engineering courses. • To impart the knowledge in basic concepts of the optical phenomenon like interference, diffraction and polarization. • To understand the mechanisms of emission of light, the use of lasers as light sources for low and high energy applications, study of propagation of light wave through optical fibers along with engineering applications. • To open new avenues of knowledge and understanding the basic concepts of dielectric and magnetic materials and its application in the emerging micro devices. • Evolution of band theory to distinguish materials, basic concepts and transport phenomenon of charge carriers in semiconductors. • To identify the importance of semiconductors in the functioning of electronic devices. • To teach the concepts related to superconductivity which leads to their fascinating applications. • To familiarize the students with smart material applications relevant to engineering branches. •					
Syllabus					Total Hours:48
Unit - I		Wave Optics			10
Interference- Principle of superposition – Interference of light – Types of Interference – Path difference – Phase difference – Conditions for sustained interference- Interference in thin films (Reflection Geometry) – Colors in thin films – Newton’s Rings – Determination of wavelength and refractive index of liquid.					
Diffraction- Introduction – Fresnel and Fraunhofer diffraction – Fraunhofer diffraction due to single slit, double slit and N-slits (qualitative) – Grating spectrum.					
Polarization- Introduction – Types of polarization – Polarization by reflection, refraction and double refraction - Nicol’s Prism - Half wave and Quarter wave plates with applications.					
Unit –II		Lasers and Fiber optics			10
Lasers- Introduction – Characteristics of laser – Spontaneous and Stimulated emission of radiation – Einstein’s coefficients – Population inversion – Lasing action – Pumping mechanisms – Ruby laser– He-Ne laser – Applications of lasers.					
Fiber optics- Introduction – Principle of optical fiber – Acceptance Angle – Numerical Aperture – Classification of optical fibers based on refractive index profile and modes – Propagation of electromagnetic wave through optical fibers – Propagation Losses (qualitative) – Applications.					
Unit –III		Dielectric and Magnetic Materials			10
Dielectric Materials- Introduction – Dielectric polarization – Dielectric polarizability, Susceptibility and Dielectric constant – Types of polarizations: Electronic, Ionic and Orientation polarizations (Qualitative) – Lorentz internal field – Clausius-Mossotti equation.					
Magnetic Materials- Introduction –Basic definitions – Origin of permanent magnetic moment – Classification of magnetic materials: Dia, para & Ferro – Hysteresis – Soft and Hard magnetic materials.					

Unit –IV	Semiconductors and Superconductors	10
Semiconductors- Introduction – Classification of crystalline solids – Intrinsic semiconductors – Intrinsic Density of charge carriers- Intrinsic Conductivity-Intrinsic Fermi level- Extrinsic semiconductors– p-type and n-type- Drift and diffusion currents – Einstein’s equation – Formation of p-n junction diode – Direct and indirect band gap semiconductors – Hall effect – Hall coefficient – Applications of Hall effect. Superconductors- Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors – BCS theory – Josephson effects (AC and DC) – High T_c superconductors – Applications of superconductors.		
Unit –V	New Engineering Materials	8
Nanomaterials- Introduction – Surface area and quantum confinement –Properties of Nanomaterials – Synthesis of nanomaterials: Top-down: Ball Milling – Bottom-up: Chemical Vapour Deposition – Applications of nanomaterials. Smart Materials: Introduction- Smart Memory alloys (SMA), photovoltaics (PV) (properties and applications)		
Course Outcomes: On completion of this course, the students are able to: - Describe the importance of Interference, Diffraction and Polarization and the engineering applications as well (L2) - Demonstrate the properties of lasers and fiber optics to various applications in science and technology (L2) - Explain the fundamental concepts and theory related to dielectric and magnetic materials (L1) - Illustrate the functioning of semiconductors in electronic devices (L2) - Discuss the principles and theory related to superconductors and explore their technological applications(L2) - Illustrate diverse principles and theories of nano and smart materials and their technological applications in diverse fields (L2)		
Text Books: - Engineering Physics – Dr. M.N. Avadhanulu & Dr. P.G. Kshirsagar, S. Chand and Company - Engineering Physics – B.K. Pandey and S. Chaturvedi, Cengage Learning. - Applied Physics for Engineers- K.Venkataramanan, R. Raja, M. Sundararajan(Scitech) [3,5] 2014		
Reference Books: - Engineering Physics – Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018 - Engineering Physics – K. Thyagarajan, McGraw Hill Publishers - Engineering Physics - Sanjay D. Jain, D. Sahasrambudhe and Girish, University Press - Semiconductor physics and devices- Basic principle – Donald A, Neamen, Mc Graw Hill - T Pradeep “A Text book of Nano Science and Nano Technology”- Tata Mc GrawHill 2013		
E-resources: https://www.textbooks.com/Catalog/MG5/Applied-Physics.php https://edurev.in/courses/9596_Electromagnetic-Theory-Notes--Videos--MCQs--PPTs https://libguides.ntu.edu.sg/c.php?g=867756&p=6226561 https://bookauthority.org/books/best-applied-physics-books https://www.electronicsforu.com/resources/16-free-ebooks-on-material-science/2		

COMMUNICATIVE ENGLISH					
(Common to all Branches of Engineering)					
Course Code	L:T: P: S	Credits	Exam marks	Exam Duration	Course Type
22A0013T	3: 0: 0: 0	3	CIE:30 SEE:70	3 Hours	HSC
Course Objectives:					
- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers. - Help improve speaking skills motivating the learners to participate in activities such as role plays, discussions and structured talks/oral presentations. - Focus on appropriate reading skills for comprehension of various academic texts and authentic materials. - Impart effective strategies for good writing skills in summarizing, writing well organized essays, drafting formal letters and designing well-structured reports. - Broaden the knowledge base of grammatical structures and vocabulary and encourage their appropriate use in speech and writing.					
Syllabus					Total Hours:48
Unit - I	On the Conduct of Life: William Hazlitt				9 Hrs
Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions. Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others. Reading: Skimming to get the main idea of a text Scanning to look for specific pieces of information. Reading for Writing: Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph. Grammar and Vocabulary: Parts of Speech, Content words and function words; Word order in sentences; Basic sentence structures; Types of questions - Wh- questions.					
Unit - II	The Brook: Alfred Tennyson				9Hrs
Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts. Speaking: Discussion in pairs/small groups on specific topics followed by short structured talks. Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together. Writing: Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters. Grammar and Vocabulary: Use of Articles and zero Article Prepositions Punctuation, capital letters Cohesive devices - linkers					
Unit - III	The Death Trap: Saki				11 Hrs
Listening: Listening for global comprehension and summarizing what is listened to. Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed Reading: Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension. Writing: Paragraph Writing, Summarizing Grammar and Vocabulary: Verbs - Tenses Subject-Verb agreement Direct & Indirect speech					

Unit - IV	Ponnuthayi – Bama	10 Hrs
Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video. Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. Reading: Read and Interpret Graphic Information to reveal trends/patterns/relationships, communicate processes or display complicated data. Writing: Letter Writing: Official Letters/Report Writing Grammar and Vocabulary: Adjectives and Adverbs; Comparing and Contrasting Voice - Active & Passive Voice.		
Unit - V	My Beloved Charioteer- Shasi Deshpande	9 Hrs
Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension. Speaking: Formal oral presentations on topics from academic contexts- without the use of PPT slides Reading: Reading for Comprehension Writing: Writing structured essays on specific topics using suitable claims and evidences. Grammar and Vocabulary: Identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)		
Course Outcomes (CO): On completion of this course, student will be able to • Retrieve the knowledge of basic grammatical concepts • Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English • Apply grammatical structures to formulate sentences and correct word forms • Analyze discourse markers to speak clearly on a specific topic in informal discussions • Evaluate listening /reading texts and to write summaries based on global comprehension of these texts. • Create and develop coherent paragraph interpreting graphical description.		
Textbooks:		
1) Language and Life: English Skills for Engineering Students - Orient Black Swan		
Reference Books:		
1. Bailey, Stephen. Academic Writing: A Handbook for International Students. Routledge, 2014. 2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018. 3. Raymond Murphy's English Grammar in Use Fourth Edition (2012) E-book 4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012. 5. Oxford Learners Dictionary, 12th Edition, 2011 6. Norman Lewis Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary (2014)		
Web links:		
www.englishclub.com www.easyworldofenglish.com www.languageguide.org/english/ www.bbc.co.uk/learningenglish www.eslpod.com/index.html		

PROBLEM SOLVING USING C					
Common to (CSE, AI&ML, CS, DS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0501T	3:1:0:0	3	CIE: 30 SEE:70	3 Hours	ESC
Course Objectives: This course will enable students to: • Formulate the algorithms and draw flowcharts for solving simple problems • Convert the algorithms/flowcharts to C programs. • Illustrate the basic concepts of C programming language. • Choose a suitable C-construct to develop C code for a given problem. • Develop simple C programs to illustrate the applications of different data types such as arrays, structures, pointers, functions.					
Syllabus					Total Hours:45
Unit - I	Introduction to Programming Paradigms, Algorithms and Flowcharts				9Hrs
Introduction to programming paradigms - Programming environment, Demonstration of Assemblers, Compilers, interpreters, Linker, Loaders, Number systems					
Introduction to Algorithms and flowcharts: what is an algorithm, Representation of Algorithm, Flowchart/Pseudo code with examples, error debugging					
Unit - II	Introduction to C Language, Control Structures				9Hrs
Introduction to C Language: Structure of C program, C character set, C tokens, variables, data types, operators, Formatted I/O					
Control structures: Sequence, Selection, Iterative, Expressions, Precedence and Associativity, Expression evaluation, type casting, Type Qualifiers, Pre-processor directives					
Unit - III	Arrays, Strings				9Hrs
Arrays: Introduction, Types of arrays - one dimensional arrays, two dimensional arrays, creating, accessing and manipulating elements of 1d and 2d arrays, Applications of arrays.					
Strings: Introduction to strings, string input/output functions, arrays of strings, string manipulation Functions.					
Unit - IV	Functions, Structures & Unions				9Hrs
Functions: Defining Function, user defined functions, standard functions, inter function communication, passing arguments to functions, Parameter passing mechanisms, Recursion, Scope, Storage classes					
Structures and Unions: Defining structures, declaration and initialization of structures, Array of structures, Nested structures, Passing structure to function, Unions, Structure vs Union					
User defined data types – type definition, enumerated, Bit fields					
Unit - V	Pointers, Files				9Hrs

Pointers: Introduction, Pointer declaration and Initialization, Arrays and pointers, array of pointers, pointer to a function, pointer to a structure, pointer to pointer, void pointers, pointer arithmetic, Self-referential structures, dynamic memory allocation, command line arguments.

Files: Concept of a file, Streams, Text files and Binary files, file operations, File input / output functions, Sequential Access and Random-Access Functions in files.

Course Outcomes (CO):

On completion of this course, student will be able to

- Understand basic programming paradigms and system software required for developing C programs and also develop an algorithm/flowchart for the problems.
- Illustrate and explain the basic computer concepts and programming principles of C language and select the best selection and loop construct for solving given problem
- Develop C programs to demonstrate the applications of derived data types such as arrays, strings.
- Decompose a problem into functions and to develop modular reusable code and also understand the concepts of structures, unions, user defined data types.
- Demonstrate the concepts of pointer and perform I/O operations in files.

Text Books:

1. C Programming & Data Structures – Behrouz A. Fourazan, Richard F. Gilberg.
2. Programming with C – Byron Gottfried, Third edition, Scham's Outlines
3. C Programming: A Problem Solving Approach- Behrouz A. Fourazan , E.V.Prasad, Richard F. Gilberg

Reference Books:

1. Let us C, Yashwant Kanetkar, 6th Edition , BPB
2. C Programming and Data Structures, P. Padmanabham, Third Edition, BS Publications
3. C Programming, E. Balagurusamy, 3rd edition, TMH Publishers
4. Programming in C, Ashok N. Kamthane, Amit Kamthane, Pearson

E-resources:

1. <https://www.geeksforgeeks.org/c-programming-language/>
2. <http://en.cppreference.com/w/c>
3. https://onlinecourses.nptel.ac.in/noc19_cs42/
4. https://www.linuxtopia.org/online_books/programming_books/gnu_c_programming_tutorial/index.html
5. <https://codeforwin.org/>

ENGINEERING DRAWING					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0302T	1: 0: 0/4 :3	3	CIE: 30 SEE:70	3 Hours	ESC
Course Objectives:					
• Bring awareness that Engineering Drawing is the Language of Engineers. • Familiarize how industry communicates technical information. • Teach the practices for accuracy and clarity in presenting the technical information. • Develop the engineering imagination essential for successful design.					
Syllabus				Total Hours: 50	
Unit - I	Introduction to Engineering Drawing			10 Hrs	
Introduction to Engineering Drawing: Principles of Engineering Drawing and its significance- Conventions in drawing-lettering - BIS conventions. a) Draw the Conic sections including Ellipse, Parabola, Hyperbola, and the rectangular hyperbola using general methods b) Draw the Cycloid, Epicycloids, and Hypocycloid c) Draw the Involute of circle, square, pentagon, and hexagon					
Unit - II	Projections of points, lines and planes			10 Hrs	
Projections of points, lines, and planes: Projection of points in any quadrant, lines inclined to one and both planes, finding true lengths, finding true inclinations, angle made by line. Projections of regular plane surfaces using rotating plane method.					
Unit - III	Projections of Solids			10 Hrs	
Projections of solids: Projections of regular solids inclined to one and both the principle planes using auxiliary views method.					
Unit - IV	Sections of solids			10 Hrs	
Sections of solids: Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections.					
Unit - V	Development of surfaces			10 Hrs	
Development of surfaces: Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts.					
Course Outcomes (CO):					
On completion of this course, student will be able to					
• Draw various curves applied in engineering. (I2) • Show projections of solids and sections graphically. (I2) • Draw the development of surfaces of solids. (I3)					
Textbooks:					
1. K.L.Narayana & P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.					
2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers, 2016.					

Reference Books:

1. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2009
2. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers, 2000
3. Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009
4. K.C.John, Engineering Graphics, 2/e, PHI, 2013
5. Basant Agarwal & C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.

APPLIED PHYSICS IN SCIENCE AND ENGINEERING Lab					
(Common to CSE, AI&ML, CS, DS)					
Course Code	L:T:P:S	Credits	Exam Marks		Exam Duration
22A0010P	0:0:3:0	1.5	CIE:30	SEE:70	3 Hours
Course Type					
BSC					
Course Objectives:					
This course will enable students to:					
- Understands the concepts of interference, diffraction and their applications. - Understand the role of optical fiber parameters in communication. - Recognize the importance of energy gap in the study of conductivity and Hall Effect in a semiconductor. - Illustrates the magnetic and materials applications. - Apply the principles of semiconductors in various electronic devices					
Syllabus					Total Hours: 48
Note: In the following list, out of 12 experiments, any 2 experiments must be performed in a virtual mode					
List of Experiments					
1. Determine the thickness of the wire using wedge shape method 2. Determination of the radius of curvature of the lens by Newton's ring method 3. Determination of wavelength by plane diffraction grating method 4. Determination of dispersive power of prism. 5. Determination of wavelength of LASER light using diffraction grating. 6. Determination of particle size using LASER. 7. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle 8. Magnetic field along the axis of a circular coil carrying current –Stewart Gee's method. 9. Study the variation of B versus H by magnetizing the magnetic material (B-H curve) 10. To determine the resistivity of semiconductor by Four probe method 11. To determine the energy gap of a semiconductor 12. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect.					

Course Outcomes:

On completion of this course, the students are able to:

- Determine the radius of a curvature and / or thickness of thin wire using microscope with the help of interference concept (L2)
- Evaluate the wavelength of various colors of grating and also dispersive power of prism by spectrometer using the principle of diffraction (L2)
- Evaluate wavelength of light source and particle size with He-Ne laser using the principle of diffraction Estimate the numerical aperture of a given optical fiber and hence to find its acceptance angle (L2)
- Estimate the dielectric constant of a given material (L2)
- Examine the hysteresis loss of the magnetic material by B- H curve and estimate the magnetic field of a circular coil carrying current along the axis (L2)
- Measure the type of conductivity, hall voltage and hall coefficient of a given semiconductor using hall effect and also measure the energy band gap of a given semiconductor material (L2)

Text Books:

1. Engineering Practical Physics B Mallick S Panigrahi, 1st, Edition, Cengage Learning Publishers
2. A Text book of Engineering Physics Practical, Dr. Ruby Das, Dr. Rajesh Kumar, C. S. Robinson, Prashant Kumar Sah, UNIVERSITY SCIENCE PRESS (An Imprint of Laxmi Publications Pvt. Ltd.)

Reference Books:

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017

E-resources:

<http://vlab.amrita.edu/index.php> -Virtual Labs, Amrita University
<https://www.scribd.com/doc/81569075/Physics-Lab-Manual>
<http://www.mlritm.ac.in/assets/img/Lab%20manual%20Physics.pdf>
https://bmsit.ac.in/public/assets/pdf/physics/studymaterial/Physics%20lab%20manual_cbcs%20%20-%20kavichintu.pdf

COMMUNICATIVE ENGLISH LAB (Common to all Branches of Engineering)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0014P	0:0:3:0	1.5	CIE:30 SEE:70	3 Hours	HSC
Course Objectives This course will enable students to: • Students will be exposed to a variety of self-instructional, learner friendly modes of language learning. • Students will learn better pronunciation through sounds, stress, intonation and rhythm. • Students will be trained to use language effectively to face interviews, group discussions, public speaking. • Students will be initiated into greater use of the computer in resume preparation, report writing, format making etc.					
List of Experiments					Total Hours: 48
1. Phonetics 2. Describing objects/places/persons 3. Role Play or Conversational Practice 4. JAM 5. Etiquettes of Telephonic Communication 6. Group Discussions 7. Debates 8. Oral Presentations 9. Interviews Skills 10. Reading comprehension 11. E-mail Writing 12. Resume Writing					
Course Outcomes: On completion of this course, the students are able to: • Listening and repeating the sounds of English Language • Understand the different aspects of the English language proficiency with emphasis on LSRW skills • Apply communication skills through various language learning activities • Analyze the English speech sounds, syllable division, stress, rhythm, intonation for better Listening and Speaking Comprehension. • Evaluate and exhibit acceptable etiquette essential in social and professional settings • Create awareness on mother tongue influence and neutralize it in order to Improve fluency in spoken English.					
Suggested Software: Walden InfoTech / Young India Films					

Reference Books:

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.
5. A Textbook of English Phonetics for Indian Students by T. Balasubramanyam.

Online Learning Resources/Virtual Labs:

www.esl-lab.com

www.englishmedialab.com

www.englishinteractive.net

PROBLEM SOLVING USING C LAB (Common to CSE, AI&ML, CS, DS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0503P	0:0:3:0	1.5	CIE:30 SEE:70	3 Hours	ESC
Course Objectives: This course will enable students to: - Exploring basic data structures such as stacks and queues. - Introduces variety of data structures such as hash linked list, trees and graphs. - Introduces searching and sorting algorithms.					
Syllabus				Total Hours: 48	
List of Experiments					
1. a) Write an algorithm to calculate and display the volume of a CUBE having its height (h=10cm), width (w=12cm) and depth (8cm). b) Write an algorithm to calculate area and Circumference of a circle. c) Write an algorithm to calculate simple interest for a given P, T, and R ($SI = P \cdot T \cdot R / 100$)					
2. a) Write a C program to find sum and average of three numbers. b) Write C program to evaluate each of the following equations. (i) $V = u + at$. (ii) $S = ut + \frac{1}{2}at^2$ (iii) $T = 2 \cdot a + \sqrt{b + 9c}$ (iv) $H = \sqrt{b^2 + p^2}$					
3. a) Write program that declares Class awarded for a given percentage of marks, where mark <40%= Failed, 40% to <60% = Second class,60% to <70%=First class, >= 70% = Distinction. Read percentage from standard input. b) Write a C program to find the roots of a quadratic equation.					
4. a) Write a C program to find the sum of individual digits of a given positive integer. b) Write a C program to generate the first n terms of the Fibonacci Sequence. c) Write a C program to check whether a given number is an Armstrong number or not.					
5. Write a C program to read in two numbers, x and n, and then compute the sum of this Geometric progression: $1+x+x^2+x^3+\dots +x^n$. For example: if n is 3 and x is 5, then the program computes 1+5+25+125.					
6. a) Write a C program to find the minimum, maximum and average in an array of integers. b) Write a program in C to sort elements of array in ascending order					
7. a) Write a C program to perform addition of two matrices. b) Write a C program that uses functions to perform multiplication of two Matrices.					
8. a) Write a program in C to print individual characters of string in reverse order. b) Write a program in C to compare two strings without using string library functions. c) Write a C program to determine if the given string is a palindrome or not					
9. a) Write a C program to find factorial of a given integer using non-recursive function. b) Write a C program to find factorial of a given integer using recursive function.					

10. a) Write C program to find GCD of two integers by using recursive function.
b) Write C program to find GCD of two integers using non-recursive function
11. Write a C program to Calculate Total and Percentage marks of a student using structure.
12. Write a C program that uses functions to perform the following operations:
 - i) Reading a complex number
 - ii) Writing a complex number
 - iii) Addition of two complex numbers
 - iv) Multiplication of two complex numbers
 (Note: represent complex number using a structure.)
- 13.a) Write a program for display values reverse order from array using pointer.
b) Write a program through pointer variable to sum of n elements from array.
c) Write a program in C to find the largest element using Dynamic Memory Allocation.
14. Write a C program to check whether given number is even or odd; number is given as Input through command line.
15. a) Write a C program to copy contents of one file to another file
b) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).

Course Outcomes:

On completion of this course, the students are able to:

CO1: Convert the algorithms/flowcharts to C programs.

CO2: Use conditional and iterative statements for writing the C programs.

CO3: Make use of different data-structures like arrays, strings, structures for solving problems.

CO4: Decompose a problem into functions so that they can be reused.

CO5: Develop basic C programs that uses pointers and files

Text Books:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

Reference Books:

1. C Programming and Data Structures, P.Padmanabham, Third Edition, BS Publications
2. C Programming, E.Balagurusamy, 3rd edition, TMHPublishers
3. Programming in C, Ashok N. Kamthane, AmitKamthane, Pearson

E-resources:

- https://onlinecourses.nptel.ac.in/noc19_cs42/
- <http://learn-c.org/>
- https://www.linuxtopia.org/online_books/programming_books/gnu_c_programming_tutorial/index.html
- <https://www.geeksforgeeks.org/c-programming-language/>
- <https://codeforwin.org/>



GEETHANJALI INSTITUTE OF SCIENCE AND TECHNOLOGY
(AUTONOMOUS)
NELLORE – 524137 (A.P) INDIA

B. TECH Computer Science & Engineering (AI&ML)
Course Structure (RG22)

Semester - 2 (Theory-4, Lab-5)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	BSC	22A0002T	Differential Equations & Vector Calculus	3	0	0	3
2	BSC	22A0006T	Chemistry	3	0	0	3
3	ESC	22A0203T	Basic Electrical & Electronics Engineering	3	0	0	3
4	ESC	22A0504T	Data Structures	3	0	0	3
5	ESC(LAB)	22A0304P	Engineering Workshop	0	0	3	1.5
6	ESC (LAB)	22A0502P	IT Workshop	0	0	3	1.5
7	BSC(LAB)	22A0011P	Chemistry Lab	0	0	3	1.5
8	ESC(LAB)	22A0204P	Basic Electrical & Electronics Engineering Lab	0	0	3	1.5
9	ESC(LAB)	22A0505P	Data Structures Lab	0	0	3	1.5
			Total credits				19.5

Category	Credits
Basic Science Course (BSC)	7.5
Engineering Science Course (ESC)	12
Total	19.5

DIFFERENTIAL EQUATIONS & VECTOR CALCULUS					
Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
22A0002T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	BSC
Course Objectives:					
To enlighten the learners in the concept of differential equations and multivariable calculus, to furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.					
Syllabus					Total Hours:45
Unit - I	Linear Differential Equations of Higher Order (Constant Coefficients)				9 Hrs
Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Mass spring system.					
Unit - II	Partial Differential Equations				9 Hrs
Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order equations using Lagrange's method. Nonlinear equations of first order – Type I, II, III, IV.					
Unit - III	Applications of Partial Differential Equations				9 Hrs
Classification of PDE, method of separation of variables for second order equations. Applications of Partial Differential Equations: One dimensional Wave equation (Without Derivation), Solutions one Dimensional Wave equation by the method of separation of variables and related Problems.					
Unit - IV	Vector Differentiation				9 Hrs
Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, vector identities.					
Unit - V	Vector Integration				9 Hrs
Line integral-circulation-work done, surface integral-flux, green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and applications of these theorems.					
Course Outcomes (CO):					
On completion of this course, student will be able to					
• Solve the linear differential equations with constant coefficients by appropriate method. • Apply a range of techniques to find solutions of standard partial differential equations. • Classify the PDE, learn the applications of PDEs • Apply del to Scalar and vector point functions, illustrate the physical interpretation of Gradient, Divergence and Curl. • Apply Green's, Stokes and Divergence theorem in evaluation of double and triple integrals.					
Text Books:					
1. B.S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017. 2. Differential Equations & Vector Calculus by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S. Chand publication.					

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. B.V.Ramana, “Higher Engineering Mathematics”, Mc Graw Hill publishers.
3. Engineering Mathematic I & II, by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S. Chand publication.

CHEMISTRY (Common to CSE, AI&ML, CS, ECE, EEE, DS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0006T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	BSC
Course Objectives: Student will be able to					
- To familiarize engineering chemistry and its applications. - To train the students on the principles and applications of electrochemistry and polymers. - To introduce instrumental methods.					
Syllabus				Total Hours: 48 Hrs	
Unit- I	Structure and Bonding				9Hrs
Planck's quantum theory, dual nature of matter, Schrodinger wave equation, significance of Ψ and Ψ^2 , molecular orbital theory – bonding in homo- and hetero nuclear diatomic molecules – energy level diagrams of O ₂ and CO, etc. π -molecular orbitals of butadiene and benzene, calculation of bond order.					
Unit-II	Modern Engineering materials				10Hrs
Coordination compounds: Crystal field theory – salient features – splitting of d-orbitals in octahedral and tetrahedral geometry. Basic concept, band diagrams for conductors, semiconductors and insulators, Effect of doping on band structures. Super capacitors: Introduction, Basic Concept-Classification – Applications. Nano chemistry: Introduction, classification of nanomaterials, properties and applications of Fullerenes, and carbon nanotubes.					
Unit-III	Electrochemistry and Applications				10Hrs
Electrodes – concepts, reference electrodes (Calomel electrode, Ag/AgCl electrode and glass electrode); Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), conductometric titrations (acid-base titrations). Primary cells: Zinc-air battery, Secondary cells: lead acid and lithium-ion batteries-working of the batteries including cell reactions, Fuel cells: hydrogen-oxygen, methanol -oxygen fuel cells – working principle of the cells.					
Unit-IV	Polymer Chemistry				10Hrs
Introduction to polymers, functionality of monomers, Types of polymerization-addition, condensation and copolymerization with specific examples and mechanisms of polymerization. Plastics - Thermoplastics and Thermosetting, Preparation, properties and applications of – PTFE, Bakelite, Calculation of molecular weight of polymer by weight average and number average method, Polydispersity Index. Elastomers–Buna-S, Buna-N–preparation, properties and applications. Conducting polymers – polyacetylene, polyaniline, – mechanism of conduction and					

applications. Biodegradable polymers: polylactic acid, poly dioxanone, starch, cellulose.		
Unit-V	Instrumental Methods and its applications	9Hrs
EMR spectra, Beer-Lambert's law, Basic Principle, Instrumentation and applications of UV-visible spectrophotometer and FTIR, Chromatography-Introduction, Principle and instrumentation of Gas Chromatography (GC), retention time, TLC, R _f factor.		
Course Outcomes (CO): After completion of the course, students will be able to		
• Describe Planck's quantum theory, dual nature of matter, Schrodinger equation, molecular orbital Theory and molecular orbital energy level diagram of different molecules • Explain Crystal field theory, splitting in octahedral and tetrahedral geometry and the magnetic behavior, Oxidation state, coordination and color of complexes. • Explain the principle of Band diagrams of conductors, superconductor, semiconductors and insulator and nonmaterial • Discuss the principles of electrochemistry in potentiometry, conductometry, battery and electrochemical sensors • Explain polymerization and the preparation, properties, and applications of thermoplastics &thermosetting, elastomers, & conducting polymers • Discuss the different applications of analytical instruments		
Text Books:		
1. P. C. Jain & Monika Jain, Engineering Chemistry, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 16th edition, 2013. 2. K. N. Jayaveera, G. V. Subba Reddy and C. Ramachandriah, Engineering Chemistry, Mc.Graw Hill Publishers, New Delhi. 3. Energy scenario beyond2100,by S.Muthu Krishna Iyer.		
Reference Books:		
1. J. D. Lee, Concise Inorganic Chemistry, Oxford University Press, 5th edition 2010. 2. Skoog and West, Principles of Instrumental Analysis, Thomson, 6th edition, 2007. 3. Peter Atkins, Julio de Paula and James Keelar, Atkins' Physical Chemistry, Oxford University Press, 10th edition, 2010.		

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (Common for all branches)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0203T	3: 0:0:0	3	CIE: 30 SEE:70	3 Hours	ESC
Course Objectives: Student will be able to					
1. Introduce the concept of electrical circuits and its components. 2. Introduce the characteristics of various electronic devices. 3. Impart the knowledge of various configurations, characteristics and applications of electrical & electronic components.					
Unit - I	DC&AC Circuits			9 Hrs	
Electrical circuit elements (R - L and C) - Kirchhoff laws - Series and parallel connection of resistances with DC excitation. Superposition Theorem - Representation of sinusoidal waveforms - peak and rms values - phasor representation - real power - reactive power - apparent power - power factor - Analysis of single-phase ac circuits consisting of RL - RC - RLC series circuits, Resonance.					
Learning Outcomes: At the end of this unit, the student will be able to					
● Recall Kirchoff laws ● Analyze simple electric circuits with DC excitation ● Apply network theorems to simple circuits ● Analyze single phase AC circuits consisting of series RL - RC - RLC combinations					
Unit - II	DC & AC Machines			9 Hrs	
A: DC Machines: Principle and operation of DC Generator - EMF equations - OCC characteristics of DC generator – principle and operation of DC Motor – Performance Characteristics of DC Motor - Speed control of DC shut Motor.					
B: AC Machines: Principle and operation of Single-Phase Transformer-EMF equation - OC and SC tests on transformer - Principle and operation of 3-phase induction motor and alternator., [Elementary treatment only]					
Learning Outcomes: At the end of this unit, the student will be able to					
● Explain principle and operation of DC Generator & Motor. ● Perform speed control of DC Motor ● Explain operation of transformer, EMF equation ● Explain construction & working of induction motor, alternators - DC motor					
Unit - III	Basics of Power Systems			10 Hrs	
Layout & operation of Hydro, Thermal, Nuclear Stations - Solar & wind generating stations – Typical					
AC Power Supply scheme – Elements of Transmission line – Types of Distribution systems: Primary & Secondary distribution systems.					
Learning Outcomes: At the end of this unit, the student will be able to					
● Understand working operation of various generating stations ● Explain the types of Transmission and Distribution systems					
Unit - IV	P-N Junction Diode			10 Hrs	
P-N Junction Diode: Diode equation, Energy Band diagram, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Diffusion and Transition Capacitances. Zener diode operation, Zener diode as voltage regulator.					
Rectifiers: P-N junction as a rectifier - Half Wave Rectifier, Ripple Factor - Full Wave Rectifier, Bridge Rectifier.					

Bipolar Junction Transistor (BJT): Construction, Principle of Operation, Symbol, Amplifying Action, Common Emitter, Common Base and Common Collector configurations and Input-Output Characteristics, Comparison of CE, CB and CC configurations		
<u>Learning outcomes:</u> At the end of this unit, the student will be able to • Remember and understand the basic characteristics of semiconductor diode. (L1) • Understand principle of operation of Zener diode and other special semiconductor diodes. (L1) • Analyze BJT based biasing circuits. (L3) • Design an amplifier using BJT based on the given specifications. (L4)		
Unit - V	Junction Field Effect Transistor& Digital Electronics	10 Hrs
Junction Field Effect Transistor and MOSFET: Construction, Principle of Operation, Symbol, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET. Digital Electronics: Logic Gates, Simple combinational circuits–Half and Full Adders, BCD Adder. Latches and Flip-Flops (S-R, JK and D), Shift Registers and Counters. Introduction to Microcontrollers and their applications (Block diagram approach only).		
<u>Learning outcomes:</u> At the end of this unit, the student will be able to • Explain the functionality of logic gates. (L2) • Apply basic laws and De Morgan’s theorems to simplify Boolean expressions. (L3) • Analyze standard combinational and sequential circuits. (L4) • Distinguish between 8085 • & 8086 microprocessors also summarize features of a microprocessor. (L5)		
Course Outcomes (CO): After completion of the course, students will be able to • Apply KCL, KVL and network theorems to analyses DC circuit. • Analyze the single-phase AC Circuits, the representation of alternating quantities and determining the power and power factor in these circuits. • Comprehend the construction and Operation of DC and AC machines. • Understand the operation of PN Junction diode and its application in rectifier circuits. • Compare the different configurations of BJT and draw the V-I characteristics of BJT, JFET and MOSFET.		
Text Books 1. M.Surya Kalavathi, Ramana Pilla, Ch. Srinivasa Rao, Gulinindala Suresh, “ Basic Electrical and Electronics Engineering”, S.Chand and Company Limited, New Delhi, 1st Edition, 2017. 2. R.L.Boylestad and Louis Nashlesky, “Electronic Devices & Circuit Theory”, Pearson Education, 2007.		
References 1. V.K. Mehtha and Rohit Mehta, “Principles of Electrical Engineering and Electronics”, S.Chand & Co., 2009. 2. Jacob Milliman, Christos C .Halkias, Satyabrata Jit (2011), “Electronic Devices and Circuits”, 3rd edition, Tata McGraw Hill, New Delhi. 3. Thomas L. Floyd and R. P. Jain, “Digital Fundamentals”, Pearson Education, 2009. 4. David A. Bell, “Electronic Devices and Circuits”, Oxford University Press, 2008. 5. Nagrath I.J. and D. P. Kothari, “Basic Electrical Engineering”, Tata McGraw Hill, 2001. 6. Mittle N., “Basic Electrical Engineering”, Tata McGraw Hill Education, New Delhi, 2nd Edition, 2005.		

E - Resources

1. <https://www.electrical4u.com/ohms-law-equation-formula-and-limitation-of-ohms-law/>
2. <https://www.eeweb.com/passives>
3. <http://nptel.ac.in/courses/108108076/>
4. <http://nptel.ac.in/downloads/108105053/>

DATA STRUCTURES (Common to CSE, AI&ML, CS, DS)					
Course Code	L:T:P	Credits	Exam. Marks	Exam Duration	Course Type
22A0504T	3:0:0	3	CIE:30 SEE:70	3 Hours	ESC
Course Objectives: - Introduce the fundamental concept of data structures and Arrays - Emphasize the importance of data structures in developing and implementing efficient algorithms - Introduces a variety of data structures such as linked structures, stacks, queues, trees, and graphs					
Syllabus					48 Hours
Unit –I					10 Hours
Introduction to Data Structures: Definitions, Concept of Data Structures, Overview of Data Structures, Implementation of Data Structures Arrays: Definition, terminology, One Dimensional array, multi-Dimensional arrays, Pointer Arrays, Linear Search, Binary Search					
Unit –II					9 Hours
Linked Lists: Definition, Single Linked List, Circular Linked List, Double Linked List, Circular Double Linked List, Applications of Linked List					
Unit –III					10 Hours
Stacks: Introduction, Definition, Representation of Stack, Operations on Stacks, Applications of stack: Expression Evaluation, Conversion of Infix to postfix and prefix expression, Tower of Hanoi Queues: Introduction, Definition, Representation of Queues, Operations on Queues, Various Queue Structures, Applications of Queues					
Unit –IV					10 Hours
Trees: Basic Terminologies, Definition and Concepts, Binary Tree, Representation of Binary Tree, Operations on Binary Tree, Binary Search Tree, Operations in BST: insertion, deletion, finding min and max, finding the kth minimum element. Heap Tree, Height Balanced Binary Tree, Red-Black Tree, Splay Tree, B Trees, B+ Trees					
Unit –V					9 Hours
Graphs: Introduction, Graph Terminologies, Representation of graphs, Operations on Graphs, Graph Traversal: Breadth First Search (BFS), Depth First Search (DFS) Sorting: Insertion sort, Selection sort, Bubble sort, Counting sort, Quick sort, Merge sort, heap sort					
Text Books: - Classic Data Structures, Second Edition, Debasissamanta, PHI - Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S.Sahni and Susan Anderson Freed, Universities Press					
References: - Data Structures: A Pseudo code Approach with C, 2nd Edition, R.F.Gilberg and B. A. Forouzan, Cengage Learning. “Data Structures and Algorithm Analysis in C” by Weiss “Data Structure Through C” by Yashavant P Kanetkar “Problem Solving in Data Structures and Algorithms Using C: The Ultimate Guide to Programming Interviews” by Hemant Jain					
Course Outcomes:					

After the completion of the course students will able to

- CO1: Ability to select the data structures that efficiently model the information in a problem
- CO2: Discuss the computational efficiency of the principal algorithms for sorting & searching
- CO3: Implement basic operations on stack and queue using array representation.
- CO4: Use linked structures, trees, and Graphs in writing programs
- CO5: Demonstrate different methods for traversing Graphs and Trees

ENGINEERING WORKSHOP (Common to all branches)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0304P	0:0:3:0	1.5	CIE:30 SEE:70	3 Hours	ESC
Course Objectives: This course will enable students to: Familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills.					
Syllabus					Total Hours: 48
List of Experiments					
Wood Working: Familiarity with different types of woods and tools used in wood working and make following joints a) Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint Sheet Metal Working: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets a) Tapered tray b) Conical funnel c) Elbow pipe d) Brazing Fitting: Familiarity with different types of tools used in fitting and do the following fitting exercises a) V-fit b) Dovetail fit c) Semi-circular fit d) Bicycle tire puncture and change of two-wheeler tyre Electrical Wiring: Familiarities with different types of basic electrical circuits and make the following connections a) Parallel and series b) Two-way switch c) Godown lighting d) Tube light e) Three phase motor f) Soldering of wires					
Course Outcomes: On completion of this course, the students are able to: ➤ Apply wood working skills in real world applications. (I3) ➤ Build different objects with metal sheets in real world applications. (I3) ➤ Apply fitting operations in various applications. (I3) ➤ Apply different types of basic electric circuit connections. (I3) ➤ Use soldering and brazing techniques. (I2)					
Text Book(s):					
Note: In each section a minimum of three exercises are to be carried out.					

IT WORKSHOP					
Course Code	L:T:P	Credits	Exam. Marks	Exam Duration	Course Type
22A0502P	0:0:3	1.5	CIE:30 SEE:70	3 Hours	ESC
Course Objectives: - To make the students know about the internal parts of a computer, assembling and disassembling a computer from the parts, preparing a computer for use by installing the operating system. - To provide technical training to the students on Productivity tools like Word processors Spreadsheets, Presentations and LaTeX. - To learn about Networking of computers and use Internet facility for Browsing and Searching.					
Syllabus Task 1: Learn about Computer: Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report. Task 2: Assembling a computer: Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods Task 3: Install Operating system: Student should install Linux on the computer. Student may install another operating system (including proprietary software) and make the system dual boot or multi boot. Students should record the entire installation process. Task 4: Operating system features: Students should record the various features that are supported by the operating system(s) installed. They have to submit a report on it. Students should be able to access CD/DVD drives, write CD/DVDs, access pen drives, print files, etc. Students should install new application software and record the installation process. Networking and Internet. Task 5: Networking: Students should connect two computers directly using a cable or wireless connectivity and share information. Students should connect two or more computers using switch/hub and share information. Crimping activity, logical configuration etc. should be done by the student. The entire process has to be documented. Task 6: Browsing Internet: Student should access the Internet for Browsing. Students should search the Internet for required information. Students should be able to create e-mail account and send email. They should get acquaintance with applications like Facebook, skype etc. If Intranet mailing facility is available in the organization, then students should share the information using it. If the operating system supports sending messages to multiple users (LINUX supports it) in the same network, then it should be done by the student. Students are expected to submit the information about different browsers available, their features, and search process using different natural languages, and creating email account. Task 7: Antivirus: Students should download freely available Antivirus software, install it and use it to check for threats to the computer being used. Students should submit information about the features of the antivirus used, installation process, about virus definitions, virus engine etc.					

Productivity tools

Task 8: Word Processor: Students should be able to create documents using the word processor tool. Some of the tasks that are to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, inserting header and Footer, changing the font, changing the color, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Students should submit a user manual of the word processor considered, Image Manipulation tools.

Task 9: Presentations: creating, opening, saving and running the presentations, selecting the style for slides, formatting the slides with different fonts, colors, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyperlinking, running the slide show, setting the timing for slide show.

Task 10: Spreadsheet: Students should be able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells. Students should submit a user manual of the Spreadsheet

Task 11: LaTeX: Introduction to Latex and its installation and different IDEs. Creating first document using Latex, using content into sections using article and book class of LaTeX. Styling Pages: reviewing and customizing different paper sizes and formats. Formatting text (styles, size, alignment, colors and adding bullets and numbered items, inserting mathematical symbols, and images, etc.). Creating basic tables, adding simple and dashed borders, merging rows and columns. Referencing and Indexing: cross-referencing (refer to sections, table, images), bibliography (references).

References:

1. Introduction to Computers, Peter Norton, McGraw Hill
2. MOS study guide for word, Excel, Powerpoint & Outlook Exams, Joan Lambert, Joyce Cox, PHI.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
4. Networking your computers and devices, Rusen, PHI
5. Trouble shooting, Maintaining & Repairing PCs, Bigelows, TMH
6. Lamport L. LATEX: a document preparation system: user's guide and reference manual. Addison-wesley; 1994.

CHEMISTRY LAB					
(Common to CSE, AI&ML, CS, ECE, EEE, DS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0011P	0:0:1.5:0	1.5	CIE:30 SEE:70	3 Hours	BSC
Course Objectives: This course will enable students to: The objective of the laboratory sessions is to enable the learners to get hands-on experience on the principles discussed in theory sessions and to understand the applications of these concepts in engineering.					
Syllabus					Total Hours: 48
List of Experiments					
1. Conduct metric titration of strong acid vs. strong base, 2. Determination of cell constant and conductance of solutions 3. Potentiometry - determination of redox potentials and emfs 4. pH metric titration of strong acid vs. strong base 5. Determination of Strength of an acid in Pb-Acid battery 6. Preparation of a polymer 7. Verification of Lambert-Beer's law 8. Preparation of Nanomaterials 9. Separation of organic mixtures by Thin Layer chromatography 10. Identification of simple organic compounds by IR. 11. Estimation of Ferrous Iron by Dichrometry. 12. Determination of Copper by EDTA method. (Any 10 experiments from the above list)					
Course Outcomes: On completion of this course, the students are able to: ➤ Determine the cell constant and conductance of solutions and the strength of an acid by conductometry ➤ Synthesize of advanced polymer materials ➤ Measure the strength of an acid present in secondary battery and Ferrous ion using volumetric analysis ➤ Determine the potentials and EMFs of solutions by Potentiometry ➤ Identify some organic and inorganic compounds by instrumental methods ➤ Synthesize of nanomaterials by simple methods					
Text Book(s): 1. A Textbook of Quantitative Analysis, Arthur J. Vogel. 2. Jain & Jain. Engineering Chemistry: Dhanapath rai Publications., 2015. 3. S.S.Dara, Experiments and Calculations in Engineering Chemistry: S-Chand Publications, Revised edition, 2008.					
Reference Book(s): 1. S.K. Bhasin and Sudha Rani, "Laboratory Manual on Engineering Chemistry", Dhanpat Rai Publishing Company, New Delhi, 2 nd edition. 2. Sunitha Rattan, "Experiments in Applied Chemistry", S.K. Kataria & Sons, New Delhi, 2 nd edition.					

Basic Electrical and Electronics Engineering Lab (Common for all branches excluding EEE & ECE)					
Course Code	L:T:P	Credits	Exam. Marks	Exam Duration	Course Type
22A0240P	0:0:3	1.5	CIE:30 SEE:70	3 Hours	PC
Course Objectives: To get practical knowledge about basic electrical circuits, electronic devices like Diodes, BJT, JFET and also analyze the performance of DC Motors, AC Motors and Transformers.					
Syllabus					
LIST OF EXPERIMENTS: (Conduct all experiments). Note: All the experiments shall be implemented using both Hardware and Software. Equipment Required: 1. Verification of Kirchhoff's Laws. 2. Verification of Superposition Theorem. 3. Magnetization characteristics of DC Shunt Generator. 4. Brake Test on DC-Shunt Motor. Determination of Performance curves. 5. OC & SC Tests on Single Phase Transformer. 6. V-I Characteristics of Solar Cell 7. V-I Characteristics of PN junction Diode 8. V-I Characteristics Zener Diode 9. Half Wave Rectifier and Full Wave rectifier. 10. Input and Output characteristics of BJT with CE configuration 11. Input and Output characteristics of BJT with CB configuration 12. Input and Output Characteristics of JFET. Additional Experiments: 13. Speed control of DC Shunt Motor 14. Brake Test on Three Phase Induction Motor.					
Course Outcomes: After the completion of the course students will able to, 1. Experimentally verify the basic circuit theorems, KCL and KVL 2. Draw the Open circuit characteristics of DC Shunt Generator circuits experimentally. 3. Acquire hands on experience of conducting various tests on dc shunt motor, single phase transformers obtaining their performance indices using standard analytical as well as graphical methods 4. Experimentally verify the V-I characteristics of Solar cell 5. Draw the characteristics of different semiconductor devices like PN junction Diode, Zener Diode, BJT and JFET by conducting suitable experiments. 6. Experimentally verify the working of half and full wave rectifier by using PN Junction diodes					

DATA STRUCTURES LAB (Common to CSE, AI&ML, CS, DS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0505P	0:0:3:0	1.5	CIE:30 SEE:70	3H	ESC
Course Objectives: This course will enable students to: - Exploring basic data structures such as stacks and queues. - Introduces variety of data structures such as hash linked list, trees and graphs. - Introduces searching and sorting algorithms					
Syllabus					Total Hours: 48
List of Experiments					
- Write C program that use both recursive and non-recursive functions to perform Linear search for a key value in a given list. - Write C program that use both recursive and non-recursive functions to perform Binary search for a key value in a given list. - Write a C program that uses functions to perform the following operations on singly linked list.: - Creation - Insertion - Deletion - Traversal - Write a C program that uses functions to perform the following operations on doubly linked list.: - Creation - Insertion - Deletion - Traversal - Write a C program that uses functions to perform the following operations on circular linked list.: - Creation - Insertion - Deletion - Traversal - Write a C program that implement stack (its operations) using - Arrays - Pointers - Write a C program that implement Queue (its operations) using - Arrays - Pointers - Write a C program that Uses Stack Operations to Convert Infix expression into Postfix expression - Write a C program that Uses Stack Operations to Evaluate the Postfix expression - Write a C program that uses functions to perform the following - creating a binary tree of integers - Traversing the above binary tree in preorder, inorder and post order - Write a C program that uses functions to perform the following operations on Binary search Tree.: - Creation - Insertion - Deletion - Write a program that implements the following sorting methods to sort a given list of integers in ascending order - Quick sort - Merge sort - Write a program to implement the graph traversal methods.					
Course Outcomes: On completion of this course, the students are able to: CO1: Use basic data structures such as arrays, Stacks and Queues CO2: Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals CO3 Use various searching and sorting algorithms. CO4: Use linked structures, trees, and Graphs in writing programs					
Text Book(s): - Classic Data Structures, Second Edition, Debasissamanta, PHI - Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S.Sahni and Susan Anderson Freed, Universities Press - Circuit Theory Analysis & Synthesis A. Chakrabarti, Dhanpat Rai &					

Reference Book(s):

1. Data Structures: A Pseudo code Approach with C, 2nd Edition, R.F.Gilberg and B. A. Forouzan, Cengage Learning.
2. “Data Structures and Algorithm Analysis in C” by Weiss
3. “Data Structure Through C” by Yashavant P Kanetkar
4. “Problem Solving in Data Structures and Algorithms Using C: The Ultimate Guide to Programming Interviews” by Hemant Jain



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Semester-3 (Theory-6, Lab-3, SC-1, MC-1)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	BSC	22A0016T	Probability & Statistics	3	0	0	3
2	PCC	22A0508T	Software Engineering	3	0	0	3
3	PCC	22A0514T	Python Programming	3	0	0	3
4	ESC	22A0410T	Digital Electronics and Micro Processors	3	0	0	3
5	PCC	22A0521T	Design and Analysis of Algorithms	3	0	0	3
6	HSC	22A0022T	Managerial Economics & Financial Analysis	3	0	0	3
7	PCC(Lab)	22A0517T	Python Programming Lab	0	0	3	1.5
8	ESC(Lab)	22A0411P	Digital Electronics and Micro Processors Lab	0	0	3	1.5
9	PCC(Lab)	22A0524P	Algorithms Lab	0	0	3	1.5
10	SC	22A0511	Skill Oriented Course HTML and Java Script	1	0	2	2
11	MC	22A0030T	Mandatory Course Constitution of India	2	0	0	0
				Total credits			24.5

Category	Credits
Basic Science Course (BSC)	3
Professional Core Courses (PCC)	12
Engineering Science Courses (ESC)	4.5
Humanities and Social Science Course (HSC)	3
Skill Oriented Course (SC)	2
Total	24.5



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PROBABILITY AND STATISTICS (Common to CSE, AI&ML, DS, CS, CE)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0016T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	BSC

Course Objectives:

- Summarize the basic concepts of data science and its importance in engineering analyze the data quantitatively or categorically, measure of averages, variability, adopt correlation methods and principle of least squares, regression analysis

Course Outcomes(CO):

On completion of this course, student will be able to:

- Define the terms trial, events, sample space, probability, and laws of probability, Make use of probabilities of events in finite sample spaces from experiments,
- Apply Baye's theorem to real time problems and explain the notion of random variable, distribution functions and expected value.
- Apply Binomial and Poisson distributions for real data to compute probabilities, theoretical frequencies, interpret the properties of normal distribution and its applications.
- Explain the concept of estimation, interval estimation and confidence intervals; apply the concept of hypothesis testing for large samples.
- Apply the concept of testing hypothesis for small samples to draw the inferences and estimate the goodness of fit.

Syllabus		Total Hours:48
Module – I	Descriptive Statistics	10 Hrs
Statistics Introduction, Measures of Variability (dispersion) Skewness Kurtosis, correlation, correlation coefficient, rank correlation, principle of least squares, method of least squares, regression lines, regression coefficients and their properties.		
Module – II	Probability	9 Hrs
Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties.		
Module – III	Probability distributions	10 Hrs
Discrete distribution - Binomial, Poisson approximation to the binomial distribution and their properties. Continuous distribution: normal distribution and their properties. Normal approximation to Binomial Distribution. Uniform distribution		
Module – IV	Estimation and Testing of hypothesis, large sample tests	9 Hrs
Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems.		
Module – V	Test of Significance	10 Hrs
Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), χ^2 - test for goodness of fit, χ^2 - test for independence of attributes.		

Text Books:

1. B.S.Grewal , “Higher Engineering Mathematics”, Khanna publishers.
2. Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008.
3. Probability & Statistics by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad S. Chand publication.

Reference Books:

1. B.V.Ramana, “Higher Engineering Mathematics”, Mc Graw Hill publishers.
2. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968.
3. Mathematical Foundations of Statistics by K. C. Kapoor & Gupta, S. Chand Publications.



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Software Engineering

(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0508T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students to:

- To learn the basic concepts of software engineering and life cycle models.
- To understand the requirements engineering and agile models.
- To interpret the basic concepts of software design
- To understand the basic concepts of black box and white box software testing and enable to design test cases for unit, integration, and system testing
- To understand the basic concepts in risk management and reengineering..

Course Outcomes(CO):

On completion of this course, student will be able to

- Use software life cycle activities for process models(L3).
- Use software requirements specifications for given problems(L3).
- Apply design concepts, component Level and user interface design for a given problems(l3)
- Apply various test cases for a given problems(L3).
- Apply quality management concepts at the application level.(L3)
- Determine risk management plans and implementation(l3)

Syllabus		Total Hours:48
Module-I	Software ,Software Engineering and Software Process	9Hrs

Basic concepts: abstraction versus decomposition, evolution of software engineering techniques, Software development life cycle (SDLC) models: Iterative waterfall model, Prototype model, Evolutionary model, Spiral model, RAD model, Agile models, software project management: project planning, project estimation, COCOMO, project scheduling, Organization and team structure, risk management.

Module-II	Requirements Engineering and Agile Models	10Hrs
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The Nature of software, The unique nature of web apps, The software myths

Requirements Engineering: Functional and non-functional requirements, the software requirements document, Requirements specification, Requirements engineering processes, Requirements elicitation and analysis, Requirements validation, Requirements management

Agile development model: What is agility, what is an agile process, XP, Agile process models, CMMI

Module-III	Design Concepts, Component Level and User Interface Design	10Hrs
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Design Concepts: Good Software Design, Cohesion and coupling, The design Process, Design concepts, design models

Component Level Design: Introduction to components, designing class-based components

User Interface Design: Golden rules, User Interface analysis and design

Module-IV	Software Testing Strategies, Project Metrics and Quality Management	10Hrs
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Software Testing Strategies: coding standards and guidelines, code review, testing, types of testing.

Process and project metrics: software measurement, A framework for product metrics.

Quality Management: Quality, Software quality, metrics for software quality, software quality assurance.

Module-V	Risk Management and Reengineering	9Hrs
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Risk Management: Risk identification, risk projection, risk refinement, RMMM

Maintenance and reengineering: Software maintenance, reengineering, reverse engineering and forward engineering

Case Study: Implementation of safe home system using software engineering principles.

Text Books:

1. Pressman R, “Software Engineering- Practioner Approach”, McGraw Hill.
2. Somerville, “Software Engineering”, Pearson 2.
3. ajib Mall, “Fundamentals of Software Engineering”, 5th Edition, PHI, 2018.

Reference Books:

1. Richard Fairley, “Software Engineering Concepts”, Tata McGraw Hill.
2. Jalote Pankaj, “An integrated approach to Software Engineering”, Narosa.

E-resources:

<https://nptel.ac.in/courses/106/105/106105182/> <http://peterindia.net/SoftwareDevelopment.html>



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PYTHON PROGRAMMING

(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0514T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students to:

- Introduction to Programming Basics, Binary Computation, problem-solving methods and algorithm development. Includes procedural and data abstractions, program design, debugging, testing and documentation .covers data types ,control structures, functions, parameter passing, library functions ,arrays ,Inheritance and Object oriented design

Course Outcomes(CO):

On completion of this course, student will be able to

- Understand the features, functions, strings, files of python.
- Analyze the flow control, looping statements and its functions in Python.
- Identify the methods to create and manipulate lists, and tuples.
- Apply the modular approach for solving the problems on Modules and Packages .
- Implement programs with the use of oops Concept in python.
- Apply dictionaries and files concepts for real world applications.

Syllabus		Total Hours:48
Module-I	Introduction to Python	10Hrs
Introduction: History of Python, Features of Python Programming, Applications of Python Programming, Running Python Scripts, Comments, Typed Language, Identifiers, Variables, Keywords, Input/output, Indentation, Data types, Type Checking, range(), format(), Math Module.		
Module-II	Operators Expressions and Functions	9Hrs
Operators and Expressions: Arithmetic, Assignment, Relational, Logical, Boolean, Bitwise, Membership, Identity, Expressions and Order of Evaluations, Control Statements. Functions: Introduction, Defining Functions, Calling Functions, Anonymous Function, Fruitful Functions and Void Functions, Parameters and Arguments, Passing Arguments, Types of Arguments, Scope of variables, Recursive Functions.		
Module-III	Strings, Lists, Tuples, and Dictionaries	10Hrs
Strings, Lists, Tuples, and Dictionaries: Strings- Operations, Slicing, Methods, List- Operations, slicing, Methods, Tuple- Operations, Methods, Dictionaries- Operations, Methods, Mutable Vs Immutable, Arrays Vs Lists, Map, Reduce, Filter, Comprehensions.		
Module-IV	Files, Modules and Packages	9Hrs
Files, Modules and Packages: Files- Persistent, Text Files, Reading and Writing Files, Format Operator, Filename and Paths, Command Line Arguments, File methods, Modules- Creating Modules, Import Statement, Form Import Statement, name spacing, Packages- Introduction to PIP, Installing Packages via PIP(Numpy).		
Module-V	Object Oriented Programming, Errors and Exceptions	10Hrs

OOP in Python: Object Oriented Features, Classes, self variable, Methods, Constructors, Destructors, Inheritance, Overriding Methods, Data hiding, Polymorphism.

Error and Exceptions: Difference between an error and Exception, Handling Exception, try except **Files,**

Modules and Packages: Files- Persistent, Text Files, Reading and Writing Files, Format Operator, Filename and Paths, Command Line Arguments, File methods, Modules- Creating Modules, Import Statement, Form Import Statement, name spacing, Packages- Introduction to PIP, Installing Packages via PIP(Numpy).block, Raising Exceptions.

Text Books:

1. Vamsi Kurama, Python Programming: A Modern Approach, Pearson, 2017.
2. Allen Downey, Think Python, 2ndEdition,Green Tea Press

Reference Books:

1. R. Nageswara Rao, “Core Python Programming”, 2nd edition, Dreamtech Press, 2019.
2. Allen B. Downey, “Think Python”, 2ndEdition, SPD/O’Reilly, 2016.
3. Martin C.Brown, “The Complete Reference: Python”, McGraw-Hill, 2018.
4. Mark Lutz, Learning Python, 5th Edition, Orielly, 2013.

Online Learning Resources:

- <https://nptel.ac.in/courses/106/106/106106145/>
- <https://www.youtube.com/watch?v=MEPILAjPvXY>



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DIGITAL ELECTRONICS AND MICRO PROCESSORS

(Common to CSE,AI&ML,DS,CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0410T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	ESC

Course Objectives:

This course will enable students to:

- To understand all the concepts of Logic Gates and Boolean Functions.
- To learn about Combinational Logic and Sequential Logic Circuits.
- To design logic circuits using Programmable Logic Devices.
- To understand basics of 8086 Microprocessor and 8051 Microcontroller.
- To understand architecture of 8086 Microprocessor and 8051 Microcontroller.
- To learn Assembly Language Programming of 8086 and 8051.

Course Outcomes(CO):

On completion of this course, student will be able to

CO1: Differentiate various number systems and binary codes.

CO2: Solve the Boolean Expressions using Boolean algebra and k-maps.

CO3: Implement different combinational and Sequential circuits.

CO4: Explain the internal architecture and organization of the 8086 microprocessor.

CO5: Demonstrate the assembly level language programming for 8086 and 8051

CO6: Describe the architecture, hardware details and memory organization of 8051 microcontroller.

Syllabus		Total Hours:48
Unit - I	Number Systems & Code Conversion	10Hrs
Number Systems & Code conversions, Boolean Algebra & Boolean properties, Logic Gates, Truth Tables, Universal Gates, Simplification of Boolean functions using Boolean properties, SOP and POS methods – Simplification of Boolean functions using K-maps, Signed and Unsigned Binary Numbers.		
Unit - II	Combinational Circuits	9Hrs
Combinational Logic Circuits: Adders & Subtractors, magnitude Comparators, Multiplexers, Demultiplexers, Encoders, Decoders, Programmable Logic Devices.		
Unit - III	Sequential Circuits	10Hrs
Sequential Logic Circuits: Compression between combinational & sequential circuits, Latches, SR Latch, Flipflops, SR FlipFlop, JK Flip Flop, Master Slave JK, T Flip-Flops, D Flip Flop, Shift Registers, Types of Shift Registers, Counters, Synchronous Counters, Asynchronous Counters, Up-Down Counter		
Unit - IV	Microprocessors - I	9Hrs
8085 microprocessor, Block Diagram of 8085 Microprocessor, 8086 microprocessor, Functional Diagram, register organization 8086, Flag register of 8086 and its functions, Addressing modes of 8086, Pin diagram of 8086, Minimum mode & Maximum mode operation of 8086, Interrupts in 8086.		
Unit - V	Microprocessors - II	10Hrs
Instruction set of 8086, Assembler directives, Procedures and Macros, Simple programs involving arithmetic, logical, branch instructions, Ascending, Descending and Block move programs, String Manipulation Instructions. Functional Diagram of 8051, register organization 8051.		

Text Books:

1. M. Morris Mano, Michael D. Ciletti, Digital Design, Pearson Education, 5th Edition, 2013
2. Anil K. Maini, Digital Electronics: Principles, Devices and Applications, John Wiley & Sons, Ltd., 2007.
3. Advanced microprocessors and peripherals-A.K Ray and K.M.Bhurchandani, TMH, 2nd edition, 2006.

Reference Books:

1. Thomas L. Floyd, Digital Fundamentals – A Systems Approach, Pearson, 2013.
2. Charles H. Roth, Fundamentals of Logic Design, Cengage Learning, 5th, Edition, 2004.
3. D.V.Hall, Microprocessors and Interfacing. TMGH, 2nd edition, 2006.

E-resources: NPTEL, SWAYAM



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DESIGN AND ANALYSIS OF ALGORITHMS

(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0521T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students to:

- Learn asymptotic notations, and analyze the performance of different algorithms.
- Understand and implement various data structures.
- Learn and implement greedy, divide and conquer, dynamic programming and backtracking algorithms using relevant data structures.
- Understand non-deterministic algorithms, polynomial and non-polynomial problems.

Course Outcomes(CO):

On completion of this course, student will be able to

CO1: To interpret the basic concepts of algorithms, Time complexity, Space complexity, Divide and conquer method, Greedy method, dynamic programming, Back tracking, Branch and Bound, NP-Hard and NP-Complete problems

CO2: To apply Divide and Conquer method and Greedy Method to different problems and compute their time complexity.

CO3: To apply Dynamic Programming method to different problems

CO4: To apply Backtracking method to different real-world problems

CO5: To apply branch and bound to different problems

CO6: To apply NP-hard and Np-Complete concepts for different problems

Syllabus			Total Hours:48
Module-I	Introduction & Asymptotic Notations		10Hrs
Introduction: What is an Algorithm? Algorithm Specification, Performance Analysis: Space complexity, Time complexity Asymptotic Notations: Big-Oh notation (O), Omega notation (Ω), Theta notation (Θ), Mathematical analysis of non-Recursive and recursive Algorithms with Examples.			
Module-II	Divide and conquer & Greedy Method		9Hrs
Divide and conquer: General method, Applications-Finding Maximum and minimum, Selection, binary search, quick sort, Strassen's matrix multiplication. Greedy Method: General method, Applications-job sequencing with deadlines, Fractional knapsack problem, minimum cost spanning trees, Single source shortest path problem.			
Module-III	Dynamic Programming		10Hrs
Dynamic Programming: General method, The Principle of Optimality, Applications- 0/1 knapsack problem, All pairs shortest path problem, Travelling salesperson problem, Optimal Binary Search Tree, Reliability design, Matrix chain multiplication.			
Module-IV	Backtracking		9Hrs
Backtracking: General method, N-Queens problem, Sum of subsets problem, Graph coloring, Hamiltonian cycles. Branch and Bound: General method, applications - travelling sales person problem, 0/1 knapsack problem- LC branch and bound solution, FIFO branch and bound solution.			
Module-V	NP-Complete and NP-Hard problems		10Hrs
NP-Complete and NP-Hard problems: Basic concepts: deterministic and non-deterministic algorithms, Tractable and Intractable Problems , Complexity Classes: P, NP, NP-Hard and NP-Complete			

Text Books:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Sartaj Sahni and Rajasekharam, Galgotia publications Pvt. Ltd.

Reference Books:

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI.
2. Design and Analysis of Algorithms , S. Sridhar, Oxford (Higher Education).
3. Introduction to the Design and Analysis of Algorithms, AnanyLevitin:, 2nd Edition, 2009. Pearson.
4. Design and Analysis of Computer Algorithms by Aho, Hopcraft, Ullman 1998, PEA.
5. Introduction to the Design and Analysis of Algorithms by Goodman, Hedetniemi, TMG.



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MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0022T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	HSC

Course Objectives:

This course will enable students to:

1. To understand the concepts of managerial economics and financial analysis this helps in optimal decision making in business environment.
2. To have a thorough knowledge on the production theories and cost while dealing with the production and factors of production.
3. To have a thorough knowledge regarding market structure and forms of business organizations in the market.
4. To understand the concept of capital and capital budgeting in selecting the proposals.
5. To have a thorough knowledge on recording, classifying and summarizing of transactions in preparing of final accounts.

Course Outcomes(CO):

On completion of this course, student will be able to

- Outline the Managerial Economic concepts for decision making and forward planning. Also know law of demand and its exceptions, to use different forecasting methods for predicting demand for various products and services. (L2)
- Assess the functional relationship between Production and factors of production and list out various costs associated with production and able to compute breakeven point to illustrate the various uses of breakeven analysis. (L5)
- Outline the different types of business organizations and provide a framework for analyzing money in its functions as a medium of exchange. (L2)
- Interpret various techniques for assessing the proposals of project for financial position of the business. (L2)
- Identify the principles of accounting to record, classify and summarize various transactions in books of accounts for preparation of final accounts. (L3)

Syllabus		Total Hours:48
Module-I	INTRODUCTION TO MANAGERIAL ECONOMICS & DEMAND	10Hrs
Managerial Economics – Definition – Nature & Scope - Contemporary importance of Managerial Economics - Demand Analysis - Concept of Demand - Demand Function - Law of Demand - Elasticity of Demand - Significance - Types of Elasticity - Measurement of Elasticity of Demand - Demand Forecasting - Factors governing Demand Forecasting - Methods of Demand Forecasting - Relationship of Managerial Economics with Financial Accounting and Management.		
Module-II	THEORY OF PRODUCTION AND COST ANALYSIS	9Hrs
Production Function – Least-cost combination - Short-run and Long-run Production Function - Isoquants and Isocosts, MRTS - Cobb-Douglas Production Function - Laws of Returns - Internal and External Economies of scale - Cost concepts and Cost behavior - Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems) - Managerial significance and limitations of Break-Even Analysis.		
Module-III	INTRODUCTION TO MARKETS AND FORMS OF BUSINESS ORGANIZATIONS	10Hrs
Market structures - Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition – Monopoly - Monopolistic Competition – Oligopoly - Price-Output Determination - Pricing Methods and Strategies - Forms of Business Organizations - Sole Proprietorship - Partnership - Joint Stock Companies - Public Sector Enterprises.		
Module-IV	CAPITAL AND CAPITAL BUDGETING	9Hrs
Concept of Capital - Significance - Types of Capital - Components of Working Capital Sources of Short-term and Long-term Capital - Estimating Working capital requirements – Capital Budgeting – Features of Capital Budgeting Proposals – Methods and Evaluation of Capital Budgeting Projects – Pay Back Method – Accounting Rate of Return (ARR) – Net Present Value (NPV) – Internal Rate Return (IRR) Method (simple problems).		

Module-V	INTRODUCTION TO FINANCIAL ACCOUNTING AND ANALYSIS	10Hrs
Accounting Concepts and Conventions - Introduction Double-Entry Book Keeping, Journal, Ledger, and Trial Balance - Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.		
Text Books: 1. Managerial Economics, PL Mehata, Sulthan Chand Publications		
Reference Books: 1. Ahuja HI “Managerial economics” 3 rd edition, Schand, ,2013 2. S.A. Siddiqui and A.S. Siddiqui: “Managerial Economics and Financial Analysis”, New Age International,. 2013. 3. Joseph G. Nellis and David Parker: “Principles of Business Economics”, 2nd edition, Pearson, New Delhi. 4. Domnick Salvatore: “Managerial Economics in a Global Economy”, Cengage, 2013. 5. Managerial Economics, Varshney &Maheswari, Sultan Chand, 2013. 6. Managerial Economics and Financial Analysis, Aryasri, 4th edition, MGH, 2019.		



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PYTHON PROGRAMMING LAB

(Common to CSE,AI&ML,DS,CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0517P	0:0:3:0	1.5	CIE:30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students to:

- To train the students in solving computational problems
- To elucidate solving mathematical problems using Python programming language
- To understand the fundamentals of Python programming concepts and its applications
- To able to write Python programs for real world problems using simple and compound data types
- To employee good programming style, standards and practices during program development

Course Outcomes(CO):

On completion of this course, student will be able to

- Develop solutions to mathematical problems.
- Develop Python programs for numerical and text based problems.
- Select appropriate programming construct for solving the problem.
- Implement basic data structures in python.
- Ability to choose appropriate data structures to represent data items in real world.
- Implement and know the application of algorithms for sorting and pattern matching.

Syllabus	Total Hours:48
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List of Experiments:

- Develop solutions to mathematical problems.
- Develop Python programs for numerical and text based problems.
- Select appropriate programming construct for solving the problem.
- Implement basic data structures in python.
- Ability to choose appropriate data structures to represent data items in real world.
- Implement and know the application of algorithms for sorting and pattern matching.

Week-1

1. Installing Python for Windows
2. Installing numpy
3. Setting the Path to Python
4. Writing Our First Python Program
5. Executing a Python Program

Week 2

1. Write a program to illustrate basic concepts of value types, and variables
2. Write a program to illustrate sequences in python
3. Write a program to illustrate operators in python

Week-3

1. Write a program to illustrate input & output statements in python
2. Write a program to illustrate control statements in python
3. Write a program to read number and a digit, and count the number of times the digit occurs in the number

Week-4

1. Write a program to use Strings and develop a python application and analyse various string Patterns
2. Write a program that finds a given word in a string.
3. Write a program that will read a text and count all occurrences of a particular alphabet

Week-5

1. Write a program to implement operations on Array.
2. Write a program to transpose a matrix.
Write a program to add, subtract and multiply two matrices.

Week-6

1. Write a program to create a List and apply list operations in python
2. Write a program to sort the matrix
3. Write a program to find Common Elements in Two Lists
4. Write a program for the following:
 - a. Removing Spaces from a String,
 - b. Finding Sub Strings,
 - c. Counting Substrings in a String,
 - d. Replacing a String with another String

Week-7

1. Write a program to create a dictionary and Implement dictionary operations in python
2. Write a program to illustrate data and time methods in python
3. Write a program to illustrate string methods in python`

Week-8

1. Write a program to create a module and access members from a module
2. Write a program to illustrate mathematical methods in python
3. Write a program for the following:
 - a. Changing Case of a String
 - b. Checking Starting and Ending of a String
 - c. Sorting Strings

Searching in the Strings

Week-9

1. Write a program to copy content from one file to another file
2. Write a program to finding Number of Characters and Words in a given text file
3. Write a program for the following:
 - a. Inserting Sub String into a String
 - b. Inserting Elements in a Tuple
 - c. Modifying Elements of a Tuple
 - d. Deleting Elements from a Tuple

Week-10

1. Write a program to getting Diagonal Elements of a Matrix
2. Write a program to find Maximum and Minimum Elements in a given set of elements
3. Write a program to find Sum and Average of Elements in a given set of elements

Additional Experiments:

Week-1

1. Python Program to Find the Size (Resolution) of a Image
2. Python Program to Merge Mails
3. Python Program to Display Fibonacci Sequence Using Recursion
4. Python Program to Find Factorial of Number Using Recursion

Week-2

1. Python Program to Convert Decimal to Binary Using Recursion
2. Python Program to Display Calendar
3. Python Program To Display Powers of 2 Using Anonymous Function

Reference Books:

- Michael Dawson, —Python Programming for absolute beginners, 3rd Edition, CENGAGE Learning Publications, 2018.
- Martin C. Brown, —The Complete Reference Python, 4th Edition, McGraw Hill, 2018
- Allen B. Downey, —Think Python, Second Edition, O'Reilly Media, 2017.



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DIGITALEL ECTRONICS AND MICRO PROCESSORS LAB

(Common to CSE,AI&ML,DS,CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0411P	0:0:3:0	1.5	CIE:30 SEE:70	3 Hours	ESC

Course Objectives:

This course will enable students to:

- To understand all the concepts of Logic Gates and Boolean Functions.
- To learn about Combinational Logic and Sequential Logic Circuits.
- To design logic circuits using Programmable Logic Devices.
- To understand basics of 8086 Microprocessor
- To understand architecture of 8085 & 8086 Microprocessor
- To learn Assembly Language Programming of 8086.

Course Outcomes(CO):

On completion of this course, student will be able to

- Identify the various digital ICs and understand their operation.
- Use Boolean laws and K-map to simplify the digital circuits.
- Demonstrate the basic digital circuits and verify their operation.
- Interpret the hardware architecture and assembly language programming using MASM.
- Execute arithmetic and data transfer operations using MASM in 8086.
- Implement some basic operations using Aurdino on IoT development trainer kit.

Syllabus	Total Hours: 48
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List of Experiments

Note: Minimum of 12 (6+6) experiments shall be conducted from both the sections given below:

DIGITAL ELECTRONICS:

- Verification of Truth Table for AND, OR, NOT, NAND, NOR and EX-OR gates.
- Realization of NOT, AND, OR, EX-OR gates with only NAND and only NOR gates.
- Karnaugh map Reduction and Logic Circuit Implementation.
- Verification of DeMorgan's Laws.
- Implementation of Half-Adder and Half-Subtractor.
- Implementation of Full-Adder and Full-Subtractor.
- Four Bit Binary Adder
- Four Bit Binary Subtractor using 1's and 2's Complement.

MICROPROCESSORS (8086 Assembly Language Programming)

- 8 Bit Addition and Subtraction.
- 16 Bit Addition.
- BCD Addition.
- BCD Subtraction.
- 8 Bit Multiplication.
- 8 Bit Division.
- Searching for an Element in an Array.
- Sorting in Ascending and Descending Orders.
- Finding Largest and Smallest Elements from an Array.

Text Books:

1. M. Morris Mano, Michael D. Ciletti, Digital Design, Pearson Education, 5th Edition, 2013.
2. Anil K. Maini, Digital Electronics: Principles, Devices and Applications, John Wiley & Sons, Ltd., 2007.
3. N. Senthil Kumar, M. Saravanan, S. Jeevanathan, Microprocessor and Microcontrollers, Oxford Publishers, 2010.
4. Advanced microprocessors and peripherals-A.K ray and K.M.Bhurchandani, TMH, 2nd edition, 2006

Reference Books:

1. Thomas L. Floyd, Digital Fundamentals – A Systems Approach, Pearson, 2013.
2. Charles H. Roth, Fundamentals of Logic Design, Cengage Learning, 5th, Edition, 2004.
3. D.V.Hall, Microprocessors and Interfacing. TMGH, 2nd edition, 2006.
4. Kenneth. J. Ayala, The 8051 microcontroller, 3rd edition, Cengage Learning, 2010

E-resources: <https://www.vlab.co.in/>



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ALGORITHMS LAB

(Common to CSE,AI&ML,DS,CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0524P	0:0:3:0	1.5	CIE:30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students to:

- Learn data structures for various applications.
- Implement different operations of data structures by optimizing the performance.
- Develop applications using Greedy, Divide and Conquer, dynamic programming.
- Implement applications for backtracking algorithms using relevant data structures.

Course Outcomes(CO):

On completion of this course, student will be able to

- To apply Divide and Conquer method to different problems and implement them.
- To apply Greedy Method to different problems and compute their time complexity.
- To apply Dynamic Programming method to different problems and implement them .
- To apply Backtracking method to different real-world problems.

Syllabus

Total Hours:48

List of Experiments

1. Implementation of binary search
2. Implement of quick sort
3. Implementation of Finding Maximum and minimum
4. Implementation of Optimal solution for a Knap Sack Problem using Greedy Method.
5. Implementation of minimum cost spanning tree using Prim's Algorithm.
6. Implementation of minimum cost spanning tree using Kruskal's Algorithm.
7. Implementation of All pairs shortest path problem using dynamic programming.
8. Implementation of Optimal solution for a 0/1 Knap Sack Problem using dynamic programming.
9. Implementation of sum of subsets problem using back tracking.
10. Implementation of n-queen's problem using back tracking.

Reference Books:

1. Y Daniel Liang, "Introduction to Programming using Python", Pearson.
2. Benjamin Baka, David Julian, "Python Data Structures and Algorithms", Packt Publishers,2017.
3. Rance D. Necaise, "Data Structures and Algorithms using Python", Wiley Student Edition

Web Reference:

1. <http://cse01-iiith.vlabs.ac.in/>
2. <http://peterindia.net/Algorithms.html>



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HTML and Java Script (Skill Oriented Course)

(Common to CSE,AI&ML,DS,CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0511	1:0:2:0	2	CIE:30 SEE:70	3 Hours	SC

Course Objectives:

This course will enable students to:

- Learn website development using HTML, CSS, and JavaScript.
- Understand the concepts of responsive web development using the bootstrap framework
- Learn the frame concepts to the websites and interactive websites.
- Discover how development process to use Google Charts to provide a better way to visualize data on a website
- Learn Content Management Systems to speed the development process

Course Outcomes(CO):

On completion of this course, student will be able to

CO1: Construct websites with valid HTML,CSS.

CO2: Create responsive monitors.

CO3: Develop websites using jQuery and bootstrap to provide interactivity and engaging user experiences

CO4: Design and Develop JavaScript applications.

CO5: Embed Google chart tools in a website for better visualization of data.

CO6: Design and develop web applications using Content Management Systems like Word Press

Syllabus

Total Hours:48

List of Experiments

Module -1:

HTML: What is a browser, Internet concepts, Introduction to HTML, Basic structure of HTML document, Creating an HTML document, Mark up Tags, Heading-Paragraphs, and Line Breaks HTML Tags.

Task: Design HTML page to display different heading tags and scroll college name as a message.

Module-2:

Introduction to elements of HTML, Working with Text, Lists, Hyperlinks, Images, Multimedia.

Task: Design HTML page to display the list of departments in college by using ordered and unordered list.

Module-3:

HTML(continued):HTML Tables

Task: Design HTML page to display Class Timetable

Module-4:

HTML Frames and Frameset.

Task: Design college website.

Module-5:

HTML Form Elements.

Task: Design a Student Registration web page using forms.

Module-6:

Cascading Style Sheets(CSS):CSS Properties, Types of CSS, Selectors, box model ,Pseudo-elements, z-index

Task: Apply CSS on student registration form.

Module - 7:

Bootstrap - CSS Framework: Layouts (Containers, Grid system), Forms, Other Components

Task: Style the student registration Form designed in Module-5 still more beautiful using Bootstrap CSS (Re-size browser and check how the webpage displays in mobile resolution).

Module - 8:

HTTP & Browser Developer Tools: Understand HTTP Headers (Request & Response Headers), URL & its Anatomy, Developer Tools: Elements/Inspector, Console, Network, Sources, performance, Application Storage.

Task: Analyze various HTTP requests (initiators, timing diagrams, responses) and identify problems

Module-9:

JavaScript: Variables, Data Types, Operators.

Task: Design a simple JavaScript program to perform arithmetic operations.

Module-10:

JavaScript objects, conditions, loops and functions.

Task: Write JavaScript to find the factorial of a given number and generate the Fibonacci series (Recursive and non-Recursive).

Module-11:

JavaScript arrays and pop-up box.

Task: Validate all Fields and Submit the student registration Form designed in Module-5

Reference Books:

1. Deitel and Deitel and Nieto, —Internet and World Wide Web-How to Program, PrenticeHall, 5th Edition, 2011.
2. Web Technologies, Uttam K.Roy, Oxford Higher Education., 1st edition, 10th impression, 2015.
3. Stephen Wynkoop and John Burke—Running a Perfect Website, QUE, 2nd Edition, 1999.
4. Jeffrey C and Jackson, —Web Technologies A Computer Science Perspective Pearson Education, 2011.
5. Gopalan N.P. and Akilandeswari J., —Web Technology, Prentice Hall of India, 2011.

Web Reference:

1. HTML: <https://html.spec.whatwg.org/multipage/>
2. HTML: <https://developer.mozilla.org/en-US/docs/Glossary/HTML5>
3. CSS: <https://www.w3.org/Style/CSS/>
4. Bootstrap-CSS Framework: <https://getbootstrap.com/>
5. Browser Developer Tools: https://developer.mozilla.org/enUS/docs/Learn/Common_questions/What_are_browser_developer_tools
6. Javascript: <https://developer.mozilla.org/en-US/docs/Web/JavaScript>
7. JQuery: <https://jquery.com>
8. Google Charts: <https://developers.google.com/chart>
9. Wordpress: <https://wordpress.com>



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CONSTITUTION OF INDIA

(Common to CSE, AI&ML, CS, DS, ECE, EEE, ME)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0030T	2:0:0:0	0	CIE:30		MC

Course Objectives:

This course will enable students to:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and Election Commission of India.
- To understand the central-state relation in financial and administrative control

Course Outcomes(CO):

On completion of this course, student will be able to

- Understand historical background of the constitution making and its importance for building a democratic India.
- Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and local self-government
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy

Syllabus		Total Hours:48
Module-I	Introduction to Indian Constitution	10Hrs
Introduction to Indian Constitution – Constitution -Meaning of the term - Indian Constitution Sources and constitutional history - Features– Citizenship – Preamble - Fundamental Rights and Duties - Directive Principles of State Policy.		
Module-II	Union Government and its Administration Structure of the Indian Union	9Hrs
Union Government and its Administration Structure of the Indian Union - Federalism - CentreState relationship – President's Role, power and position - PM and Council of ministers - Cabinet and Central Secretariat –Lok Sabha - Rajya Sabha - The Supreme Court and High Court - Powers and Functions		
Module-III	State Government and its Administration	10Hrs
State Government and its Administration - Governor - Role and Position -CM and Council of ministers - State Secretariat-Organization Structure and Functions.		
Module-IV	Local Administration	9Hrs
Local Administration - District's Administration Head - Role and Importance - Municipalities - Mayor and role of Elected Representatives -CEO of Municipal Corporation Pachayati Raj - Functions– PRI –Zilla Parishath - Elected officials and their roles – CEO,ZillaParishath - Block level Organizational Hierarchy - (Different departments) - Village level - Role of Elected and Appointed officials - Importance of grass root democracy.		
Module-V	Election Commission	10Hrs
Election Commission - Election Commission- Role of Chief Election Commissioner and Election Commissionerate - State Election Commission -Functions of Commissions for the welfare of SC/ST/OBC and Women		

Text Books:

1. Durga Das Basu, "Introduction to the Constitution of India", Prentice – Hall of India Pvt. Ltd.. New Delhi
2. Subash Kashyap, "Indian Constitution", National Book Trust
3. R R Gaur, R Asthana, GP

Reference Books:

1. H.M.Sreevai, "Constitutional Law of India", 4th edition in 3 volumes
2. J.A. Siwach, "Dynamics of Indian Government & Politics"
3. M.V. Pylee, "Indian Constitution", Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
4. J.C. Johri, Indian Government and Politics Hans
5. M.V. Pylee, "Indian Constitution)

Web Reference:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution



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Semester-4 (Theory-5, Lab-3, SC-1, MC-1)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	BSC	22A0017T	Discrete mathematical structures	3	0	0	3
2	PCC	22A0512T	Database Management Systems	3	0	0	3
3	PCC	22A0507T	Object Oriented Programming Through JAVA	3	0	0	3
4	PCC	22A3301T	Artificial Intelligence	3	0	0	3
5	HSC	22A0021T	Universal Human Values	3	0	0	3
6	PCC(LAB)	22A0515P	Database Management Systems Lab	0	0	3	1.5
7	PCC(LAB)	22A0509P	Object Oriented Programming Through JAVA Lab	0	0	3	1.5
8	PCC(LAB)	22A3302P	Artificial Intelligence Lab	0	0	3	1.5
9	SC	22A0518	Skill Oriented Course Linux Programming	1	0	2	2
10	MC	22A0028T	Mandatory Course Environmental Science	2	0	0	0
Total credits							21.5

Category	Credits
Basic Science Course (BSC)	3
Humanities and Social Sciences Course (HSC)	3
Professional Core Courses (PCC)	13.5
Skill oriented Course(SC)	2
Total	21.5



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DISCRETE MATHEMATICAL STRUCTURES

(Common to CSE, AI&ML, DS, CS, CE)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0017T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	BSC

Course Objectives:

- Introduce the concepts of mathematical logic and gain knowledge in sets, relations and functions
- Solve problems using counting techniques and combinatorics
- Introduce generating functions and recurrence relations.
- Use Graph Theory for solving real world problems

Course Outcomes (CO):

On completion of this course, student will be able to:

- Apply mathematical logic to solve problems.
- Understand the concepts and perform the operations related to sets, relations and functions.
- Gain the conceptual background needed and identify structures of algebraic nature.
- Apply basic counting techniques to solve combinatorial problems.
- Formulate problems and solve recurrence relations.
- Apply Graph Theory in solving computer science problems.

Syllabus		Total Hours:48
Module – I	Mathematical Logic	10 Hrs
Introduction, Statements and Notation, Connectives, Well-formed formulas, Tautology, Duality law, Equivalence, Implication, Normal Forms, functionally complete set of connectives, Mathematical Induction.		
Module – II	Set Theory	10 Hrs
Basic Concepts of Set Theory, Relations and Ordering, The Principle of Inclusion-Exclusion, Pigeon hole principle and its application, Functions composition of functions, Inverse Functions, Recursive Functions, Lattices and its properties. Algebraic structures: Algebraic Systems-Examples and General Properties, Semigroups and Monoids, groups, sub groups, homomorphism, Isomorphism.		
Module – III	Elementary Combinatorics	9 Hrs
Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multinomial Theorems.		
Module – IV	Recurrence Relations	9 Hrs
Calculating Coefficients of Generating Functions, Recurrence relations, Solving Recurrence Relations by Substitution, The Method of Characteristic roots, Solutions of homogeneous Recurrence Relations.		
Module – V	Graph Theory	10 Hrs
Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multigraphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four-Color Problem.		

Text Books:

1. Joel. Mott, Abraham Kandel and Theodore P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians, 2nd Edition, Pearson Education.
2. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 2002.

Reference Books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, McGraw Hill Education (India) Private Limited.
2. Graph Theory with Applications to Engineering and Computer Science by Narsingh Deo.

Online Learning Resources:

<http://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf>



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DATABASE MANAGEMENT SYSTEMS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0512T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students to:

- To teach the role of database management system in an organization.
- To design databases using data modeling and Logical database design techniques.
- To construct database queries using relational algebra and calculus and SQL.
- To explore implementation issues in database transaction.
- To familiarize database security mechanisms.

Course Outcomes(CO):

On completion of this course, student will be able to

- Understand the Basic Concepts of Database languages, Relational model, SQL.
- Choose the specific Data models for large enterprise database design.
- Analyze the data efficiently through SQL instructions.
- Apply Normal forms on database for eliminating the redundancy.
- Demonstrate the Basic Concepts of transaction management techniques.
- Apply concurrency control techniques for Database recovery.

Syllabus

Total Hours:48

Module-I	Introduction to Database concepts and Modeling	10Hrs
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Conceptual Modeling Introduction: Introduction to Data bases, Purpose of Database Systems, View of Data, Data Models, Database Languages, Database Users, Database Systems architecture.

The Entity-Relationship Model: Overview of Database Design, Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Conceptual Design with the ER Model.

Module-II	Relational Model, Relational Algebra	9Hrs
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Relational Model: Introduction to the Relational Model – Integrity Constraints over Relations, Enforcing Integrity constraints, querying relational data, Logical data base Design, Views.

Relational Algebra: Introduction to Relational algebra, selection and projection, set operations, renaming, joins, division.

Module-III	SQL	10Hrs
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SQL: Basic form of SQL Query, DDL, DML queries, Views in SQL, Joins, Nested & Correlated queries, Operators, predefined functions, Aggregate Functions.

PL/SQL: Introduction, Functions & Procedures, Triggers, Cursors.

Module-IV	Normalization	9Hrs
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Relational database design: Introduction, Functional Dependencies (FDs), Normalization for relational databases: 1NF, 2NF, 3NF and BCNF, Basic definitions of Multi Valued Dependencies, 4NF and 5NF.

Module-V	Transaction Management & Concurrency Control and Recovery	10Hrs
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Transaction Management: Transaction processing, Transaction Concept, Transaction States, Implementation of Atomicity and Durability, Concurrent Executions.

Concurrency Control: Lock-Based Protocols, Timestamp- Based Protocols, Validation-Based Protocols, Multiple Granularity.

Recovery: Failure Classification, Recovery and Atomicity, Log-Based Recovery.

Text Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, 6th Edition, Tata McGraw-Hill Publishing Company, 2017.
2. Raghu Ramakrishnan, Database Management System, 3rd Edition, Tata McGraw-Hill Publishing Company, 2014.

Reference Books:

1. Peter Rob, A. Ananda Rao, Carlos Coronel, Database Management Systems (for JNTU), Cengage Learning, 2011.
2. Hector Garcia Molina, Jeffrey D. Ullman, Jennifer Widom, Database System Implementation, 1st Edition, Pearson Education, United States, 2000.
3. E. Ramez and Navathe, Fundamental of Database Systems, 7th Edition, Pearson Education
4. R.P. Mahapatra & Govind Verma, Database Management Systems, Khanna Publishing House, 2016.
5. Carlos Coronel and Steven Morris, Database Systems: Design, Implementation, and Management, 12th edition, Cengage Learning, 2016.
6. John V. ,Absolute beginner's guide to databases, Petersen, QUE

E-resources:

<https://www.coursera.org/learn/database-management>

<https://www.coursera.org/learn/sql-data-science>

<https://www.w3schools.com/sql/>

<https://www.youtube.com/watch?v=fHAfc7Hjq28&list=PLWPirh4EWFpGrpcMfZ6UcdI786QdtSxV8>

<https://www.youtube.com/watch?v=HwmEcudlv44&list=PL4OCRJoJkV1jN-Ed6RkQpWfBvqe0utRd6>

<http://www.w3schools.in/dbms/>

<https://www.geeksforgeeks.org/dbms/>

<https://www.javatpoint.com/dbms-tutorial>

<https://www.edureka.co/blog/dbms-tutorial/>



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OBJECT ORIENTED PROGRAMMING THROUGH JAVA

(Common to CSE,AI&ML,DS,CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0507T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students to:

- To understand object-oriented principles like abstraction, encapsulation, inheritance, polymorphism and apply them in solving problems.
- To understand the principles of inheritance and polymorphism and demonstrate how they relate to the design of abstract classes.
- To implement the concept of packages, interfaces, exception handling and concurrency mechanism.
- Demonstrate on the multi-tasking by using multiple threads.
- To understand the design of Graphical User Interface using applets and swing controls.

Course Outcomes(CO):

On completion of this course, student will be able to

CO1: Understand the Object-Oriented Programming Principles to develop java programs.(Understand)

CO2: Apply code reusability through inheritance, packages and interfaces. (Apply)

CO3: Inspect Exception Handling and multi-threading mechanisms in real time applications.(Analyze)

CO4: Develop applications by using I/O streams for better performance. (Apply)

CO5: Construct GUI based applications using applets, AWT and swings for internet and system-based applications.(Apply)

CO6: Compare AWT and Swing classes for GUI based applications (Analyze).

Syllabus		Total Hours:48
Module-I	Introduction	10Hrs
Introduction: History and Evolution of Java, Java Buzzwords, Object Oriented Programming Principles, A first Simple Program, Data types, Variables, Type Conversion and Casting, Arrays, Operators, Control Statements, Classes, Objects, Methods, Constructors this key word, Garbage Collection, Parameter Passing, Method Overloading, Constructor Overloading. String handling methods.		
Module-II	Inheritance, Packages & Interfaces	9Hrs
Inheritance: Basics, Using Super, Creating Multilevel hierarchy, Method overriding, Dynamic Method Dispatch, Using Abstract classes, using final with inheritance. Packages: Basics, finding packages and CLASSPATH, Access Protection, Importing packages. Interfaces: Definition, Implementing Interfaces, Extending Interfaces, Applying Interfaces.		
Module-III	Exception handling & Multithreading	10Hrs
Exception handling - Fundamentals, Exception types, Uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws and finally, built-in exceptions, creating own exception subclasses. Multithreading: The Java thread model, creating threads, Thread priorities, Synchronizing threads, Interthread communication.		
Module-IV	Stream based I/O& Applet	9Hrs
Stream based I/O (java.io) – The Stream classes-Byte streams and Character streams, reading console Input and Writing Console Output, File class, Reading and Writing Files, Random access file operations Scanner class. Applet: Basics, Architecture, Applet Skeleton, requesting repainting, using the status window, passing parameters to applets		

Module-V	Introducing AWT & Swings	10Hrs
Introducing AWT: AWT Classes, Window Fundamentals, Working with Frame Windows, Working with Graphics, Working with Color, Event Handling. GUI Programming with Swings –Swing components and containers, layout managers, using a push button, jtextfield, jlabel.		
Text Books: 1. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd. 2. Core Java: An Integrated Approach – Dr R Nageswara Rao.		
Reference Books: 1. Object Oriented Programming through Java, P.Radha Krishna, Universities Press. 2. Java and Object Orientation, an introduction, John Hunt, second edition, Springer. 3. Maurach’s Beginning Java2 JDK 5, SPD. 4. Introduction to Java Programming 7/e, Brief version, Y.Daniel Liang, Pearson 5. Java How to Program, 7/E: Paul Deitel, Deitel& Associates, Inc		



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ARTIFICIAL INTELLIGENCE

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A3301T	3: 0:0:0	3	CIE: 30SEE:70	3Hours	ESC

Course Objectives:

This course will enable students to:

1. To understand the importance of the task environment in determining the appropriate agent design.
2. To teach the concepts of state space representation, heuristic search together with the time and Space complexities.
3. To describe the various types of learning methods and natural language processing.
4. To provide basic knowledge on natural language for communication and perception.
5. To understand the basic knowledge on robotics and philosophical foundations of AI.

Course Outcomes(CO):

On completion of this course, student will be able to

- Understand the role of agents, environments and relationship among them. (BL-2)
- Examine various problem-solving approaches in searching and learning. (BL-2)
- Demonstrate the use of Reinforcement learning and natural language processing.(BL-3)
- Understand the natural language for communication and object perception. (BL-2)
- Demonstrate the role of Robot in various applications and list out philosophical issues in AI.(BL-2)

Syllabus		Total Hours:45
Module-I	Introduction to Artificial Intelligence	9Hrs
Introduction: AI Definition, Foundations of Artificial Intelligence, History of Artificial Intelligence. Intelligent Agents: Agents and Environments, Good Behavior Concept of Rationality, Nature of Environments, The Structure of Agents. Problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform-cost search, DFS: Informed (Heuristic) Search strategies: Greedy BFS, A* search.		
Module-II	Problem Solving beyond classical search and Learning	9Hrs
Local search algorithms and optimization problems: Hill-climbing, simulated annealing; Local Search in Continuous Spaces, Searching with Non-Deterministic Actions, Searching with partial observations, Online Search Agents and Unknown Environment.		
Module-III	Reinforcement Learning and Natural Language Processing	9Hrs
Introduction, Passive Reinforcement Learning, Active reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, applications of Reinforcement Learning, Language Models, Text Classification, Information Retrieval, Information Extraction.		
Module-IV	Natural Language for communication and Perception	9Hrs
Phrase structure grammars, Syntactic analysis, Augmented grammars and semantic Interpretation, Machine translation, Speech Recognition. Image formation, Early Image Processing Operations, Object recognition by appearance, Reconstructing the 3D World, Object recognition from structural information, Using Vision.		
Module-V	Robotics and Philosophical foundations	9Hrs
Introduction, Robotic Hardware, Robotic Perception, Planning to move, Planning uncertain movements, Moving, Robotic software architectures, and application domains. Week AI, Strong AI, Ethics and Risks of AI, Agent Components and Agent architectures, Are we going in the right direction, What if AI does succeed.		

Text Books:

1. Stuart Russell and Peter Norvig, Artificial Intelligence A Modern Approach, 3rd Edition, Pearson Education.
2. Elaine Rich, Kevin Knight & Shivashankar B Nair, “Artificial Intelligence”, 3rd - Edition, McGraw Hill Education.

Reference Books:

1. Patrick Henny Winston, Artificial Intelligence, 3rd Edition, Pearson Education.
2. Patterson, Introduction to Artificial Intelligence and Expert Systems, 1st Edition Pearson India.
3. George F Luger, Artificial intelligence, structures and Strategies for Complex problem solving, 6th ed, PEA, 2008 .
4. Poole, D. and Mackworth, Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press. 2010
5. Padhy, N.P , Artificial Intelligence and Intelligent Systems,. 2009, Oxford University Press.

E-resources:

https://www.tutorialspoint.com/artificial_intelligence/index.htm

<https://www.javatpoint.com/artificial-intelligence-ai>

<https://www.youtube.com/watch?v=JMUxmLyrhSk>



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UNIVERSAL HUMAN VALUES

(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0021T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	HSC

Course Objectives:

This course will enable students to:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

Course Outcomes(CO):

On completion of this course, student will be able to

- Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
- They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
- They would have better critical ability.
- They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
- It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

Syllabus		Total Hours:48
Module-I	Course Introduction - Need, Basic Guidelines, Content and Process for Value Education	10Hrs

Purpose and motivation for the course, recapitulation from Universal Human Values-I
Self-Exploration-what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
Continuous Happiness and Prosperity- A look at basic Human Aspirations
Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority
Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
Method to fulfil the above human aspirations: understanding and living in harmony at various levels.
Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

Module-II	Understanding Harmony in the Human Being - Harmony in Myself!	9Hrs
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Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
Understanding the characteristics and activities of 'I' and harmony in 'I'
Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

Module-III	Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship	10Hrs
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Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
Understanding the meaning of Trust; Difference between intention and competence

Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship

Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals

Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships.

Discuss with scenarios. Elicit examples from students' lives

Module-IV

Understand the Nature and Existence of existence as Coexis

9Hrs

Understanding the harmony in the Nature

Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all- pervasive space

Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Module-V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

10Hrs

Natural acceptance of human values Definitiveness of Ethical Human Conduct

Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco- friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

Case studies of typical holistic technologies, management models and production systems Strategy for transition from the present state to Universal Human Order:

a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers

b. At the level of society: as mutually enriching institutions and organizations Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Text Books:

2. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

3. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kanta, 1999.

2. A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004. The Story of Stuff (Book).

3. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"

4. E. F. Schumacher. "Small is Beautiful" Slow is Beautiful – Cecile Andrews

5. J C Kumarappa "Economy of Permanence" Pandit Sunderlal "Bharat Mein Angreji Raj" Dharampal, "Rediscovering India"

6. Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule" India Wins Freedom - Maulana

Abdul Kalam Azad Vivekananda - Romain Rolland (English) Gandhi - Romain Rolland (English)



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DATABASE MANAGEMENT SYSTEMSLAB

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0515P	0:0:3:0	1.5	CIE:30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students to:

- Illustratethedifferentissuesinvolvedinthedesignandimplementationofadatabasesystem.
- Usedata manipulation language to query, update, and manage a database.
- Design and build a simple database system and demonstrate competence with the fundamental tasks involved with modelling, designing, and implementing a DBMS.

Course Outcomes (CO):

On completion of this course, student will be able to

- Apply database tools to perform various operations for the given database.
- Design database and retrieve information from database
- Develop ER diagrams and normalize the solution of a database.
- Implement the integrity constraints and PL/SQL programs to build efficient databases.
- Develop solutions for database applications using procedures and functions.
- Develop solutions for database applications using cursors and triggers.

Syllabus

Total Hours:48

1. Practice session: Students should be allowed to choose appropriate DBMS software, install it, configure it and start working on it. Create sample tables, execute some queries, use SQLPLUS features, and use PL/SQL features like cursors on sample database.
2. Draw E-R diagram for library management system
3. Draw E-R diagram for university management system
4. Draw E-R diagram for hospital management system
5. Implement all DDL Commands
6. Implement all DML Commands
7. Implement all TCL and DCL Commands
8. a) Create relationship between the tables using Nested Queries
b) Implement different types of joins on tables
9. Implement set operations on tables
10. Create a table and apply various key constraints.
11. Views—Create a Virtual table based on the result set of an SQL statement.
12. a) Write a PL/SQL program to swap two numbers.
b) Write a PL/SQL program to find the largest of three numbers.
13. a) Write a PL/SQL program to find the total and average of 6 subjects and display the grade.
b) Write a PL/SQL program to find the sum of digits in a given number.
14. a) Write a PL/SQL program to display the number in reverse order.
b) Write a PL/SQL program to check whether the given number is prime or not.
c) Write a PL/SQL program to find the factorial of a given number.
15. Write PL/SQL programs to implement procedures and functions.
16. Write a PL/SQL Program on cursors
17. Write a PL/SQL Program to implement triggers

Text Books:

1. Raghu Ramakrishnan, Johannes Gehrke, Jeff Derstadt, Scott Selikoff and Lin Zhu, Database Management Systems solutions manual, third Edition, 2013.

References:

3. Ramez Elmasri, Shamkant, B. Navathe, “Database Systems”, Pearson Education, 6th Edition, 2013.
4. Peter Rob, Carles Coronel, “Database System Concepts”, Cengage Learning, 7th Edition, 2008.

Online Learning Resources/Virtual Labs:

<http://www.scoopworld.in>

<http://vlabs.iitb.ac.in/vlabs-dev/labs/dblab/index.php>



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OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0509P	0:0:3:0	3	CIE:30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students to:

- Practice object-oriented programs and build java applications.
- Implement java programs for establishing interfaces.
- Implement sample programs for developing reusable software components.
- Create database connectivity in java and implement GUI applications.

Course Outcomes(CO):

On completion of this course, student will be able to

- Recognize the Java programming environment.
- Develop efficient programs using multithreading.
- Design reliable programs using Java exception handling features.
- Extend the programming functionality supported by Java.
- Select appropriate programming constructs to solve a problem.

Syllabus

Total Hours:48

List of Experiments

Week-1

- Installation of Java software, study of any Integrated development environment, Use Eclipse or NetBeans platform and acquaint with the various menus. Create a test project, add a test class and run it.
See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods and classes. Try debug step by step with java program to find prime numbers between 1 to n.
- Write a Java program that prints all real solutions to the quadratic equation $ax^2+bx+c=0$. Read in a, b, c and use the quadratic formula.

Week 2

- Write a Java program find the factorial of given number
- Write a Java program to find whether given number is prime or not
- The Fibonacci sequence is defined by the following rule. The first two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a java program that uses both recursive and non-recursive functions.

Week-3

- Write a Java program to find the sum of individual digits of a number
- Write a java program for Arithmetic calculator using switch case menu

Week-4

- Write a java program to multiply two given matrices.
- Write a java program to implement method overloading and constructors overloading.
- Write a java program to implement method overriding.

Week-5

- Create a Java class called Student with the following details as variables within it. USN, Name,

Branch, Phone. Write a Java program to create n Student objects and print the USN, Name, Branch, and Phone of these objects with suitable headings.

- b. Write Java program on use of inheritance, preventing inheritance using final, abstract classes

Week-6

- a. Write a Java program to implement exception handling.
b. Write a java program to split a given text file into n parts. Name each part as the name of the original file followed by .part where n is the sequence number of the part file.

Week-7

- a. Write a java program that displays the number of characters, lines and words in a text file.
b. Write a java program that reads a file and displays the file on the screen with line number before each line

Week-8

Write a program that creates a user interface to perform integer division. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 and Num2 were not integers, the program would throw a Number Format Exception. If Num2 were zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box

Week-9

- a. Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.
b. Write a java program that implements inter thread communication.

Week-10

- a. Develop an applet in Java that displays a simple message.
b. Develop an applet in Java that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named “Compute” is clicked.

Week-11

- a. Develop a Java application to implement the opening of a door while opening man should present before hut and closing man should disappear.
b. Develop a java application for simple calculator.

Week-12

- a. Develop a Java application to demonstrate the mouse event handlers.
b. Develop a Java application by using Swings.

Reference Books:

5. P. J. Deitel, H. M. Deitel, “Java for Programmers”, Pearson Education, PHI, 4th Edition, 2007.
6. P. Radha Krishna, “Object Oriented Programming through Java”, Universities Press, 2nd Edition, 2007
7. Bruce Eckel, “Thinking in Java”, Pearson Education, 4th Edition, 2006.
8. 4. Sachin Malhotra, Saurabh Chaudhary, “Programming in Java”, Oxford University Press, 5th Edition, 2010

Web Reference:

1. www.niecdelhi.ac.in
2. <https://www.linkedin.com/in/achin-jain-85061412>
3. www.rank1infotech.com



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ARTIFICIAL INTELLIGENCE LAB

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A3302P	0:0:3:0	1.5	CIE:30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students to:

- To teach the methods of implementing algorithms using artificial intelligence techniques
- To illustrate search algorithms
- To demonstrate the building of intelligent agents

Course Outcomes(CO):

After completion of this course, students will be able to:

- Implement search algorithms
- Solve Artificial intelligence problems
- Design chatbot and virtual assistant

Syllabus

Total Hours:36

1. Write a program to implement DFS and BFS
2. Write a Program to find the solution for traveling salesman Problem
3. Write a program to implement Simulated Annealing Algorithm
4. Write a program to find the solution for the Wumpus world problem
5. Write a program to implement 8 puzzle problem
6. Write a program to implement Towers of Hanoi problem
7. Write a program to implement A* Algorithm
8. Write a program to implement Hill Climbing Algorithm
9. Build a Chatbot using AWS Lex, Pandora bots.
10. Build a bot that provides all the information related to your college.
11. Build a virtual assistant for Wikipedia using Wolfram Alpha and Python
12. Implementation of humanoid Robot using AI techniques.



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LINUX PROGRAMMING (SKILL)

(Common to AI& ML,DS,CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0518	1:0:2:0	2	CIE:30 SEE:70	3 Hours	SC

Course Objectives:

This course will enable students to:

- Analyze the Linux utilities and Linux environment.
- Learn the fundamentals of shellscripting/programming.
- Understand system administration processes by providing a hands-on experience.

Course Outcomes(CO):

On completion of this course, the students are able to:

- CO1: Understand the Basic commands and utilities in Linux Environment
CO2 Identify and use Linux utilities to create and manage simple file processing operations, Organize directory structures with appropriate security.
CO3 Analyze the Linux utilities and Linux environment.
CO4 Use shell script to automate different tasks as Linux.
CO5 Illustrate file processing operations such as standard I/O and formatted I/O.
CO6 Develop various client server applications using TCP or UDP protocols.

Syllabus

Total Hours:48

Introduction to Linux/Unix:- Architecture of Unix, Features of Unix , Unix Commands – man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip, : User and session management commands: useradd, groupadd, userdel, groupdel.

Linux/Unix Utilities:- Introduction to unix file system, file handling utilities, vi editor, Text processing utilities and backup utilities: commands to be covered are tail, head, sort, nl, uniq, sed, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr and awk.

Unix Session, Standard Streams, Redirection, Pipes.

Filters and Pipes, Concatenating files, Display Beginning and End of files, Cut and Paste, Sorting, Translating Characters, Files with Duplicate Lines, Count characters, Words or Lines, Comparing Files

Shell Programming:

Introduction to shells, Variables, input and output, Environment variables, Basic script concepts, Expressions, Decision making and repetition etc.

Socket programming: Client Sever Implementation Using Sockets and Shared Memory

Task 1: Study and Practice on various commands like man, echo, printf, clear, script, passwd, cal,uname, who, date, tty, stty, pwd, who,.

Task 2: Study and Practice on various commands like cd, mkdir, rmdir cp, mv, ln, rm, unlink, du, df, mount, umount, find, unmask, ulimit, ps.

Task 3: Study and Practice on various commands like tail, head, sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr.

Task 4:

Session-1

- Log into the system
- Use vi editor to create a file called myfile.txt which contains some text.
- correct typing errors during creation.
- Save the file
- logout of the system

Session-2

- Log into the system
- open the file created in session 1
- Add some text
- Change some text

- e)Delete some text
- f)Save the Changes
- g)Logout of the system

Task 5:

- a)Login to the system
- b)Use the appropriate command to determine your login shell
- c)Use the /etc/passwd file to verify the result of step b.
- d)Use the who command and redirect the result to a file called myfile1. Use the more command to see the contents of myfile1.
- e)Use the date and who commands in sequence (in one line) such that the output of date will display on the screen and the output of who will be redirected to a file called myfile2. Use the more command to check the contents of myfile2.

Task 6:

- a)Log into the system
- b)Use the cat command to create a file containing the following data. Call it mytable use tabs to separate the fields.

1425	Ravi	15.65
4320	Ramu	26.27
6830	Sita	36.15
1450	Raju	21.86

- c)Use the cat command to display the file, mytable.
- d)Use the vi command to correct any errors in the file, mytable.
- e)Use the sort command to sort the file mytable according to the first field. Call the sorted file my table (same name)
- f)Print the file mytable
- g)Use the cut and paste commands to swap fields 2 and 3 of mytable. Call it my table (same name)
- h)Print the new file, mytable
- i)Logout of the system.

Task 7:

- a)Write a sed command that deletes the first character in each line in a file.
- b)Write a sed command that deletes the character before the last character in each line in a file.
- c)Write a sed command that swaps the first and second words in each line in a file.

Task 8:

1. Write a shell script that accepts a file name, starting and ending line numbers as arguments and displays all the lines between the given line numbers.
2. Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.

Task 9:

1. Write a program to generate Fibonacci series
2. Write a program to check whether given string is palindrome or not
3. Write a shell script to find factorial of a given integer.

Task 10:

1. Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory and reports accordingly. Whenever the argument is a file, the number of lines on it is also reported.
2. Write a shell script to list all of the directory files in a directory

Task 11:

1. Write an awk script to count the number of lines in a file that do not contain vowels.
2. Write an awk script to find the number of characters, words and lines in a file.
3. Write an awk script to calculate average marks of each student.
4. Write an awk script to replace a string in a file.

Task 12:

Simulate the following commands

- a) Simulate cat command b) Simulate cp command

Task 13:

1. Write client and server programs (using java) for interaction between server and client processes using Unix domain sockets.
2. Write client and server programs (using java) for interaction between server and client processes using Internet domain sockets.

Reference Book(s):

1. Sumitabha Das, “Your Unix The Ultimate Guide”, Tata McGraw-Hill, New Delhi, India, 2007.
2. B. A. Forouzan and R. F. Gilberg, “Unix and Shell Programming”, Cengage Learning.
3. Robert Love, “Linux System Programming”, O'Reilly, SPD.
4. Stephen G. Kochan, Patrick Wood, “Unix Shell Programming”, Sams publications, 3rd Edition, 2007.
5. T. Chan, “Unix System Programming using C++”, Prentice Hall India, 1999.



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ENVIRONMENTAL SCIENCE

(Common to CSE, AI&ML, CS, DS, ECE,EEE, ME)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0028T	2:0:0:0	0	CIE:30		MC

Course Objectives:

This course will enable students to:

- To make the students to get awareness on environment.
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day-to-day activities of human life.
- To save earth from the inventions by the engineers.

Course Outcomes(CO):

On completion of this course, student will be able to

- Recognize the knowledge about environment, natural resources and different techniques involved in its conservation.
- Describe the information about different eco-systems and its functions.
- Explain the different types of bio-diversity along with values and conservation methods.
- Predict various environmental pollutions and able to design the environmental friendly process in engineering.
- Apply the sustainable development concepts in life, society and industry.

Syllabus		Total Hours:48
Module-I	Multidisciplinary Nature of Environmental Studies and Natural Resources	10Hrs

Definitions, components of Environment, Scope and Importance –Need for Public Awareness

Renewable and non-renewable resources –Forest resources – Use and over – exploitation, deforestation, – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

Module-II	Ecosystems	9Hrs
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Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers– Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem

- Grassland ecosystem.
- Desert ecosystem

Module-III	Biodiversity And Its Conservation	10Hrs
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Introduction Definition: genetic, species and ecosystem diversity – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values — India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching, Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity

Module-IV	Environmental Pollution	9Hrs
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Definition, Cause, effects and control measures of:

- air pollution
- water pollution
- noise pollution

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes

Module-V	Social Issues and The Environment	10Hrs
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From Unsustainable to Sustainable development – Urban problems related to energy –Environment Protection Act. – Air (Prevention and Control of Pollution) act

Definition, Cause, effects and control measures of:Global warming, Acid rain, Ozone layer depletion

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain –Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

Text Books:

1. Text book of Environmental Studies for Undergraduate Courses- Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies- Kaushik &Kaushik, New Age Publishers.

Reference Books:

1. Environmental studies- R.Rajagopalan, Oxford University Press
2. Comprehensive Environmental studies- J.P.Sharma, Laxmi publications.



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Semester-5 (Theory-5, Lab-2, SC-1, MC-1)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	PCC	22A3303T	Automata Theory and Compiler Design	3	0	0	3
2	PCC	22A05M09	Software Engineering	3	0	0	3
3	PCC	22A0528T	Machine Learning	3	0	0	3
4	PEC	22A0522Ta 22A3204T 22A0520T 22A3304T	Professional Elective-I: 1. Object Oriented Analysis and Design 2. Data Warehousing and Mining 3. Computer Networks 4. Distributed Computing	3	0	0	3
5	OEC	22A0430T 22A0258T 22A0149T 22A0323Ta	Open Elective-I: 1. Principles of Communication Systems 2. Applications of Power Electronics to Power Systems 3. Building Materials 4. Automobile Engineering	3	0	0	3
6	PCC(Lab)	22A0510P	Software Engineering Lab	0	0	3	1.5
7	PCC(Lab)	22A0532P	Machine Learning Lab	0	0	3	1.5
8	SC	22A3305P	Skill Advanced Course: Data Wrangling with Python	1	0	2	2
9	MC	22A0526	Mandatory Course: Design Thinking and Innovation	2	0	0	0
Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester)				0	0	0	1.5
				Total credits			21.5
Honors / Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)				4	0	0	4



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AUTOMATA AND COMPILER DESIGN					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A3303T	3: 0:0:0	3	CIE:30 SEE:70	3 Hours	PCC
Course Objectives:					
This course will enable students to: - Understand formal definitions of machine models - Illustrate finite state machines to solve problems in computing - Understand of formal grammars - Learn different phases of compiler. - Learn various parsing techniques.					
Course Outcomes (CO):					
On completion of this course, student will be able to: - Understand the fundamental concepts of Formal Languages and Automata(L2) - Apply the knowledge of Automata Theory, Grammars & Regular Expressions for solving various problems(L3) - Design of Context Free Grammar for formal language(L3) - Discuss the major phases of compilers and use the knowledge of the Lex tool(L2) - Develop the parsers and experiment with the knowledge of different parsers design(L3) - Summarize various optimization techniques and examine the design issues of code generator(L4)					
Syllabus					Total Hours:48
MODULE-I	Finite Automata				10Hrs
Why Study Automata Theory? The Central Concepts of Automata Theory, Automation, Finite Automata, Transition Systems, Acceptance of a String by a Finite Automaton, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with ϵ -Transition, Minimization of Finite Automata, Mealy and Moore Machines, Applications and Limitations of Finite Automata.					
MODULE -II	Regular Expressions				9Hrs
Regular Expressions, Equivalence of two Regular Expressions, Finite Automata and Regular Expressions, Inter Conversion, Equivalence between Finite Automata and Regular Expressions, Pumping Lemma, Closers Properties, Applications of Regular Expressions, Grammars, Classification of Grammars-Chomsky Hierarchy, Finite Automata and Regular Grammars, Regular Expressions and Regular Grammars.					

MODULE -III	Context Free Grammars	10Hrs
Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars-Elimination of Useless Symbols, E-Productions and Unit Productions, Normal Forms for Context Free Grammars-Chomsky Normal Form and Greibach Normal Form, Pumping Lemma, Closure Properties, Applications of Context Free Grammars.		
MODULE -IV	Introduction to Compiler	9Hrs
Introduction to Compiler: Overview of Compilers, Phases of a Compiler. Lexical Analysis: The Role of Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens, The lexical analyzer generator Lex, Design of a Lexical Analyzer generator		
MODULE -V	Syntax Analysis	10Hrs
Syntax Analysis: The role of the Parser, First and Follow, Predictive Parsing, LR Parsers-SLR, Canonical LR, LALR, Parser Generator (YACC). Syntax-Directed Definition, S-Attributed SDD, L-Attributed SDD, Translation Schemes, three address code, Principle Sources of Code Optimizations, Issues Code generation		
Text Books: 1. J.E. Hopcroft, R.Motwani and J.D.Ullman “Introduction to Automata Theory, Languages and Computation” , 3rd Edition, Pearson, 2008. 2. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman.,” Compiler Principles, Techniques and Tools”, Second Edition, Pearson,2014.		
Reference Books: 1. K.L.P. Mishra and Chandrasekaran,” Theory of Computer Science-Automata, Languages and Computation”, 3rd Edition, PHI, 2007. 2. Shyamalendu Kandar, “Introduction to Automata Theory, Formal Languages and Computation”, Pearson, 2013. 3. Parag H. Dave, Himanshu B. Dave, “Compilers Principles and Practice”, Pearson 4. John R. Levine, Tony Mason, Doug Brown, LEX &YACC –O’reilly .		
Web References: https://onlinecourses.nptel.ac.in/noc21_cs07/preview https://onlinecourses.nptel.ac.in/noc21_cs19/preview		



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SOFTWARE ENGINEERING (Common to CSE, AI&ML, DS, CS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A05M09	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PCC
Course Objectives:					
This course will enable students to: • Learn the basic concepts of software engineering and life cycle models. • Understand the requirements engineering and agile models. • Interpret the basic concepts of software design • Understand the basic concepts of black box and white box software testing and enable to design test cases for unit, integration, and system testing • Understand the basic concepts in risk management and reengineering.					
Course Outcomes (CO):					
On completion of this course, student will be able to • Use software life cycle activities for process models (L3). • Use software requirements specifications for given problems (L3). • Apply design concepts, component Level and user interface design for a given problem(L3) • Apply various test cases for a given problem (L3). • Apply quality management concepts at the application level. (L3) • Determine risk management plans and implementation(l3)					
Syllabus				Total Hours:48	
Module-I	Software, Software Engineering and Software Process			10 Hrs	
Basic concepts: abstraction versus decomposition, evolution of software engineering techniques, Software development life cycle (SDLC) models: Iterative waterfall model, Prototype model, Evolutionary model, Spiral model, RAD model, Agile models, software project management: project planning, project estimation, COCOMO, project scheduling, Organization and team structure, risk management.					
Module-II	Requirements Engineering and Agile Models			9 Hrs	
The Nature of software, The unique nature of web apps, The software myths Requirements Engineering: Functional and non-functional requirements, the software requirements document, Requirements specification, Requirements engineering processes, Requirements elicitation and analysis, Requirements validation, Requirements management Agile development model: What is agility, what is an agile process, XP, Agile process models, CMMI					

Module-III	Design Concepts, Component Level and User Interface Design	9 Hrs
Design Concepts: Good Software Design, Cohesion and coupling, The design Process, Design concepts, design models Component Level Design: Introduction to components, designing class-based components User Interface Design: Golden rules, User Interface analysis and design		
Module-IV	Software Testing Strategies, Project Metrics and Quality Management	10 Hrs
Software Testing Strategies: coding standards and guidelines, code review, testing, types of testing. Process and project metrics: software measurement, A framework for product metrics. Quality Management: Quality, Software quality, metrics for software quality, software quality assurance.		
Module-V	Risk Management and Reengineering	10 Hrs
Risk Management: Risk identification, Risk projection, risk refinement, RMMM Maintenance and reengineering: Software maintenance, reengineering, reverse engineering and forward engineering Case Study: Implementation of safe home system using software engineering principles.		
Text Books: 1. Pressman R, “Software Engineering- Practioner Approach”, McGraw Hill. 2. Somerville, “Software Engineering”, Pearson 2.		
Reference Books: 1. Rajib Mall, “Fundamentals of Software Engineering”, 5th Edition, PHI, 2018. 2. Richard Fairley, “Software Engineering Concepts”, Tata McGraw Hill. 3. Jalote Pankaj, “An integrated approach to Software Engineering”, Narosa.		
Web Resources: https://nptel.ac.in/courses/106/105/106105182/ http://peterindia.net/SoftwareDevelopment.html		



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MACHINE LEARNING					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0528T	3: 0:0:0	3	CIE:30 SEE:70	3Hours	PCC
Course Objectives:					
This course will enable students to: - Understand basic concepts of Machine Learning - Study different Machine learning algorithms - Illustrate evaluation of learning algorithms					
Course Outcomes (CO):					
On completion of this course, the students will be able to - Understand the basic concepts of Machine Learning(L2) - Understand the concept of Building, Evaluating and Improving a Model(L2) - Apply different Classification algorithms to real-world problems(L3) - Apply regression techniques in real-time scenarios(L3) - Implement Clustering techniques in real-world problems(L3)					
Syllabus					Total Hours:48
Module-I	Introduction – Human Learning & Machine Learning				9Hrs
Human Learning, Types of Human Learning, Machine Learning, Types of Machine Learning, Applications of Machine Learning, Issues in Machine Learning. Basic types of Data in Machine Learning, Data Preprocessing: Data Cleaning, Data transformation and Data Reduction					
Module-II	Modeling and Evaluation				10Hrs
Introduction, selecting a Model, training a Model, Model Representation and Interpretability, Evaluating Performance of a Model, Improving Performance of a Model					
Module-III	Supervised Learning: Classification				9Hrs
Classification – Methods of Classification: Classification model, Classification Learning Steps, Classification by Decision tree Induction, Classification by Back propagation, K-Nearest Neighbor Classification, Random Forest Algorithm, Naïve Baye’s Classification					
Module-IV	Supervised Learning: Regression				10Hrs
Regression – Assumptions in Regression Analysis, Types of Regression: Simple Linear Regression, Multiple Linear Regression, Polynomial Regression, Logistic Regression, Curve Fitting- Method of Least Squares.					

Module-V	Unsupervised Learning: Clustering	10Hrs
Clustering- Different types of clustering techniques, Partitioning Methods: K-Means Algorithm, K-Medoids algorithm, Hierarchical Clustering Methods, Density based Clustering Methods- DBSCAN, DENCLUE, OPTICS		
Text Books:		
1. SaikatDutt, Subramanian Chandramouli, Amit Kumar Das, “Machine Learning”, Pearson, 2019.		
Reference Books:		
1. Ethern Alpaydin, “Introduction to Machine Learning”, MIT Press, 2004. 2. Stephen Marsland, “Machine Learning -An Algorithmic Perspective”, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series,2014. 3. Andreas C. Müller and Sarah Guido “Introduction to Machine Learning with Python: A Guide for Data Scientists”, Oreilly.		
Web References:		
1. https://www.deeplearning.ai/machine-learning 2. https://www.cse.huji.ac.il/~shais/UnderstandingMachineLearning/index.html		



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OBJECT ORIENTED ANALYSIS AND DESIGN (Common to CSE, AI&ML, CS, DS)					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0522Ta	3: 0:0:0	3	CIE:30 SEE:70	3 Hours	PEC
Course Objectives:					
This course will enable students to: - Understand the concepts of Object-Oriented System - Understand Unified approach & Object-Oriented System development methodologies. - Demonstrate UML diagrams - Model user interface and map object-oriented system to relational system					
Course Outcomes (CO):					
On completion of this course, student will be able to - Understand the concepts of object model(L2) - Identify the classes and vocabulary of the problem domain(L2) - Illustrate the importance of modeling and software development life cycle(L2) - Draw the class and object diagrams for various applications(L3) - Apply the basics of behavioral modeling to behavioral diagrams(L3) - Model the various components and deployment diagram for the applications(L3)					
Syllabus				Total Hours:48	
Module-I	Introduction to Object Model			9Hrs	
Introduction to Object Model: Introduction to object-oriented analysis and Design, Iterative development and the Unified Process (UP), UP phases: Inception, Elaboration, Construction and Transition, Object-oriented metrics, Evaluation of Object Model, Foundation of Object Model, Elements of object Model, Applying object Model.					
Module-II	Classes and Objects			10Hrs	
Classes and Objects: The Nature of an Object, Relationships among Objects, The Nature of a Class, Relationships among Classes, The Interplay of Classes and Objects, The Importance of Proper Classification, Identifying Classes and Objects, Key Abstractions and Mechanisms					
Module-III	Introduction to UML			9Hrs	
Introduction to UML: The importance of modeling, Principles of modeling, Object oriented modeling, why model, Conceptual model of UML, Architecture, Software Development Life Cycle.					
Module-IV	Structural Modelling			10Hrs	
Basic Structural Modelling: Classes, Relationships, Common Mechanisms, and diagrams, class diagrams. Advanced Structural Modelling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages, Object Diagrams					
Module-V	Behavioral Modelling			10Hrs	

Basic Behavioral Modelling: Interactions, Interaction diagrams, use cases, Use case diagrams, Activity Diagrams, Sequence Diagrams, Collaboration and Deployment diagrams.
Advanced Behavioral Modeling: Events and signals, state machines, time and space, state chart diagrams

Text Books:

1. Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston, “Object- Oriented Analysis and Design with Applications”, Pearson, 3rd edition, 2013.
2. Grady Booch, James Rumbaugh, Ivar Jacobson, “The Unified Modeling Language User Guide”, Pearson, 12th Impression, 2012

Reference Books:

1. Mahesh P. Matha, “Object-Oriented Analysis and Design using UML”, PHI
2. Brett D. McLaughlin, Gary Pollice, Dave West, “Head First Object-Oriented Analysis and Design”, O’Reilly
3. John W. Satzinger, Robert B. Jackson, Stephen D. Burd, “Object-Oriented Analysis and Design with the Unified process”, Cengage Learning

Web References:

1. https://www.youtube.com/watch?v=VnVHgj6OPrQ&list=PLAXUYU7PbJhhH0iWvtyD_J2L8mv15pchq
2. https://onlinecourses.nptel.ac.in/noc19_cs48/preview



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DATAWARE HOUSING & MINING

DATAWARE HOUSING & MINING					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A3204T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PEC
Course Objectives:					
This course will enable students to: - Know the basic concepts and principles of Data Warehouse. - Study the concepts of Data Mining and Major Issues in Data Mining. - Learn Pre-processing techniques and Data Transformation methods. - Study the performance of Frequent Item sets and Classification. - Understand and compare different types of Cluster Analysis.					
Course Outcomes (CO):					
On completion of this course, student will be able to - Understand the basic concepts of data warehouse and data mining(L2) - Determine the Data Warehouse Design and Data Warehouse Schemas(L2) - Use the Data Mining Technologies and Major Issues in Data Mining(L3) - Apply Pre-processing techniques for Data cleaning(L3) - Apply the Frequent Patterns and Classification Methods for item sets(L3) - Determine the performance of the different Cluster algorithms(L3)					
Syllabus				Total Hours:48	
Module-I	Data Warehousing and Online Analytical Processing			10 Hrs	
Data Warehouse: Basic Concepts, Data Warehouse Modelling: Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Schemas for Decision Support, Data Warehouse Implementation.					
Module-II	Introduction to Data Mining			10Hrs	
Why Data Mining, What Kinds of Data Can Be Mined, What Kinds of Patterns Can Be Mined, Which Technologies Are Used, Major Issues in Data Mining.					
Module-III	Data Preprocessing			9 Hrs	
Data Preprocessing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.					
Module-IV	Mining Frequent Patterns, Association rule mining and Classification			10Hrs	
Basic Concepts, Frequent Itemset Mining Methods, Classification: Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification, Support vector machine.					
Module-V	Cluster Analysis			9 Hrs	

Cluster Analysis: Partitioning Methods, Hierarchical Methods, Density-Based Methods, outlier analysis and detection methods.

Text Books:

1. Jiawei Han, Micheline Kamber, Jian Pei. “Data Mining: concepts and techniques”, 3rd edition.
2. Pang-Ning Tan, Michael Steinbach and Vipin Kumar “Introduction to Data Mining”, Pearson Education.

Reference Books:

1. Arun K Pujari, “Data Mining Techniques”, Second Edition, Universities Press.
2. Sam Aanhory & Dennis Murray “Data Warehousing in the Real World”, Pearson Edn Asia.
3. K. P. Soman, S. Diwakar, V. Ajay “Insight into Data Mining” , PHI,2008.

Web References:

<https://www.digimat.in/nptel/courses/video/106105174/L01.html>



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COMPUTER NETWORKS (Common to CSE, AI&ML, CS, DS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0520T	3: 0:0:0	3	CIE:30 SEE:70	3 Hours	PEC
Course Objectives:					
This course will enable students to: • Determine the basic concepts of Computer Networks. • Determine the layered approach for design of computer networks • Distinguish OSI and TCP/IP reference models • Predict the network path used in Internet environment • Use the format of headers of IP, TCP and UDP • Illustrate the concepts of application layer, network security fundamentals.					
Course Outcomes (CO):					
On completion of this course, student will be able to: • Use the software and hardware components of a computer network (L3) • Apply the reference model of a computer network(L3) • Solve the error correction and detection in existing protocols(L3) • Predict path for routing, and congestion control algorithms(L3) • Determine the functionality of TCP and UDP(L3) • Use the appropriate application layer applications(L3)					
Syllabus					Total Hours:48
Module-I	The Internet and The Reference Models				10Hrs
Introduction: Computer Network, Network Topologies, types of networks, Reference models- The OSI Reference Model the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models. Physical Layer –Introduction to physical layer, Guided Media- Twisted-pair cable, Coaxial cable, Fiber optic cable, Unguided media: Wireless-Radio waves, microwaves, infrared.					
Module-II	The Data Link Layer				9Hrs
The Data Link Layer: Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols					
Module-III	The Network Layer				10Hrs
The Network Layer: Network Layer design issues, Routing algorithms, Congestion control and Internetworking, Network layer in internet.					
Module-IV	The Transport Layer				9Hrs

Transport Layer: Transport layer services, Service primitives, Elements of transport protocols, The Internet Transport Protocols: TCP/IP, UDP.		
Module-V	The Application Layer and Network Security	10Hrs
The Application Layer: DNS, SMTP, FTP, Email and security, network security.		
Text Books: 1. Andrew S.Tanenbaum, David j.Wetherall, “Computer Networks”, 5th Edition, Pearson. - James F. Kurose, Keith W. Ross, “Computer Networking: A Top-Down Approach”, 6th edition, Pearson, 2019.		
Reference Books: 1. Forouzan, “Data communications and Networking”, 5th Edition, McGraw Hill Publication. 2. Youlu Zheng, Shakil Akthar, “Networks for Computer Scientists and Engineers”, Oxford Publishers, 2016.		
Web References: 1. https://nptel.ac.in/courses/106105183/25 2. http://www.nptelvideos.in/2012/11/computer-networks.html 3. https://nptel.ac.in/courses/106105183/3		



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DISTRIBUTED COMPUTING (Common to CSE, AI&ML, DS, CS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A3304T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PEC
Course Objectives:					
This course will enable students to:					
• Introduce the computation models of distributed systems • Illustrate the issues of synchronization and collection of information in distributed systems • Describe distributed mutual exclusion and distributed deadlock techniques • Elucidate agreement protocols and fault tolerance mechanisms in distributed systems • Explain the cloud computing models and the underlying concepts					
Course Outcomes (CO):					
On completion of this course, student will be able to					
• Understand the foundations of distributed systems. (L2) • Solve synchronization and state consistency problems. (L3) • Use resource sharing techniques in distributed systems. (L3) • Apply working model of consensus and reliability of distributed systems. (L3) • Understand the fundamentals of cloud computing(L2) • Illustrate the Cloud services and Platforms. (L2)					
Syllabus				Total Hours:48	
Module-I	Introduction			10Hrs	
Introduction: Definition, Relation to computer system components, Motivation, Message-passing systems versus shared memory systems, Primitives for distributed communication, Synchronous versus asynchronous executions, Design issues and challenges.					
A model of distributed computations: A distributed program, A model of distributed executions, Models of communication networks, Global state of a distributed system					
Module-II	Logical Time and Global State			9 Hrs	
Physical clock synchronization: NTP, A framework for a system of logical clocks, Scalar time, Vector time					
Message ordering and group communication: Message ordering paradigms, Asynchronous execution with synchronous communication, Synchronous program order on an asynchronous system, Group communication, Causal order (CO), Total order					
Global state and snapshot recording algorithms: Introduction, System model and definitions, Snapshot algorithms for FIFO channels					

Module-III	Distributed Mutex and Deadlock	10 Hrs
Distributed mutual exclusion algorithms: Introduction, Preliminaries, Lamport’s algorithm, Ricart–Agrawala algorithm, Token-based algorithms, Suzuki–Kasami’s broadcast algorithm. Deadlock detection in distributed systems: Introduction, System model, Preliminaries, Models of deadlocks, Chandy–Misra–Haas algorithm for the AND model and OR model.		
Module-IV	Consensus and Recovery	10 Hrs
Consensus and agreement algorithms: Problem definition, Overview of results, Agreement in a failure-free system (synchronous or asynchronous), Agreement in (message-passing) synchronous systems with failures Check pointing and Rollback recovery: Introduction, Background and definitions, Issues in failure recovery, Checkpoint-based recovery, coordinated check pointing algorithm, Algorithm for asynchronous check pointing and recovery		
Module-V	Cloud Computing	9 Hrs
Definition of Cloud Computing: Characteristics of Cloud, Cloud Deployment Models, Cloud Service Models, Driving Factors and Challenges of Cloud, Virtualization, Load Balancing, Scalability and Elasticity, Replication, Monitoring Cloud Services and Platforms: Compute Services, Storage Services, Application Services		
Text Books: 1. Kshemkalyani Ajay D, Mukesh Singhal, “Distributed Computing: Principles, Algorithms and Systems”, Cambridge Press, 2011. 2. Mukesh Singhal, Niranjana G Shivaratri, “Advanced Concepts in Operating systems”, McGraw Hill Publishers, 1994.		
Reference Books: 1. George Coulouris, Jean Dollimore, Tim Kindberg, “Distributed Systems Concepts and Design”, Fifth Edition, Pearson Education, 2012. 2. Pradeep L Sinha, “Distributed Operating Systems: Concepts and Design”, Prentice Hall of India, 2007. 3. Tanenbaum A S, Van Steen M, “Distributed Systems: Principles and Paradigms”, Pearson Education, 2007. 4. Liu M L, “Distributed Computing: Principles and Applications”, Pearson Education, 2004. 5. Nancy A Lynch, “Distributed Algorithms”, Morgan Kaufman Publishers, 2003. 6. Arshdeep Bagga, Vijay Madisetti, “Cloud Computing: A Hands-On Approach”, Universities Press, 2014.		
Web References https://www.geeksforgeeks.org/distributed-systems-tutorial/ https://www.baeldung.com/cs/distributed-systems-guide		



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PRINCIPLES OF COMMUNICATION SYSTEMS (Common to EEE, CSE, AI&ML, IT, CS, DS)					
Course Code	L:T:P:S	Credits	Exam. Marks	Exam Duration	Course Type
22A0430T	3:0:0:0	3	CIE:30SEE:70	3 Hours	OEC
Course Objectives: This course will enable students to: - Understand the concept of various modulation schemes and multiplexing. - Apply the concept of various modulation schemes to solve engineering problems. - Analyses various modulation schemes. - Evaluate various modulation scheme in real time applications.					
Course Outcomes: After the completion of the course students will be able to: - Understand the concept of various modulation schemes(L2) - Understand the concept of Different multiplexing techniques(L2) - Apply the concept of various modulation schemes to solve engineering problems(L3) - Analyze various modulation schemes(L4) - Apply various modulation schemes in real time applications(L3) - Understand the concept of various Communication systems(L2)					
		Syllabus		Total:48 Hrs	
Module-I		Amplitude Modulation		10 Hrs	
Amplitude Modulation: Introduction to Noise and Fourier Transform. An overview of Electronic Communication Systems. Need for Frequency Translation Amplitude Modulation: DSB-FC, DSB-SC, SSB-SC and VSB, Radio Transmitter and Receiver.					
Module-II		Frequency Modulation		9 Hrs	
Frequency Modulation: Introduction to Angle Modulation, Tone modulated FM Signal, Arbitrary Modulated FM Signal, FM Modulation and Demodulation. Stereophonic FM Broadcasting.					
Module-III		Pulse Modulation		9 Hrs	
Pulse Modulation: Sampling Theorem- Low pass and Band pass Signals. Pulse Amplitude Modulation and Concept of Time Division Multiplexing and Frequency Division Multiplexing. Pulse Width Modulation. Digital Representation of Analog Signals.					
Module-IV		Digital Modulation		10 Hrs	
Digital Modulation: Binary Amplitude Shift Keying, Binary Phase Shift Keying and Quadrature Phase Shift Keying, Binary Frequency Shift Keying. Regenerative Repeater, M-ARY and comparison					

Module-V	Communication Systems	10 Hrs
Communication Systems: Satellite, RADAR, Optical, Micro wave communication, Mobile and Computer Communication (Block diagram approach only).		
Text Books: Herbert Taub, Donald L Schilling and Goutam Saha, “Principles of Communication Systems”, 3rd Edition, Tata McGraw-Hill Publishing Company Ltd., 2008.		
References: B. P. Lathi, Zhi Ding and Hari M. Gupta, “Modern Digital and Analog Communication Systems”, 4th Edition, Oxford University Press, 2017. K. Sam Shanmugam “Digital and Analog Communication Systems”, Wiley India Edition, 2008.		
Web References: https://onlinecourses.nptel.ac.in/noc22_ee05/preview		



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APPLICATIONS OF POWER ELECTRONICS TO POWER SYSTEMS					
Course Code	L: T:P:S	Credits	Exam. Marks	Exam Duration	Course Type
22A0258T	3:0:0:0	3	CIE:30&SEE:70	3 Hours	OEC
Course Objectives: This course will enable students to: 1. Develop the understanding of uncompensated lines and their behavior under heavy loading conditions. 2. Understand the concept and importance controllable parameters of FACTS controllers. 3. Emphasize the objectives of Shunt compensation, and basic operation of SVC and STATCOM.					
Course Outcomes (COs): After the completion of the course, the students will be able to: • Choose proper controller for the specific application based on system requirements • Understand various systems thoroughly and their requirements • Interpret the control circuits of Shunt Controllers SVC & STATCOM for various functions viz. Transient stability Enhancement, voltage instability prevention and power oscillation damping					
Module-I	General System considerations and FACTS			10Hrs	
Transmission Interconnections, Flow of Power in an AC System, Power Flow and Dynamic Stability Considerations of a Transmission Interconnection, Principles of series and shunt compensation, Basic Types of FACTS, Controllers, Benefits from FACTS, Application of FACTS.					
Module-II	Shunt Compensators			8Hrs	
Objectives of Shunt Compensation, Midpoint Voltage Regulation for Line Segmentation, End of Line Voltage Support to Prevent Voltage Instability, improvement of Transient Stability, Power Oscillation Damping, Static Var Compensators, SVC and STATCOM, The Regulation Slope, Transfer Function and dynamic Performance, Transient Stability, Enhancement and Power Oscillation Damping.					
Module-III	Series Compensators			10Hrs	
Objectives of Series Compensation, concept of series capacitive compensation, voltage stability, improvement of transient stability, power oscillation damping, GTO thyristor-controlled series capacitor, Thyristor controlled series capacitor, SSSC.					
Module-IV	Combined Compensators			10Hrs	
Introduction, Unified power flow controller, basic operating principles, independent real and reactive power flow control, and control structure, basic control system for P and Q control.					

Module-V	Mitigation of Harmonics	10Hrs
Power quality problems, harmonics, harmonic creating loads, harmonic power flow, and mitigation of harmonics, filters, passive filters, active filters, shunt, series and hybrid filters.		
Text Books: 1. Narain G. Hingorani, Laszlo Gyugyi,” Understanding FACTS”, IEEE Press 2. Roger. C. Dugan, Mark. F. McGranagham, Surya Santoso, H.Wayne Beaty, “Electrical Power Systems Quality”, McGraw Hill,2003		
References: 1. Y.H.Song, A.T.Johns,” Flexible A.C.Transmission System”, IEE, London, 1999 Edition, Pearson, 2010.		
Web References: https://onlinecourses.nptel.ac.in/noc24_ee130/preview		



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Building Materials (ME, CSE, AI&ML, CS, DS, ECE, EEE)					
Course Code	L: T:P:S	Credits	Exam marks	Exam Duration	Course Type
22A0149T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OEC
Course Objectives:					
This course will enable students to:					
- Identify the traditional materials that are used for building constructions. - Explain basic concepts of building components such as stair case and masonry - Know the causes of dampness in structures and its preventive measures - Understand the building rules, building bye laws and acoustics of building					
Course Outcomes (CO):					
On completion of this course, the students will be able to					
- Understand the characteristics of different building materials(L2) - Differentiate brick masonry, stone masonry construction and bonds used in construction of walls of buildings(L4) - Know about the causes of dampness in buildings and its ill effects(L2) - Understand the principles of planning in buildings(L2) - Understand building rules and knowledge about, bye-laws and building elements. (L2)					
Syllabus					Total Hours:48
Module-I	Materials				9 Hrs
Traditional materials: Stones- Types of stone masonry -Brick-types of brick masonry- lime Cement – Timber – Seasoning of timber - their uses in building works					
Module-II	Building Components				9 Hrs
Lintels, Arches and Vaults – Staircases, Lifts – Types. Different types of flooring-Concrete, Mosaic, Terrazo floors; Different types of roofs- Pitched, Flat and Curved Roofs. Lean-to-Roof, Coupled Roofs, Trussed roofs - King and Queen Post Trusses. Doors & Windows- Types and Specifications					
Module -III	Dampness				10 Hrs
Dampness and its prevention: Causes of dampness- ill effects of dampness-requirements of an ideal material for damp proofing-materials for damp proofing –methods of damp proofing.					
Module-IV	Building Planning				10 Hrs
Elements of building planning- basic requirements-orientation-planning for energy efficiency-planning based on utility-other requirements					
Module-V	Building Rules and Bye-Laws				10 Hrs
Zoning regulations; Regulations regarding layouts or subdivisions; Building regulations; Rules for special type of buildings; Calculation of plinth, floor and carpet area; Floor space index. Building Information System					

Textbooks:
1. M.G. Shah, C.M. Kale and S.Y. Patki,"Building Drawing", Tata McGraw-Hill Publications 2. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain,"Building Construction" - Laxmi Publications (P) Ltd., New Delhi
Reference Books:
1.S. K. Duggal, "Building Materials", New Age International Publications. 2. N. Kumaraswamy, A. Kameswara Rao," Building Planning and Drawing", 7th Ed, Charotar
Web References: http://nptel.ac.in/courses/105104103/ http://www.academicpub.org/jwrhe/ http://www.peo.on.ca/index.php/ci_id/21843/la_id/1



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AUTOMOBILE ENGINEERING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0323Ta	3: 0:0:0	3	CIE:30SEE:70	3Hours	OEC
Course Objectives:					
This course will enable students to:					
• Impart the knowledge of vehicle structure and its components. • Demonstrate various components of petrol engines and diesel engines. • Trains about the various electrical system, circuits, and testing of automobiles. • Explain the concepts of steering, suspension and braking system in automobile.					
Course Outcomes (CO):					
On completion of this course, student will be able to:					
• Identify different parts of automobile(L2) • Explain the working of various parts like engine and brakes(L2) • Describe the working of steering and the suspension systems(L2) • Summarize the wheels and tires(L2) • Outline the future developments in the automobile industry(L3)					
Syllabus					Total Hours:48
Module-I	Introduction to Vehicle Structure and Engine Components				9 Hrs
Vehicle construction - Chassis and body - Specifications - Engine - Types - Construction - Location of engine - Cylinder arrangement - Construction details - Cylinder block - Cylinder head - Cylinder liners - Piston – piston rings - Piston pin - Connecting rod - Crankshaft - Valves. Lubrication system - Types - Oil pumps - Filters. Crankcase ventilation					
Module-II	Ignition and Fuel Supply Systems				10Hrs
Ignition system - Coil and Magneto - Spark plug - Distributor – Electronic ignition system - Fuel system - Carburetor - Fuel pumps - Fuel injection systems - Mono point and Multi point – Unit Injector – Nozzle types - Electronic Fuel Injection system (EFI) – GDI, MPFI, DTSI.					
Module-III	Steering and Suspension System				10Hrs
Principle of steering - Steering Geometry and wheel alignment - Steering linkages – Steering gearboxes - Power steering - front axle - Suspension system - Independent and Solid axle – coil, leaf spring and air suspensions - torsion bar - shock absorbers.					
Module-IV	Wheels, Tyres and Braking System				9 Hrs
Wheels and Tyres - Construction - Type and specification - Tyre wear and causes - Brakes - Needs – Classification –Drum and Disc Mechanical - Hydraulic and pneumatic - Vacuum assist – Retarders – Anti-lock Braking System (ABS).					

Module-V	Automobile Electrical Systems and Advances in Automobile Engineering	10Hrs
Battery-General electrical circuits- Active Suspension System (ASS) - Electronic Brake Distribution (EBD) – Electronic Stability Program (ESP), Traction Control System (TCS) - Global Positioning System (GPS), Hybrid vehicle, Fuel Cell.		
Text Books: 1. Kirpal Singh,” Automobile Engineering”, Vol.1&2, Standard Publications, 13/e, 2020. 2. William.H.Crouse, “Automotive Mechanics”, 10/e , McGraw-Hill, 2006.		
Reference Books: 1. David A. Corolla, “Automotive Engineering: Powertrain, Chassis System and Vehicle Body”, Butterworth-Heinemann Publishing Ltd, 2009. 2. Richard Stone, Jeffrey K. Ball, “Automotive Engineering Fundamentals", SAE International, 2004 3. Bosch,” Automotive Hand Book”, 6/e, SAE Publications, 2007. 4. K. Newton and W. Steeds, “The motor vehicle”, 13/e, Butterworth-Heinemann Publishing Ltd, 1989. 5. Joseph Heitner, “Automotive Mechanics Principles and Practices”, 2/e, CBS publishing 2004		



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SOFTWARE ENGINEERING LAB					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0510P	0:0:3:0	1.5	CIE:30 SEE:70	3Hours	PCC(Lab)
Course Objectives:					
This course will enable students to: • Learn and implement the fundamental concepts of Software Engineering. • Explore functional and non-functional requirements through SRS. • Practice the various design diagrams through the appropriate tool. • Learn to implement various software testing strategies.					
Course Outcomes (COs):					
After completion of this course, the students will be able to: • Acquaint with historical and modern software methodologies(L2) • Understand the phases of software projects and practice the activities of each phase (L2) • Practice clean coding (L3) • Take part in project management(L3) • Adopt skills such as distributed version control, unit testing, integration testing, build management, and deployment(L3)					
Syllabus				Total Hours: 48	
List of Experiments					
Experiment-1: Draw the Work Breakdown Structure for the system to be automated Experiment-2: Schedule all the activities and sub-activities Using the PERT/CPM charts Experiment-3: Define use cases and represent them in use-case document for all the stakeholders of the system to be automated Experiment-4: Identify and analyze all the possible risks and its risk mitigation plan for the system to be automated Experiment-5: Diagnose any risk using Ishikawa Diagram (Can be called as Fish Bone Diagram or Cause& Effect Diagram) Experiment-6: Define Complete Project plan for the system to be automated using Microsoft Project Tool Experiment-7: Define the Features, Vision, Business objectives, Business rules and stakeholders in the vision document Experiment-8: Define the functional and non-functional requirements of the system to be automated by using Use cases and document in SRS document					

Experiment-9: Define the following traceability matrices: 1. Use case Vs. Features 2. Functional requirements Vs. Use cases

Experiment-10: Estimate the effort using the following methods for the system to be automated: 1. Function point metric 2. Use case point metric

Experiment-11: Develop a tool which can be used for quantification of all the non-functional requirements

Experiment-12: Write C/C++/Java/Python program for classifying the various types of coupling.

Experiment-13: Write a C/C++/Java/Python program for classifying the various types of cohesion.

Experiment-14: Write a C/C++/Java/Python program for object-oriented metrics for design proposed by Chidamber and Kremer. (Popularly called CK metrics)

Experiment-15: Convert the DFD into appropriate architecture styles.

Experiment-16: Draw a complete class diagram and object diagrams using Rational tools

Experiment-17: Define the design activities along with necessary artifacts using Design Document.

Experiment-18: Reverse Engineer any object-oriented code to an appropriate class and object diagrams.

Experiment-19: Test a piece of code that executes a specific functionality in the code to be tested and asserts a certain behavior or state using Junit.

Experiment-20: Test the percentage of code to be tested by unit test using any code coverage tools

Experiment-21: Define appropriate metrics for at least 3 quality attributes for any software application of your interest

Reference Book

Carlos Otero ,”Software Engineering Design : Theory and Practice”, CRC press, 2016

Web References

<http://vlabs.iitkgp.ernet.in/se/>

<https://home.adelphi.edu/~chays/csc440/slides.html>



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MACHINE LEARNING LAB (Common to CSE, AI&ML, DS, CS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0532P	0:0:3:0	1.5	CIE: 30 SEE:70	3 Hours	PCC(Lab)
Course Objectives:					
This course will enable students to:					
• Make use of Data sets in implementing the machine learning algorithms • Implement the machine learning concepts and algorithms in any suitable language of choice.					
Course Outcomes (CO):					
On completion of this course, student will be able to					
• Understand the Mathematical and statistical prospective of machine learning algorithms through python programming (L2) • Apply different visualization techniques in the data analytics solution(L3) • Derive insights using Machine learning algorithms(L3)					
Syllabus				Total Hours:48	
List of Experiments					
Experiment 1: Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.					
Experiment 2: For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.					
Experiment 3: Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.					
Experiment 4: Build an Artificial Neural Network by implementing the Back-propagation algorithm and test the same using appropriate data sets.					
Experiment 5: Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.					
Experiment 6: Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.					
Experiment 7: Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.					
Experiment 8: Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.					

Experiment 9: Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.

Experiment 10: Implement parametric and non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Experiment 11: Implement BIRCH clustering algorithm

Experiment 12: Implement DBSCAN clustering algorithm

Reference Book:

1. Python Machine Learning Workbook for beginners, AI Publishing, 2020

Web References:

<https://www.udemy.com/course/machinelearning/>



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DATA WRANGLING WITH PYTHON (AI&ML)					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A3305P	1:0:2:0	2	100	3Hrs	SC
Course Objectives: This course will enable students to understand: • The fundamental concepts of data wrangling and Python basics. • The concept of data cleaning and formatting of the data. • The computations with Excel and pdf files. • The basic data exploration and web scrapping.					
Syllabus					Total Hours: 48
MODULE-I: INTRODUCTION TO DATA WRANGLING (10 Hrs) What Is Data Wrangling? Importance of Data Wrangling, how is Data Wrangling performed? Tasks of Data Wrangling, Data Wrangling Tools, Introduction to Python, Python Basics, Data Meant to Be Read by Machines, CSV Data, JSON Data, XML Data. Experiment – 1: Develop a Python Program for reading and Writing CSV files Experiment – 2: Develop a Python Program for reading and XML files Experiment – 3: Develop a Python Program for reading and writing JSON to a file					
MODULE-II: WORKING WITH EXCELFILES AND PDFS (10 Hrs) Installing Python Packages, Parsing Excel Files, Getting Started with Parsing, PDFs and Problem Solving in Python, Programmatic Approaches to PDF Parsing, Converting PDF to Text, Parsing PDFs Using pdf miner, Acquiring and Storing Data, Databases: A Brief Introduction-Relational Databases: MySQL and PostgreSQL, Non-Relational Databases: NoSQL, when to use a Simple File, Alternative Data Storage. Experiment – 4: Develop a Python Program for reading an excel file Experiment -- 5: Develop a Python Program for Converting TSV file into Excel Experiment – 6: Develop a Python Program for converting PDF file into Excel					
MODULE-III: DATA CLEANUP (10 Hrs) Why Clean Data? Data Cleanup Basics, Identifying Values for Data Cleanup, Formatting Data, Finding Outliers and Bad Data, Finding Duplicates, Fuzzy Matching, RegEx Matching. Normalizing and Standardizing the Data, Saving the Data, determining suitable Data Cleanup, Scripting the Cleanup, Testing with New Data. Experiment – 7: Develop a Python Program for cleaning empty cells and cleaning wrong format Experiment – 8: Develop a Python Program for finding duplicates in a data frame					

Experiment – 9: Develop a Python Program for normalizing data

MODULE–IV: DATA EXPLORATION AND ANALYSIS (9 Hrs)

Exploring Data, Importing Data, Exploring Table Functions, Joining Numerous Datasets, Identifying Correlations, Identifying Outliers, Creating Groupings, Analyzing Data - Separating and Focusing the Data, Presenting Data, Visualizing the Data, Charts, Time-Related Data, Maps, Interactives, Words, Images, Video, and Illustrations, Presentation Tools, Publishing the Data - Open-Source Platforms.

Experiment – 10: Develop a Python Program for detecting and removing outliers

Experiment – 11: Develop a Python Program for drawing bar chart, histogram and Pie chart

Experiment – 12: Develop a Python Program for time series visualization

MODULE–V: WEB SCRAPING (9 Hrs)

What to Scrape and How, analyzing a Web Page, Network/Timeline, interacting with JavaScript, In-Depth Analysis of a Page, Getting Pages, Reading a Web Page - Reading a Web Page with LXML and XPath, Advanced Web Scraping - Browser-Based Parsing, Screen Reading with Selenium, Screen Reading with Ghost. Py, Spidering the Web - Building a Spider with Scrapy, Crawling Whole Websites with Scrapy

Experiment – 13: Develop a Python Program for reading a HTML page

Experiment – 14: Develop a Python Program for building a Spider using scrapy

Text Books:

1. Jacqueline Kazil & Katharine Jarmul,” Data Wrangling with Python”, O’ReillyMediaInc.,2016.

Reference Books:

- 1.Dr. Tirtha jyoti Sarkar,Shubha deep, ”Data Wrangling with Python: Creating action table data from raw sources”, Packt Publishing Ltd., 2019.
2. Stefanie Molin,” Hands-On Data Analysis with Pandas”, PacktPublishingLtd.,2019
3. AllanVisochek,” Practical DataWrangling”, PacktPublishingLtd.,2017
4. TyeRattenbury, Joseph M. Hellerstein, Jeffrey Heer, Sean Kandel, Connor Carreras,” Principles of Data Wrangling: Practical Techniques for Data Preparation”, O’Reilly Media Inc., 2017

Web References:

- 1.<http://www.gbv.de/dms/ilmenau/toc/827365454.PDF>
- 2.<https://www.udemy.com/course/data-wrangling-with-python/>
- 3.<http://www.openculture.com/free-online-data-science-courses>
- 4.<https://www.classcentral.com/course/dataanalysiswithpython-11177>



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DESIGN THINKING AND INNOVATION					
(Common to CSE, AIML, CS, DS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0526	2:0:0:0	-	CIE:30	-	MC
Course Objectives:					
The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.					
Course Outcomes (CO):					
On completion of this course, student will be able to:					
• Define the concepts related to design thinking(L2). • Interpret the fundamentals of Design Thinking and innovation(L2) • Apply the Design thinking techniques for solving problems in various sectors(L3) • Analyze to work in a Multidisciplinary Environment(L4) • Compute the value of Creativity (L3) • Formulate specific problem statements of real time issues(L3)					
Syllabus				Total Hours:48	
Module-I	Introduction to Design Thinking			9Hrs	
Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.					
Module -II	Design Thinking Process			9Hrs	
Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brain storming, product development					
Activity: Every student presents their idea in three minutes, every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.					
Module -III	Innovation			10Hrs	
Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.					
Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.					
Module -IV	Product Design			10Hrs	

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.

Activity: Importance of modelling, how to set specifications, Explaining their own product design.

Module -V	Design Thinking in Business Processes	10Hrs
Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes. Activity: How to market our own product, About maintenance, Reliability and plan for startup.		
Text Books: 1. Tim Brown, Harper Bollins,” Change by Design”, (2009) 2. Idris Mootee “Design Thinking for Strategic Innovation”, 2013, John Wiley & Sons		
Reference Books: 1. David Lee, “Design Thinking in the Classroom”, Ulysses press 2. Shrrutin N Shetty, “Design the Future”,”, Norton Press 3. William lidwell, kritinaholden, Jill butter “Universal Principles of Design”.		
Web References: https://nptel.ac.in/courses/110/106/110106124/ https://nptel.ac.in/courses/109/104/109104109/ https://swayam.gov.in/nd1_noc19_mg60/preview		

Semester-6 (Theory-5, Lab-3, SC-1 MC-1)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	PCC	22A3306T	Natural Language Processing	3	0	0	3
2	PCC	22A3307T	Advanced Machine Learning	3	0	0	3
3	PCC	22A05H04	Computer Vision	3	0	0	3
4	PEC	22A0530Ta 22A0535Tb 22A0530Tc 22A0529T	Professional Elective-II: 1. Software Testing 2. Intelligent Information Retrieval Systems 3. Cryptography and Network Security 4. Cloud computing	3	0	0	3
5	OEC	22A0413T 22A0213Ta 22A0150T 22A0327Tb	Open Elective-II: 1. Micro Controllers and Applications 2. Control Systems 3. Environmental Economics 4. Introduction to Composite Materials	3	0	0	3
6	PCC(Lab)	22A3308P	Natural Language Processing Lab	0	0	3	1.5
7	PCC(Lab)	22A3309P	Advanced Machine Learning Lab	0	0	3	1.5
8	PCC(Lab)	22A3310P	Computer Vision Lab	0	0	3	1.5
9	SC	22A0029P	Skill Oriented Course: Soft Skills	1	0	2	2
10	MC	22A0032T	Mandatory Course: Research Methodology	2	0	0	0
			Total credits			21.5	
Honors / Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)				4	0	0	4
Industrial / Research Internship (Mandatory) 2 Months during summer vacation							



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NATURAL LANGUAGE PROCESSING (Common to CSE, AI&ML, DS& CS)					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A3306T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PCC
Course Objectives:					
This course will enable students to:					
- Understand approaches to Interpretation of Syntax and Semantics of Natural Languages. - Understand Current methods for statistical approaches to Machine Translation. - Understand Language Modeling. - Understand Machine Learning Techniques used in NLP. - Apply Fundamental algorithms and techniques in the area of Natural Language Processing (NLP)					
Course Outcomes (CO):					
On completion of this course, student will be able to:					
- Understand the logic behind Natural languages(L2) - Understand the significance of Syntax and Semantics of Natural Languages(L2) - Process the Natural Languages(L3) - Verify the Syntax and Semantics of Languages(L3) - Design New Natural Languages(L3)					
Syllabus					Total Hours:43
Module -I	Introduction to Natural Language Processing				8Hrs
The Study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different Levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English Syntax.					
Module -II	Grammars and Parsing				8Hrs
Grammars and Parsing- Top- Down and Bottom-Up Parsers, Transition Network Grammars, Feature Systems and Augmented Grammars, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks, Bayes Rule, Shannon game, Entropy and Cross Entropy					
Module -III	Grammars for Natural Language Processing				9Hrs
Grammars for Natural Language, Movement Phenomenon in Language, Handling questions in Context Free Grammars, Hold Mechanisms in ATNs, Gap Threading, Human Preferences in Parsing, Shift Reduce Parsers, Deterministic Parsers.					
Module -IV	Interpretation and Modelling				9Hrs

Semantic Interpretation-Semantic & Logical form, Word senses & ambiguity, the basic logical form language, encoding ambiguity in the logical Form, Verbs & States in logical form, Thematic roles, Speech acts & embedded sentences, Defining semantics structure model theory. Language Modelling- Introduction, n-Gram Models, Language model Evaluation, Parameter Estimation, Language Model Adaption, Types of Language Models, Language-Specific Modelling Problems, Multilingual and Cross lingual Language Modelling.		
Module -V	Multilingual Information Retrieval	9Hrs
Multilingual Information Retrieval - Introduction, Document Pre-processing, Monolingual Information Retrieval, CLIR, MLIR, Evaluation in Information Retrieval, Tools, Software and Resources. Multilingual Automatic Summarization - Introduction, Approaches to Summarization, Evaluation, How to Build a Summarizer, Competitions and Datasets		
Text Books: 1. James Allen,” Natural Language Understanding”, 2nd Edition, 2003, Pearson Education. 2. Daniel M.Bikel and Imed Zitouni “Multilingual Natural Language Processing Applications: From Theory to Practice”, Pearson Publications.		
Reference Books: 1. Akshar Bharathi, Vineet Chaitanya, “Natural Language Processing, A paninian perspective”, Prentice –Hall of India. 2. Charniack, Eugene, “Statistical Language Learning”, MIT Press, 1993. 3. Jurafsky, Dan and Martin, James, “Speech and Language Processing”, 2nd Edition, Prentice Hall, 2008. 4. Manning, Christopher and Henrich, Schutze, “Foundations of Statistical Natural Language Processing”, MIT Press, 1999.		
Web References: https://www.deeplearning.ai/resources/natural-language-processing/		



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ADVANCED MACHINE LEARNING (Common to CSE, AI&ML, DS, CS)					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A3307T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PCC
Course Objectives:					
This course will enable students to: - Explore the fundamental concepts required for Data science - Explain the basic concepts of data science. - To familiarize with Python libraries for Data Visualization. - Elucidate various Machine Learning algorithms					
Course Outcomes (CO):					
On completion of this course, students will be able to 1. Apply dimensionality reduction techniques on various data sets(L3) 2. Analyze various Neural Network topologies to solve complex problems in Deep Belief Networks(L4) 3. Examine the performance of deep architectures with respect to high dimensional input data(L4) 4. Apply Semi Supervised Learning techniques on real time data sets to label the data(L3) 5. Apply Feature Engineering techniques to transform raw data into normalized data(L3) 6. Make use of Python Machine Learning tools to ensemble different models together to solve real – time problems(L3)					

Syllabus		Total Hours:44
Module-I	Unsupervised Machine Learning & Deep Belief Networks	10 Hrs
Principal component analysis, Introducing K-means clustering, self-organizing maps. Neural Networks – A Primer, Composition of A Neural Network, Network Topologies, Restricted Boltzmann Machine, Introducing the RBM, Applications of the RBM, Deep belief Networks-Training a DBN, Applying the DBN, Validating the DBN.		
Module-II	Stacked Denoising Auto encoders & Convolutional Neural Networks	9 Hrs
Autoencoders: Introduction, Topology, Training, Denoising Autoencoders, Applying a DA,		

Stacked Denoising Autoencoders, Applying The SDA, Assessing SDA Performance. Convolutional Neural Networks: Introduction To CNN, Understanding The Convnet Topology, Understanding Convnet Layers And Pooling Layers, Training A Convnet, Applying A CNN.		
Module-III	Semi-Supervised Learning & Text Feature Engineering	9 Hrs
Semi-Supervised Learning: Introduction, understanding semi-supervised learning, Semi-supervised algorithms in action, Self- training, implementing self-training, Finessing your self-training implementation, Contrastive Pessimistic Likelihood Estimation. Text Feature Engineering: Introduction, Text Feature Engineering, Cleaning Text Data, Text Cleaning With Beautiful Soup, Managing Punctuation and Tokenizing, Tagging and Categorizing Words, Creating Features from Text Data, Stemming.		
Module-IV	Feature Engineering	10 Hrs
Introduction, creating a feature set, Engineering features for ML applications, using rescaling techniques to improve the learnability of features, creating effective derived variables, reinterpreting non-numeric features, using feature selection techniques, performing feature selection, Feature engineering in practice, acquiring data via RESTful APIs, Testing the performance of our model, Twitter, Deriving and selecting variables using feature engineering techniques.		
Module-V	Ensemble Methods & Additional Python Machine Learning Tools	10 Hrs
Ensemble Methods: Introducing Ensembles, Understanding Averaging Ensembles, Using Bagging Algorithms, Using Random Forests, Applying Boosting Methods, Using XGboost, Using Stacking Ensembles, Using Models in Dynamic Applications, Understanding Model Robustness, Identifying Modeling Risk Factors, Strategies to Managing Model Robustness. Additional Python Machine Learning Tools: Alternative Development Tools, Introduction to Lasagne, getting to know Lasagne, Introduction to Tensor flow, Knowing when to use these libraries		
Text Books: 1. John Hearty, “Advanced Machine Learning with Python”, Packt Publishing Ltd, 2016.		
Reference Books: 1. T.M. Mitchell, “Machine Learning”, McGraw-Hill,1997. 2. Machine Learning, SaikatDutt, Subramanian Chandramouli, Amit Kumar Das, Pearson, 2019.		
Web References 1. http://digimat.in/nptel/courses/video/106105152/L01.html		



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3rd Mile, Bombay Highway, Gangavaram (V), Kovur(M), SPSR Nellore (Dt), Andhra Pradesh, India- 524137

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COMPUTER VISION (Common to CSE, AI&ML, DS, CS)					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A05H04	3: 0:0:0	3	CIE: 30 SEE:70	3 Hrs	PCC
Course Objectives:					
This course will enable students to : - Understand the Fundamental Concepts of vision - Understand the filtering and image filtering operations - Understand basic principles of Thresholding. - Understand the importance of edge detection in computer vision - Understand the broad concepts of texture					
Course Outcomes (COS):					
After completion of the course, the students will be able to: - Understand vision and its concepts(L2) - Understand the concepts of image filtering (L2). - Use the Thresholding techniques in image conversion (L3) - Use image edge detection for smoothing (L3) - Understand the use of texture in image processing (L2).					
Syllabus					Total Hours:48
Module-I	Vision, the Challenge				9Hrs
Vision, the Challenge: Introduction, The Nature of Vision- The Process of Recognition, Tackling the Recognition Problem, Object Location, Scene Analysis, Vision as Inverse Graphics					
Module-II	Imaging and Image Filtering Operations				10 Hrs
Images and Imaging Operations: Introduction, Image Processing Operations, Convolutions and Point Spread Functions. Sequential Versus Parallel Operations. Basic Image Filtering Operations: Introduction, Noise Suppression by Gaussian Smoothing, Median Filters, Mode Filters, Rank Order Filters, Shifts Introduced by Median Filters, Discrete Model of Median Shifts					
Module-III	Thresholding Techniques				9Hrs
Thresholding Techniques: Introduction, Region-Growing Methods, Thresholding, Adaptive Thresholding, More Thoroughgoing Approaches to Threshold Selection, The Global Valley Approach to Thresholding, Practical Results Obtained Using the Global Valley Method.					
Module-IV	Edge Detection				10 Hrs

Edge detection: Introduction, Basic Theory of Edge Detection, The Template Matching Approach, Theory of 3 x 3 Template Operators, The Design of Differential Gradient Operators, The Concept of a Circular Operator, Detailed Implementation of Circular Operators, 0 Hysteresis Thresholding, The Canny Operator, The Laplacian Operator, Practical Results Obtained Using Active Contour

Module-V

Texture and Binary Shape Analysis

10 Hrs

Texture: Some Basic Approaches to Texture Analysis, Gray level Co-occurrence Matrices, Laws' Texture Energy Approach, Ade's Eigen filter Approach, Appraisal of the Laws and Ade Approaches
Binary Shape Analysis: Connectedness in Binary Images, Size Filtering, Distance Functions and Their Uses.

Text Books:

1. E. R. Davies, "Machine Vision: Theory, Algorithms, Practicalities" Fourth Edition

Reference Books:

1. David A. Forsyth and Jean Ponce, "Computer Vision – A Modern Approach", PHI Learning (Indian Edition), 2009.
2. R. C. Gonzalez and R. E. Woods "Digital Image Processing" Addison Wesley 2008.
3. Richard Szeliski "Computer Vision: Algorithms and Applications" Springer-Verlag London Limited 2011.

Web References:

1. https://onlinecourses.nptel.ac.in/noc19_cs58/preview



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SOFTWARE TESTING (Common to CSE, AI&ML, CS, DS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0530Ta	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PEC
Course Objectives:					
This course will enable students to: • Learn the criteria for test cases. • Learn the design of test cases. • Understand test management and test automation techniques. • Apply test metrics and measurements					
Course Outcomes (CO):					
On completion of this course, student will be able to • Interpret test cases suitable for a software development for different paths, domains and state graphs. (L2) • Discover suitable tests to be carried out. (L3) • Categorize Transaction flow testing and data flow testing. (L4) • Illustrate Domain testing and Logic based testing. (L2) • Solve path products and regular expressions. (L3) • Connect state, state graphs and transition testing. (L4)					
Syllabus				Total Hours:48	
Module-I	Introduction to Testing			10Hrs	
Introduction: Purpose of testing, dichotomies, model for testing, consequences of bugs, taxonomy of bugs. Flow graphs and path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.					
Module-II	Transaction Flow Testing			9Hrs	
Transaction flow testing: Transaction flows, transaction flow testing techniques, dataflow testing, basics of data flow testing, strategies in data flow testing, application of data flow testing.					
Module-III	Path Products			10Hrs	
Domain testing: Domains and paths, nice and ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability. Logic based testing: Overview, decision tables, path expressions, kv charts and specifications					
Module-IV	Architecture Requirements and Designing			9Hrs	
Paths, path products and regular expressions: Path products and path expression, reduction procedure, applications, regular expressions and flow anomaly detection.					

Module-V	Transition Testing	10Hrs
State, state graphs and transition testing: State graphs, good and bad state graphs, state testing, testability tips.		
Text Books: 1. BorisBeizer, “Software Testing Techniques”, DreamtechPress,2nd Edition,2003 2. Srinivasan Desikan and Gopalaswamy Ramesh, “Software Testing Principles and Practices”, Pearson Education, 2006.		
Reference Books: 1. Ron Patton,” Software Testing”, Second Edition, Sams Publishing, Pearson Education, 2007.AU Library.com 2. P.C.Jorgenson “Software Testing: A Craft men,, Approach”, Auerbach Publications, 3rd Edition, 2013 3. Perry, “Effective Methods of Software Testing”, JohnWiley,2nd Edition, 1999. 4. P.NageswaraRao”Software Testing Concepts and Tools”, Dream Tech Press, 2nd Edition, 2007.		
Web References: 1. https://nptel.ac.in/courses/106105031/		



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INTELLIGENT INFORMATION RETRIEVAL SYSTEMS (Common to CSE, AI&ML, DS, CS)					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0535Tb	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PEC
Course Objectives:					
This course will enable students to: - Understand the techniques for retrieval of information - Discuss indexing and how to use it - Demonstrate how to automate indexing					
Course Outcomes (CO):					
After the completion of the course, the students will able to - Recognize the Boolean Model, Vector Space Model, and Probabilistic Model(L2) - Understand retrieval utilities(L2) - Understand different formatting tags(L2) - Understand cross-language information retrieval(L2) - Understand different clustering techniques(L2) - Determine the efficiency of different retrieval systems(L3)					
Syllabus				Total Hours:48	
Module-I	Introduction			10Hrs	
Introduction to Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses. Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities					
Module-II	Cataloguing and Indexing, Data structure			9Hrs	
Cataloguing and Indexing: History and objectives of Indexing, Indexing Process, Automatic Indexing, Information extraction. Data structure: Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models.					
Module-III	Automatic Indexing, Document and Term Clustering			10Hrs	

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages. Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Manual Clustering Automatic Term Clustering, Complete Term Relation Method, Clustering Using Existing Clusters, One Pass Assignments, Item Clustering, hierarchy of Clusters.		
Module-IV	Automatic Indexing, Information visualization	9Hrs
Automatic Indexing: Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the INTERNET and Hypertext. Information Visualization: Introduction to Information visualization, Cognition and perception, Information Visualization Technologies.		
Module-V	Text Search Algorithms, Multimedia Information Retrieval, Information System Evaluation	10Hrs
Text Search Algorithms: Introduction to Text Search techniques, software Text Search algorithms, Hardware Text Search Systems. Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph retrieval, Imagery Retrieval, Video Retrieval. Information System Evaluation: Introduction to Information System Evaluation, Measures Used in System Evaluation, Measurement Example- TREC results.		
Text Books: 1. Gerald J. Kowalski, Mark T. Maybury, “Information Storage and Retrieval Systems: Theory and Implementation”, Springer, 2013.		
Reference Books: 1. Frakes, W.B., Ricardo Baeza-Yates,” Information Retrieval Data Structures and Algorithms”, Prentice Hall, 1992. 2. Yates “Modern Information Retrieval”, Pearson Education. 3. Robert Korfhage, “Information Storage & Retrieval” , John Wiley & Sons.		
Web References: https://www.tutorialandexample.com/information-retrieval		



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CRYPTOGRAPHY AND NETWORK SECURITY (Common to CSE, AIML, CS, DS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0530Tc	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PEC
Course Objectives:					
This course will enable students to: - Introduce the basic categories of threats to computers and networks - Illustrate various cryptographical algorithms. - Demonstrate public-key cryptosystem. - Discuss the fundamental ideas of public-key cryptography. - Explore Web security threats and protection mechanisms.					
Course Outcomes (CO):					
On completion of this course, student will be able to - Understand and apply the cryptographic algorithms to safe guard from intruders(L3) - Compare and contrast symmetric and asymmetric encryption systems and their vulnerability to attack (L4) - Implement the various key distribution, management and message authentication Schemes to send the messages with security (L3) - Identify information system requirements for Transport level, wireless network, E-Mail and IP (L3) - Design a network security system by implementing all the concepts of encryption and decryption algorithms (L3) - Design a web security system by implementing all the concepts(L3)					
Syllabus				Total Hours:48	
Module-I	Attacks on Computers and Computer Security			10Hrs	
Introduction, The need for security, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security Cryptography, plain text and cipher text, encryption and decryption, substitution techniques, transposition techniques, symmetric and asymmetric key cryptography, Steganography					
Module-II	Symmetric key Ciphers & Asymmetric key Ciphers			9Hrs	
Symmetric key Ciphers: Block Cipher principles, Block cipher modes of operation, Stream ciphers, DES, AES, Blowfish, Key distribution. Asymmetric key Ciphers: Principles of public key cryptosystems, RSA, Diffie Hellman Key Exchange, and Elliptic Curve Cryptography, Key Distribution.					
Module-III	Message Authentication and Hash Functions			10Hrs	
Authentication requirements, Functions, Message authentication codes, Hash Functions, Secure hash algorithm, Whirlpool, HMAC, CMAC, Digital signatures.					
Module-IV	E-Mail Security			9Hrs	

Pretty Good Privacy, S/MIME, IP Security: IP Security overview, IPSecurity architecture, Authentication Header, Encapsulating Security Payload (ESP), Security Associations, Key-Management.

Module-V

Web Security

10Hrs

Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction Intruders, Virus and Firewalls: Intruders, Intrusion detection, password management, Virus and related threats, Firewall design principles, Types of firewalls.

Case Studies on Cryptography and security: Secure Inter-branch Payment Transactions, Virtual Elections.

Text Books:

1. William Stallings, "Cryptography and Network Security", 5th Edition, Pearson Education, 2011.
2. Bernard Menezes "Network Security and Cryptography", 1st Edition, CENGAGE Learning, 2010.

Reference Books:

1. C K Shyamala, N Harini, Dr T R Padmanabhan, "Cryptography and Network Security", 1st Edition, Wiley India Pvt Ltd, 2011.
2. Forouzan Mukhopadhyay "Cryptography and Network Security", 2nd Edition, McGrawHill, 2010.
3. Mark Stamp, Wiley India, "Information Security, Principles and Practice", 2nd Edition, Wiley, 2011.

Web References:

1. <https://www.tutorialspoint.com/cryptography/index.htm>
2. <https://www.gatevidyalay.com/tag/cryptography-and-network-security-tutorial/>
3. <https://www.youtube.com/watch?v=C7vmouDOJYM>



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CLOUD COMPUTING (Common to CSE, AI&ML, DS, CS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0529T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PEC
Course Objectives:					
This course will enable students to:					
- Introduce the broad perceptive of cloud architecture and model - Understand the concept of Virtualization and familiar with the lead players in cloud. - Understand the features of cloud simulator and apply different cloud programming model - Design of cloud Services and explore the trusted cloud Computing system					
Course Outcomes (CO):					
On completion of this course, student will be able to					
- Understand the basic concepts about cloud computing vision and its developments and gain the knowledge of virtualization technology(L2) - Analyze the concepts of cloud services and the deployment models(L4) - Choose among various cloud technologies for implementing applications (GAE, OpenStack) (L4) - Construct the virtual machines by using VMware simulator(L3) - Build scientific applications by using Cloud environment(L3) - Develop Business and Consumer Applications(L3)					
Syllabus				Total Hours:48	
Module-I	Basics of Cloud Computing			10Hrs	
Introduction to Cloud: Introduction to Cloud, Cloud Computing Reference Model, Characteristics and Benefits, Challenges Ahead, Elasticity in Cloud, On-demand Provisioning.					
Virtualization: Introduction, Characteristics of Virtualized Environment, Taxonomy of Virtualization Techniques, Virtualization, and Cloud computing.					
Module-II	Cloud Architecture, Models and Security			9Hrs	
Cloud Computing Architecture: Introduction, Cloud Reference Model, Architecture, Infrastructure Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds.					
Cloud Deployment Model: Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud.					
Module-III	Cloud Technologies and Advancements			10Hrs	
Apache Hadoop, MapReduce, Hadoop Cluster setup, Virtual Box, Google App Engine, Programming Environment for Google App Engine – Open Stack					
Module-IV	VMware Simulator			9Hrs	

VMWare: Basics of VMWare, Advantages of VMware virtualization, create a new virtual machine on local host, cloning virtual machines, virtualize a physical machine, starting and stopping a virtual machine.

Module-V	Cloud Applications	10Hrs
Cloud Applications: Scientific Applications – Health Care, Geoscience. Business And Consumer Applications - CRM and ERP, Social Networking, Media Applications, and Multiplayer Online Gaming. Text Books: 1. Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi “Mastering Cloud Computing” ,TMH 2013. 2. George Reese, “Cloud Application Architectures: Building Applications and Infrastructure in the Cloud” O'Reilly Media Reference Books: 1. Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern Halper, “Cloud computing for dummies” Wiley Publishing, Inc, 2010. 2. Rajkumar Buyya, James Broberg, Andrzej Goscinski,”Cloud Computing (Principles and Paradigms)” , John Wiley & Sons, Inc. 2011. 3. Gautam Shroff, “Enterprise Cloud Computing”, Cambridge University Press, 2010. 4. George Reese,”Cloud Application Architectures: Building Applications and Infrastructure in the Cloud”, O ‘Reilly, SPD, RP 2011. 5. K.Chandrasekaran ,”Essentials of Cloud Computing”, CRC Press. 6. Arshdeep Bahga and Vijay Madisetti,” Cloud computing: A Hands-On Approach” 7. Anthony T.Velte , Toby J. Velte Robert Elsenpeter ,“Cloud computing a practical approach”, Tata McGraw- Hill , New Delhi – 2010. Web References: https://nptel.ac.in/courses		



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MICRO CONTROLLERS AND APPLICATIONS (Common to CSE, AI&ML, DS, CS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0413T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	OEC
Course Objectives:					
This course will enable students to:					
- Describe the Architecture of 8051 Microcontroller and Interfacing of 8051 to external memory. - Write 8051 Assembly level programs using 8051 instruction set. - Describe the Interrupt system, operation of Timers/Counters and Serial port of 8051. - Interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to 8051					
Course Outcomes (CO):					
On completion of this course, the students will be able to					
- Understand the importance of Microcontroller(L2) - Acquire the knowledge of Architecture of 8051 Microcontroller(L2) - Apply and Interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to using 8051 I/O ports(L3) - Develop the 8051 Assembly level programs using 8051 instruction set(L3) - Develop the Interrupt system(L3) - Understand the operation of Timers/Counters and Serial port of 8051(L2)					
Syllabus				Total Hours:48	
Module-I	8051 Microcontroller			10Hrs	
8051 Microcontroller: Microprocessor Vs Microcontroller, Embedded Systems, Embedded Microcontrollers, 8051 Architecture- Registers, Pin diagram, I/O ports functions, Internal Memory organization. External Memory (ROM & RAM) interfacing..					
Module-II	Addressing Modes			9Hrs	
Addressing Modes, Data Transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Bit manipulation instructions. Simple Assembly language program examples to use these instructions.					
Module-III	8051 Stack, Stack and Subroutine instructions			9Hrs	
8051 Stack, Stack and Subroutine instructions: Simple Assembly language program examples to use subroutine instructions.8051 Timers and Counters – Operation and Assembly language programming to generate a pulse using Mode-1 and a square wave using Mode- 2 on a port pin.					
Module-IV	8051 Serial Communication			10Hrs	
8051 Serial Communication- Basics of Serial Data Communication, RS- 232 standard, 9 pin RS232 signals, Simple Serial Port programming in Assembly and C to transmit a message and to receive data					

serially.8051 Interrupts. 8051 Assembly language programming to generate an external interrupt using a switch.

Module-V	8051 C programming	10Hrs
8051 C programming to generate a square waveform on a port pin using a Timer interrupt. Interfacing 8051 to ADC-0804, DAC, LCD and Interfacing with relays and Opto isolators, Stepper Motor Interfacing, DC motor interfacing, PWM generation using 8051.		
Text Books: 1. Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; “The 8051 Microcontroller and Embedded Systems – using assembly and C”, PHI, 2006 / Pearson, 2006. 2. Kenneth J. Ayala, “The 8051 Microcontroller”, 3rd Edition, Thomson/Cengage Learning		
Reference Books: 1. Manish K Patel, “The 8051 Microcontroller Based Embedded Systems”, McGraw Hill, 2014, ISBN: 978-93-329-0125-4. 2. Raj Kamal, “Microcontrollers: Architecture, Programming, Interfacing and System Design”, Pearson Education, 2005. Wayne Wolf, FPGA based system design, Prentice hall, 2004.		
Web References: https://nptel.ac.in/courses/117104072 https://onlinecourses.nptel.ac.in/noc22_ee12/preview		



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CONTROL SYSTEMS					
(Common to CSE, AI&ML, DS, CS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0213Ta	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	OEC
Course Objectives:					
This course will enable students to:					
• Merits and demerits of open loop and closed loop systems; the effects of feedback • The use of block diagram algebra and Mason’s gain formula • Transient and steady state responses, time domain specifications • Frequency domain specifications, Bode diagrams and Nyquist plots • The fundamental aspects of modern control					
Course Outcomes (CO):					
On completion of this course, student will be able to					
• Compute the effective transfer function of a system from (i) block diagram reduction techniques (ii) Mason’s gain formula(L3) • Compute the steady state errors and transient response characteristics(L3) • Determine the absolute stability and relative stability of a system(L3) • Design a compensator to accomplish desired performance(L3) • Derive state space model of a given physical system and solve the state equation(L3)					
Syllabus				Total Hours:48	
Module-I	Introduction			10Hrs	
Open Loop and closed loop control systems and their differences- Examples of control systems- Classification of control systems, Feedback Characteristics, Effects of positive and negative feedback. Mathematical models – Differential equations of Translational and Rotational mechanical systems, and Electrical Systems, Block diagram reduction methods – Signal flow graph - Reduction using Mason’s gain formula. Transfer Function of DC Servo motor - AC Servo motor - Synchro transmitter and Receiver.					
Module-II	Time Response Analysis			10Hrs	
Step Response - Impulse Response - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants					
Module-III	Stability			9Hrs	
The concept of stability – Routh’s stability criterion – Stability and conditional stability – limitations of Routh’s stability. The root locus concept - construction of root loci effects of adding poles and zeros to G(s)H(s) on the root loci.					

Module-IV	Frequency Response Analysis	10Hrs
Introduction, Frequency domain specifications-Bode Diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram Stability Analysis from Bode Plots. Polar Plots- Phase margin and Gain Margin-Stability Analysis.		
Module-V	State Space Analysis	10Hrs
Concepts of state, state variables and state model, derivation of state models from differential equations. Transfer function models. Block diagrams. Diagonalization. Solving the Time invariant state Equations- State Transition Matrix and its Properties. System response through State Space models. The concepts of controllability and observability		
Text Books: 1. Katsuhiko Ogata, "Modern Control Engineering", Pearson, 1st Impression 2015. 2. I. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International Publishers, 5th edition, 2007, Reprint 2012.		
Reference Books: 1. Farid Golnaraghi and Benjamin. C. Kuo, "Automatic Control Systems", WILEY, 9th Edition, 2010. 2. Dhanesh N. Manik, "Control Systems", CENGAGE Learning, 2012. 3. John J D'Azzo and C. H. Houpis, "Linear Control System Analysis and Design: Conventional and Modern", McGraw - Hill Book Company, 1988.		
Web References: https://archive.nptel.ac.in/courses/107/106/107106081/ https://onlinecourses.nptel.ac.in/noc20_ee90/preview		



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ENVIRONMENTAL ECONOMICS (Common to CSE, AI&ML, DS, CS)					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0150T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OEC
Course Objectives:					
This course will enable students to: • Impart knowledge on sustainable development and economics of energy • Understand environmental degradation and economic analysis of degradation • Inculcate the knowledge of economics of pollution and their management • Demonstrate the concept of cost benefit analysis of environmental resources • Make the students to understand principles of economics of biodiversity					
Course Outcomes (CO):					
On completion of this course, the students will be able to • Understand sustainable development and economics of energy(L2) • Gain knowledge on environmental degradation and economic analysis of degradation(L2) • Understand economics of pollution and their management(L2) • Interpret cost benefit analysis of environmental resources(L2) • Understand the principles of economics of biodiversity (L2)					
Syllabus				Total Hours:48	
Module-I	Sustainable Development			9Hrs	
Introduction to sustainable development - Economy-Environment interlinkages - Meaning of sustainable development - Limits to growth and the environmental Kuznets curve – The sustainability debate - Issues of energy and the economics of energy.					
Module-II	Environmental Degradation			9Hrs	
Economic significance and causes of environmental degradation - The concepts of policy failure, externality and market failure - Economic analysis of environmental degradation – Equi –marginal principle.					
Module-III	Economics of Pollution			10Hrs	
Economics of optimal pollution, regulation, monitoring and enforcement - Managing pollution using existing markets: Bargaining solutions – Managing pollution through market intervention: Taxes, subsidies and permits.					
Module-IV	Cost – Benefit Analysis			10Hrs	
Cost – Benefit Analysis: Economic value of environmental resources and environmental damage - Concept of Total Economic Value - Alternative approaches to valuation – Cost-benefit analysis and discounting.					
Module-V	Economics of Biodiversity			10Hrs	

Economics of biodiversity: Economics of biodiversity conservation - Valuing individual species and diversity of species -Policy responses at national and international levels. Economics of Climate Change – stern Report

Text Books:

1. N. Hanley, J. Shogren and B. White,” An Introduction to Environmental Economics”, Oxford University Press. (2001)
2. D.W. Pearce, A. Markandya and E.B. Barbier, “Blueprint for a Green Economy”, Earthscan, London. (1989)

Reference Books:

1. R.K. Turner, D.W. Pearce, I. Bateman and Harvester Wheatsheaf,” Environmental Economics: An Elementary Introduction”, London. (1994).
2. D.W. Pearce, R.K. Turner and Harvester Wheat sheaf, “Economics of Natural Resources and the Environment”, London. (1990).

Web Resources:

<https://nptel.ac.in/courses/109107171>



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INTRODUCTION TO COMPOSITE MATERIALS

(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0327Tb	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OEC
Course Objectives:					
This course will enable students to: - Be familiar with classification and characteristics of composite material and their applications. - Gain the knowledge about manufacturing methods of composites. - Know the testing methods related to composite materials.					
Course Outcomes (CO):					
On completion of this course, the students will be able to: - Acquire the exposure of different materials(L2) - Get knowledge on manufacturing and testing methods of composites(L2) - Understand the mechanical behavior of composites(L2) - Understand about laminates(L2) - Understand various joining methods and Failure theories(L2)					
Syllabus				Total Hours:48	
Module-I	Introduction			10Hrs	
Definitions, Composites, Reinforcements and matrices, Types of reinforcements, Types of matrices, Types of composites, Carbon Fibre composites, Properties of composites in comparison with standard materials, Applications of metal, ceramic and polymer matrix composites.					
Module-II	Manufacturing Methods			9Hrs	
Hand and spray lay - up, injection molding, resin injection, filament winding, pultrusion, centrifugal casting and prepregs. Fibre/Matrix Interface, mechanical. Measurement of interface strength.					
Module-III	Mechanical Properties			9Hrs	
Stiffness and Strength: Geometrical aspects – volume and weight fraction. Unidirectional continuous fibre, discontinuous fibers, Short fiber systems, woven reinforcements –Mechanical Testing: Determination of stiffness and strengths of unidirectional composites; tension, compression, flexure and shear.					
Module-IV	Laminates			10Hrs	
Plate Stiffness and Compliance, Assumptions, Strains, Stress Resultants, Plate Stiffness and Compliance, Computation of Stresses, Types of Laminates -, Symmetric Laminates, Anti-symmetric Laminate, Balanced Laminate, Quasi-isotropic Laminates, Crossply Laminate, Angle-ply Laminate. Orthotropic Laminate, Laminate Moduli, Hygrothermal Stresses.					

Module-V	Joining Methods and Failure Theories	10Hrs
Joining –Advantages and disadvantages of adhesive and mechanically fastened joints. Typical bond strengths and test procedures.		
Text Books: 1. K.K. Chawla, “Composite Materials”, Springer-Verlag, New York (1998). 2. B.Tomas Astrom , “Manufacturing of Polymer Composites”, CRC Press 2018.		
Reference Books: 1. Stuart M Lee, J. Ian Gray, Miltz” Composites Technology”, CRC press (1989). 2. Frank L Matthews and R D Rawlings, “Composite Materials: Engineering and Science”, Taylor and Francis (2006),		



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NATURAL LANGUAGE PROCESSING LAB (Common to CSE, AI&ML, DS, CS)					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A3308P	0: 0:3:0	1.5	CIE: 30 SEE:70	3Hours	PCC(Lab)
Course Objectives:					
This course will enable students to:					
- Introduce the students with the basics of NLP which will empower them for developing advanced NLP tools and - Solving practical problems in the field of Natural Language Processing.					
Course Outcomes (CO):					
On completion of this course, the student will be able to:					
- Understand approaches to syntax and semantics in NLP(L2) - Analyze grammar formalism and context free grammars(L4) - Apply the statistical estimation and statistical alignment models(L3) - Apply Rule based Techniques, Statistical Machine translation (SMT), Word alignment, Phrase based translation (L3) - Have the skills (experience) of solving specific NLP tasks, which may involve programming in Python, as well as running experiments on textual data. (L3)					
Syllabus				Total Hours:48	
List of Experiments:					
Experiment-1: Word Analysis					
Experiment-2: Word Generation					
Experiment-3: Morphology					
Experiment-4: N-Grams					
Experiment-5: N-Grams Smoothing					
Experiment-6: POS Tagging: Hidden Markov Model					
Experiment-7: POS Tagging: Viterbi Decoding					
Experiment-8: Building POS Tagger					
Experiment-9: Chunking					
Experiment-10: Building Chunker					

Reference Books:

1. James Allen, “Natural Language Understanding”, 2nd Edition, 2003, Pearson Education.
2. Akshar Bharathi, Vineet Chaitanya, “Natural Language Processing: A paninian perspective”, Prentice –Hall of India.

Web References:

1. [Welcome to Virtual Labs - A MHRD Govt of india Initiative \(vlabs.ac.in\)](http://vlabs.ac.in)
2. [Natural Language Processing in TensorFlow | Coursera](#)

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Advanced Machine Learning Lab (AI & ML)						
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type	
22A3309P	0:0:3:0	1.5	CIE: 30 SEE:70	3Hours	PCC(Lab)	
Course Objectives:						
This course will enable students to:						
- Study various learning algorithms - Make use of Data sets in implementing the machine learning algorithms - Implement the machine learning concepts and algorithms in any suitable language of choice - Learn about feature engineering - To develop skills of using recent machine learning packages for solving practical problems.						
Course Outcomes:						
On completion of this course, the students will be able to:						
- Apply Supervised Learning techniques to deal with unlabelled data(L3) - Apply Unsupervised Learning techniques to handle complex data(L3) - Apply Regression techniques for prediction of numerical feature values(L3) - Analyze data using python libraries Implement an end to end Machine Learning System(L4)						
Syllabus				Total Hours:48		
1. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is the probability that a student is absent given that today is Friday? Apply Baye’s rule in python to get the result. 2. Create a K-Means Clustering Algorithm from Scratch in Python? 3. Implement k-nearest neighbours classification using python 4. Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of k-means clustering with 3 means (i.e., 3 centroids) VAR1 VAR2 CLASS 1.713 1.586 0 0.180 1.786 1 0.353 1.240 1 0.940 1.566 0 1.486 0.759 1 1.266 1.106 0 1.540 0.419 1 0.459 1.799 1 0.773 0.186 1 5. The following training examples map descriptions of individuals onto high, medium and low credit-worthiness.						
Income	Recreation	Job	Status	Age group	Home - owner	Risk
Medium	skiing	design	single	twenties	no	High risk
High	golf	trading	married	forties	yes	Low risk
Low	speedway	transport	married	thirties	yes	Med risk

Medium	football	banking	single	thirties	yes	Low risk
High	flying	media	married	fifties	yes	High risk
Low	football	security	single	twenties	no	Med risk
Medium	golf	media	single	thirties	yes	Med risk
Medium	golf	transport	married	forties	yes	Low risk
High	skiing	banking	single	thirties	yes	High risk
Low	golf	unemployed	married	forties	yes	High risk

Input attributes are (from left to right) income, recreation, job, status, age group, home-owner. Find the unconditional probability of 'golf' and the conditional probability of 'single' given 'med Risk' in the dataset?

6. Implement linear regression using python.
7. Build an Artificial Neural Network by implementing the Back-propagation algorithm and test the same using appropriate data sets.
8. Implement Naïve Bayes' theorem to classify the English text
9. Use the appropriate dataset for implementing feature engineering for machine learning to find
 - Missing data imputation
 - Categorical encoding
 - Outliers
 - Feature scaling
 - Mixed variables
10. Design an Optical Character Recognizer

References:

1. John hearty, "Advanced Machine Learning with python", 2016
2. Aurelian Ger, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow" (2nd Edition), 2020
3. Y. S. Abu-Mostafa, M. Magdon-Ismail, H.-T. Lin, "Learning from Data: A Short Course", First Edition, 2012
4. C. M. Bishop, "Pattern Recognition and Machine Learning", First Edition. Springer, 2006. (Second Indian Reprint, 2015).
5. S. J. Russell, P. Norvig, "Artificial Intelligence: A Modern Approach", Third Edition, Prentice- Hall, 2010.

Online Learning Resources/Virtual Labs:

<https://github.com/jiadaizhao/Advanced-Machine-Learning-Specialization>.



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COMPUTER VISION LAB					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A3310P	0:0:3:0	1.5	CIE: 30 SEE:70	3Hours	PCC(Lab)

Course Objectives:	
On completion of this course, the students are able to: - Study the fundamentals, mathematical transforms necessary for Image Processing - Understand various Image processing techniques - Apply different transformation techniques on images	
Syllabus	Total Hours:48
1. Develop a Python program to convert RGB image into Grayscale Image 2. Develop a Python Program to perform Thresholding on an Input Image 3. Develop a Python Program to perform gray level Slicing without background 4. Develop a Python Program to perform gray level Slicing with background 5. Develop a Python Program to perform Bit Plane Slicing 6. Develop a Python Program to display Histogram of an Image 7. Develop a Python Program to perform Log transformation of an Image 8. Develop a Python Program to implement an Ideal Low Pass Filter 9. Develop a Python Program to implement Butterworth Low Pass Filter 10. Develop a Python Program for detecting edges of an Image 11. Develop a Python Program for blurring an Image 12. Develop a Python Program for overlaying an image on another image 13. Develop a Python for extracting text from an Image	
References:	
Jan Erik Solem “Programming Computer Vision with Python “, Creative Commons	
Online Learning Resources/Virtual Labs:	
https://neptune.ai/blog/image-processing-python https://www.tutorialspoint.com/image-processing-in-python	



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SOFT SKILLS (SKILL)					
(Common to CSE, AI&ML, DS, CS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0029P	1:0:2:0	2	CIE: 30 SEE:70	3 Hours	SC
Course Objectives:					
This course will enable students to:					
• Encourage all round development of the students by focusing on soft skills. • Make the students aware of critical thinking and problem-solving skills. • Develop leadership skills and organizational skills through group activities. • Function effectively with heterogeneous teams.					
Course Outcomes (CO):					
On completion of this course, student will be able to					
• Memorize various elements of effective communicative skills(L1) • Interpret people at the emotional level through emotional intelligence(L2) • Apply critical thinking skills in problem solving(L3) • Analyze the needs of an organization for team building(L4) • Judge the situation and take necessary decisions as a leader(L4) • Develop social and work-life skills as well as personal and emotional well-being(L3)					
Syllabus				Total Hours:48	
Module-I	Soft Skills & Communication Skills			10Hrs	
Introduction, meaning, significance of soft skills –Vital Components of communication skills - Inter-personal skills - Verbal and Non-verbal Communication.					
Activities: Narration about self- strengths and weaknesses- clarity of thought - Interpersonal Skills- Group Discussion – Debate – Mutual Understanding - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic. Verbal Communication- Oral Presentations- Extempore- brief addresses and speeches- Negotiation skills –Role Play- Non-verbal communication – Public speaking – Mock interviews – Anchoring Skills..					
Module-II	Critical Thinking			9Hrs	
Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open-mindedness Creative Thinking.					

Activities: Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues – placing the problem – finding the root cause - seeking viable solution – judging with rationale – evaluating the views of others - Case Study, Story Analysis.		
Module-III	Problem Solving & Decision Making	10Hrs
Meaning & features of Problem Solving – Managing Conflict – Conflict resolution – Methods of decision making – Effective decision making in teams – Methods & Styles. Activities: Placing a problem which involves conflict of interests, choice and views – formulating the problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision. Case Study & Group Discussion.		
Module-IV	Emotional Intelligence & Stress Management	9Hrs
Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self-Regulation – Stress factors – Controlling Stress – Tips. Activities: Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude, and sympathy, and confidence, compassion in the form of written or oral presentations. Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates.		
Module-V	Leadership Skills	10Hrs
Team-Building – Decision-Making – Accountability – Planning – Public Speaking – Motivation – Risk Taking - Team Building - Time Management. Activities: Forming group with a consensus among the participants- choosing a leader- encouraging the group members to express views on leadership- democratic attitude- sense of sacrifice – sense of adjustment – vision – accommodating nature- eliciting views on successes and failures of leadership using the past knowledge and experience of the participants, Public Speaking, Activities on Time Management, Motivation, Decision Making, Group discussion etc.		

Text Books:

1. , MitraBarunK, “Personality Development and Soft Skills” Oxford University Press; PAP/CDR edition (July 22, 2012)
2. Dr Shikha Kapoor,” Personality Development and Soft Skills: Preparing for Tomorrow”, I K International Publishing House; 0 edition (February 28, 2018)

Reference Books:

1. Prashant Sharma, “Soft skills: personality development for life success”, BPB publications 2018.
2. Alex K, “Soft Skills”, S. Chand
3. Gajendra Singh Chauhan, Sangeetha Sharma, “Soft Skills: An Integrated Approach to Maximize Personality “Published by Wiley.
4. A. Sharma,” Communication Skills and Soft Skills”, Yking books
5. RenuShorey,” SOFT SKILLS for a BIG IMPACT”, Notion Press.
6. Life Skills Paperback English Dr. Rajiv Kumar Jain, Dr. Usha Jain Publisher: Vayu Education of India

Web Resources:

1. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCYtvXh0E_y-bOO1_q
2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KLJ
3. <https://youtu.be/-Y-R9hDI7IU>
4. <https://youtu.be/gkLsn4ddmTs>
5. <https://youtu.be/2bf9K2rRWwo>
6. <https://youtu.be/FchfE3c2jzc>



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RESEARCH METHODOLOGY					
(Common to CSE, AI&ML, CS, DS, ECE, EEE, ME)					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0032T	2:0:0:0	0	CIE: 30	-	MC
Course Objectives:					
This course will enable students to:					
- Understand the basic concepts of research and research problem - Make the students learn about various types of data collection and sampling - Design to enable them to know the method of statistical evaluation - Make the students understand various testing tools in research - Make the student learn how to write a research report - Create awareness on ethical issues n research					
Course Outcomes (CO):					
On completion of this course, the students will be able to					
- Understand basic concepts of research and its methodologies(L2) - Understand the concept of sampling and sampling design(L2) - Design survey questionnaires for different kinds of research(L3) - Read, comprehend and explain research articles in their academic discipline(L2) - Analyze various types of testing tools used in research(L4) - Develop a research paper without any ethical issues(L3)					
Syllabus				Total Hours:48	
Module-I	Introduction to Research Methodology			10Hrs	
Meaning of Research – Objectives of Research – Types of Research – Research Approaches – Guidelines for Selecting and Defining Research Problem – Research Design – Concepts related to Research Design – Basic Principles of Experimental Design.					
Module-II	Sampling and Data Collection Methods			9Hrs	
Sampling Design – steps in Sampling Design –Characteristics of a Good Sample Design – Random Sampling Design. Measurement and Scaling Techniques-Errors in Measurement – Tests of Sound Measurement – Scaling and Scale Construction Techniques – Time Series Analysis – Interpolation and Extrapolation. Data Collection Methods – Primary Data – Secondary data – Questionnaire Survey and Interviews.					
Module-III	Correlation			10Hrs	
Correlation and Regression Analysis – Method of Least Squares – Regression vs Correlation – Correlation vs Determination – Types of Correlations and Their Applications					

Module-IV	Statistical Inference	9Hrs
Statistical Inference: Tests of Hypothesis – Parametric vs Non-parametric Tests – Hypothesis Testing Procedure – Sampling Theory – Sampling Distribution – Chi-square Test – Analysis of variance and Co-variance – Multivariate Analysis		
Module-V	Report Writing	10Hrs
Report Writing and Professional Ethics: Interpretation of Data – Report Writing – Layout of a Research Paper – Techniques of Interpretation- Making Scientific Presentations in Conferences and Seminars – Professional Ethics in Research		
Text Books: 1. C.R.Kothari, “Research Methodology:Methods and Techniques”,2nd edition, New Age International Publishers. 2. Ranjit Kumar, “A Step by Step Guide for Beginners :Research Methodology” , Sage Publications		
Reference Books: 1. P.Narayana Reddy and G.V.R.K.Acharyulu, “Research Methodology and Statistical Tools”, 1st Edition, Excel Books,New Delhi. 2. Donald R. “Business Research Methods”, Cooper & Pamela S Schindler, 9th edition. 3. S C Gupta, “Fundamentals of Statistics”, 7th edition Himalaya Publications		
Web Reference: https://onlinecourses.swayam2.ac.in/cec20_hs17/preview https://onlinecourses.nptel.ac.in/noc22_ge08/preview		



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Semester-7 (Theory-6, SC-1)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	HSC	22A0023T 22A0024T 22A0025T	Humanity Science Elective – I: 1. Management Science 2. Entrepreneurship and Innovation 3. Business Environment	3	0	0	3
2	PEC	22A0534Ta 22A3311Tb 22A0534Tc 22A3312Td	Professional Elective-III: 1. Software Project Management 2. Social Network Analysis 3. Internet of Things 4. Fog Computing	3	0	0	3
3	PEC	22A3313Ta 22A3314Tb 22A0535Tc 22A3315Td	Professional Elective-IV: 1. Speech Recognition and Synthesis 2. Data Science 3. Adhoc and Wireless Sensor Networks 4. Cloud Security	3	0	0	3
4	PEC	22A3316Ta 22A0534Tb 22A0536Tc 22A3317Td	Professional Elective-V: 1. Large language model 2. Big Data Technologies 3. Block chain Technology 4. High Performance Computing	3	0	0	3
5	OEC	22A0241Ta 22A0432T 22A0151T 22A0327Tc	Open Elective-III: 1. Smart Grid 2. Basic VLSI Design 3. Disaster management 4. Measurements and Mechatronics	3	0	0	3
6	OEC	22A0232Ta 22A0433T 22A0152T 22A0331Tc	Open Elective-IV: 1. Electric Vehicles 2. Industrial Electronics 3. Construction Management 4. Introduction to Robotics	3	0	0	3
7	SC	22A3318P	Skill Advanced Course: Generative AI	1	0	2	2
Industrial / Research Internship 2 Months (Mandatory) after Third year (to be evaluated during VII semester)				0	0	0	3

	Total credits			23
Honors / Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)	4	0	0	4

Category	Credits
Professional Elective Courses (PEC)	9
Humanities and Social Science Course (HSC)	3
Open Elective Courses (OEC)	6
Skill Advanced Course (SC)	2
Industrial / Research Internship	3
Total	23



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MANAGEMENT SCIENCE (Common to CSE, AI&ML, DS, CS, CE)					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0023T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	HSC
Course Objectives:					
This course will enable students to: - Gain fundamental knowledge on Management, Administration, Organization & its concepts. - Understand the role of management in Production - Understand the concept of HRM in order to have an idea on Recruitment, Selection, Training & Development, job evaluation and Merit rating concepts. - Be aware of identify Strategic Management areas & the PERT/CPM for better Project Management. - Be aware of the contemporary issues in management.					
Course Outcomes (CO):					
On completion of this course, student will be able to - Understand the concepts & principles of management and designs of organization in a practical world(L2) - Apply the knowledge of Work-study principles & Quality Control techniques in industry(L3) - Analyze the concepts of HRM in Recruitment, Selection and Training & Development(L4) - Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT(L4) - Create Modern technology in management science(L3)					
Syllabus				Total Hours:48	
Module – I	Introduction To Management			10 Hrs	
Management - Concept and meaning - Nature-Functions - Management as a Science and Art and both. Schools of Management Thought - Taylor’s Scientific Theory-Henry Fayol’s principles -Eltan Mayo’s Human relations - Systems Theory - Organizational Designs - Line organization –Line & Staff Organization-Functional Organization-Matrix Organization-Project Organization-Committee form of Organization-Social responsibilities of Management.					
Module – II	Operations Management			10 Hrs	
Principles and Types of Plant Layout - Methods of Production (Job, batch and Mass Production),Work Study-Statistical Quality Control-Deming’s contribution to Quality. Material Management - Objectives - Inventory-Functions - Types, Inventory Techniques - EOQ-ABC Analysis - Purchase Procedure and Stores Management - Marketing Management - Concept -Meaning-Nature-Functions					

of Marketing-Marketing Mix-Channels of Distribution-Advertisement and Sales Promotion-Marketing Strategies based on Product Life Cycle.		
Module – III	Human Resources Management	10 Hrs
HRM - Definition and Meaning – Nature - Managerial and Operative functions - Evolution of HRM - Job Analysis - Human Resource Planning (HRP)- Employee Recruitment-Sources of Recruitment- Employee Selection -Process and Tests in Employee Selection –Employee Training and Development- On-the-job & Off-the-job training methods-Performance Appraisal Concept- Methods of Performance Appraisal – Placement- Employee Induction –Wage and Salary Administration.		
Module – IV	Strategic Project Management	10 Hrs
Definition & Meaning-Setting of Vision -Mission -Goals –Corporate Planning Process-Environmental Scanning - Steps in Strategy Formulation and Implementation - SWOT Analysis –Project Management-Network Analysis-Program Evaluation and Review Technique (PERT) - Critical Path Method (CPM) Identifying Critical Path - Probability of Completing the project with in given time- Project Cost-Analysis-Project Crashing (Simple problems).		
Module – V	Contemporary Issues in Management	8 Hrs
The concept of Management Information System (MIS)-Materials Requirement Planning (MRP)- Customer Relations Management (CRM)-Total Quality Management (TQM) –Six Sigma Concept-Supply Chain Management (SCM)-Enterprise Resource Planning (ERP)-Performance Management-Business Process Outsourcing (BPO)-Business Process Re-engineering and Bench Marking-Balanced Score Card-Knowledge Management.		
Text Books: 1. A. R. Aryasri, “Management Science”, TMH,2 013 2. Stoner, Freeman and Gilbert, “Management”, Pearson Education, New Delhi,2012.		
Reference Books: 1. Koontz & Weihrich, “Essentials of Management”, 6th edition, TMH, 2005. 2. Thomas N.Duening & John M.Ivancevich, “Management Principles and Guidelines”, Biztantra. 3. Kanishka Bedi, “Production and Operations Management”, Oxford University Press, 2004. 4. Samuel C.Certo, “Modern Management”,9th edition, PHI, 2005		



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ENTREPRENEURSHIP AND INNOVATION (Common to CSE, AI&ML, DS, CS, CE)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0024T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	HSC
Course Objectives:					
This course will enable students to: • Make the student understand about Entrepreneurship • Know various sources of generating new ideas in setting up of new enterprise • Know various sources of finance in starting up of a business • Impart knowledge about various government sources which provide financial assistance to entrepreneurs / women entrepreneurs • Encourage the student in creating and designing business plans					
Course Outcomes (CO):					
On completion of this course, student will be able to • Understand the concept of Entrepreneurship and challenges in the world of competition(L2) • Apply the Knowledge in generating ideas for New Ventures(L3) • Analyze various sources of finance and subsidies to entrepreneur / women Entrepreneurs(L4) • Evaluate the role of central government and state government in promoting entrepreneurship(L3) • Create and design business plan structure through incubations(L3)					
Syllabus				Total Hours:48	
Module – I	Entrepreneurship			10 Hrs	
Entrepreneurship-Concept, knowledge and skills requirement-Characteristics of successful entrepreneurs-Entrepreneurship Process-Factors impacting emergence of entrepreneurship-Differences between Entrepreneur and Intrapreneur-Understanding individual entrepreneurial mind set and personality-Recent trends in Entrepreneurship.					
Module – II	Starting Up New Venture			10 Hrs	
Starting the New Venture - Generating business idea – Sources of new ideas & methods of generating ideas-Opportunity Recognition-Feasibility Study-Market feasibility, technical / operational feasibility - Financial feasibility - Drawing business plan - Preparing project report – Presenting business plan to investors.					
Module – III	Sources of Finance			10 Hrs	
Sources of finance - Various sources of Finance available - Long term sources - Short term sources - Institutional Finance – Commercial Banks, SFC's in India- NBFC's in India - theirway of financingin India for small and medium business -Entrepreneurship development programs in India – The entrepreneurial journey- Institutions in aid of entrepreneurship development					
Module – IV	Women Entrepreneurship			10 Hrs	

Women Entrepreneurship-Entrepreneurship Development and Government-Role of Central Government and State Government in promoting women Entrepreneurship - Introduction to various incentives, subsidies and grants – Export- oriented Units - Fiscal and Tax concessions available - Women entrepreneurship - Role and importance - Growth of women entrepreneurship in India-Issues & Challenges-Entrepreneurial motivations.		
Module – V	Introduction to Incubation & Innovation	8 Hrs
Fundamentals of Business Incubation - Principles and good practices of business incubation- Process of business incubation – Types, Advantages and Disadvantages of incubation. Innovation Meaning & Definition - Forms of innovation - Innovation, features and characteristics - Factors initiating innovations - Innovation process and its stages.		
Text Books: 1. D F Kuratko and T V Rao, “Entrepreneurship”- A South-Asian Perspective–Cengage Learning, 2012. (For PPT,Case Solutions Faculty may visit: login.cengage.com) 2. Nandan H, “Fundamentals of Entrepreneurship”, PHI, 2013		
Reference Books: 1. Vasant Desai, “Small Scale Industries and Entrepreneurship”, Himalaya Publishing 2012. 2. Rajeev Roy “Entrepreneurship”, 2nd Edition, Oxford, 2012. 3. B.Janakiram and M.Rizwana “Entrepreneurship Development: Text & Cases”, Excel Books, 2011. 4. Stuart Read, Effectual “Entrepreneurship”, Routledge, 2013.		



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BUSINESS ENVIRONMENT (Common to CSE, AI&ML, DS, CS, CE)					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0025T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	HSC
Course Objectives:					
This course will enable students to: - Understand about the business environment. - Know the importance of fiscal and monetary policy. - Understand the export policy of the country. - Impart knowledge about the functioning and role of WTO. - know the structure of stock market.					
Course Outcomes (CO):					
On completion of this course, the students will be able to - Understand various types of business environment(L2) - Understand fiscal and monetary policy(L2) - Analyze India's Trade Policy(L4) - Understand the role of WTO(L2) - Apply the knowledge of Money markets in future investment(L3)					
Syllabus				Total Hours:48	
Module – I	An Overview of Business Environment			10 Hrs	
Overview of Business Environment – Types of Environments - Internal & External –Micro and Macro environment- Competitive structure of industries - Environmental analysis - Scope of business- Characteristics of business-Process & limitations of environmental analysis.					
Module – II	Fiscal Policy & Monetary Policy			10 Hrs	
FISCAL POLICY-Public Revenues-Public Expenditure-Public debt Development activities financed by public expenditure - Evaluation of recent fiscal policy of Government of India - Highlights of Budget - MONETARY POLICY - Demand and Supply of Money – RBI –Objectives of monetary and credit policy-Recent trends-Role of Finance Commission.					
Module – III	India's Trade Policy & Balance of Payments			10 Hrs	
INDIA'S TRADE POLICY - Magnitude and direction of Indian International Trade – Bilateral and Multilateral Trade Agreements - EXIM policy and role of EXIM bank - BALANCE OF PAYMENTS– Structure & Major Components-Causes for Disequilibrium in Balance of Payments-Correction					

measures–WTO - Nature and Scope - Organization and Structure – Role and functions of WTO in promoting world trade		
Module – IV	Money Markets and Capital Markets	10 Hrs
Features and components of Indian financial systems - Objectives, features and structure of money markets and capital markets -Reforms and recent development– SEBI - Stock Exchanges - Investor protection and role of SEBI.		
Module – V	Introduction To Inflation	8 Hrs
Inflation – Meaning & Definition – Causes – Effects – Types – Advantages & Disadvantages Deflation – Meaning & Definition - Causes & Effects.		
Text Books: 1. Francis Cherunilam (2009), “International Business”: Text and Cases, Prentice Hall of India. 2. K.Aswathappa, “Essentials of Business Environment”: Texts and Cases & Exercises 13th Revised Edition. HPH 2016.		
Reference Books: 1. K.V.Sivayya,V.B.MDas (2009), Indian Industrial Economy, Sultan Chand Publishers, New Delhi, India. 2. Sundaram, Black (2009), International Business Environment Text and Cases, Prentice Hall of India, New Delhi, India. 3. Chari.S.N (2009), International Business, Wiley India. 4. E.Bhattacharya (2009), International Business, Excel Publications, New Delhi.		



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SOFTWARE PROJECT MANAGEMENT (Common to CSE, AI&ML, DS, CS)					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0534Ta	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PEC
Course Objectives:					
This course will enable students to: - Understand the specific roles within a software organization as related to Project and process management. - Study the improving software processes and the principles of conventional software engineering. - Learn the Software Life Cycle Phases and Artifact. - Understand the Iterative Process Planning and Process Automation. - Learn the basic steps of project planning, project management, quality assurance, and process management and their relationships.					
Course Outcomes (CO):					
On completion of this course, the students will be able to - Describe the purpose of project management from the perspectives of planning, tracking and completion of project(L2) - Determine the conventional software Management and Software Economics(L2) - Use the improving software processes and modern software management(L3) - Use the software Life Cycle Phases and artifact sets(L3) - Determine the Iterative Process Planning and Process Automation(L3) - Apply the quality indicators and Core Metrics(L3)					
Syllabus				Total Hours:50	
Module-I	Conventional Software Management			10 Hrs	
The waterfall model, conventional software Management performance. Evolution of Software Economics: Software Economics, pragmatic software cost estimation.					
Module-II	Improving Software Economics			8 Hrs	
Reducing Software product size, improving software processes, improving team effectiveness, Improving automation, Achieving required quality, peer inspections. The old way and the new: The principles of conventional software engineering, principles of modern software management.					
Module-III	Life Cycle Phases and Artifacts of the Process			10Hrs	
Engineering and production stages, inception, Elaboration, construction, transition phases. The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts. Model based software architectures: A Management perspective and technical perspective.					

Module-IV	Work Flows of the Process, Project Organizations and Responsibilities	10 Hrs
Checkpoints of the Process, Iterative Process Planning, Line-of-Business Organizations, Project Organizations. Process Automation: Tools, The Project Environment.		
Module-V	Project Control and Process Instrumentation	10 Hrs
The seven core Metrics, Management indicators, quality indicators, life cycle expectations pragmatic Software Metrics, Metrics automation. Tailoring the Process: Process discriminates. The Command Center Processing and Display System-Replacement (CCPDS-R), Process overview, Core Metrics.		
Text Books: 1. Walker Royce,” Software Project Management”, Pearson Education. 2. Bob Hughes & Mike Cotterell, “Software Project Management”, fourth edition, Tata McGraw Hill.		
Reference Books: 1. Andrew Stellman & Jennifer Greene, “Applied Software Project Management”, O’Reilly, 2006 2. Jennifer Greene & Andrew Stellman, “Head First PMP”, O’Reilly,2007 3. Richard H. Thayer & Edward Yourdon, “Software Engineering Project Management”, second edition, Wiley India, 2004. 4. Jim Highsmith, “Agile Project Management”, Pearson education, 2004 5. Scott Berkun, “The art of Project management”, O’Reilly, 2005. 6. Pankaj Jalote, “Software Project Management in Practice”, Pearson Education, 2002.		
E-resources: 1. https://archive.nptel.ac.in/courses/106/105/106105218/ 2.		



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SOCIAL NETWORK ANALYSIS					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A3311Tb	3:0:0:0	3	CIE: 30 SEE:70	3Hours	PEC
Course Objectives:					
This course will enable students to: - Understand the basic concepts of social network analysis - Identify communities in social networks - Perform predictive analytics in social networks					
Course Outcomes (CO):					
After completion of the course, the students will be able to - Understand the basic concepts of Social Networks(L2) - Compute different centrality measures of social network(L3) - Detect communities in social networks(L3) - Predict links in social networks(L3) - Perform Social Influence Analysis(L3)					
Syllabus				Total Hours:48	
Module-I	Fundamentals of Networks			10 Hrs	
Networks in the real world: Social networks, Information networks, Technological networks, biological networks Mathematics of networks: Networks and their representation, Types of networks: Weighted, directed and hyper graphs, the adjacency, Laplacian, and incidence matrices, Degree, paths, components, independent paths, connectivity, and cut sets.					
Module-II	Centrality measures			9 Hrs	
Degree centrality, Closeness centrality, Homophily, Transitivity and Preferential attachment, Clustering coefficient and Assortative mixing, Eigenvector centrality, Katz centrality, Betweenness centrality, Page rank, Hubs and Authorities					
Module-III	Community Detection in Social Networks			10 Hrs	
Detecting communities in social networks, Definition of community, Applications of community detection. Algorithms for community detection: The Kernighan-Lin Algorithm, Agglomerative/Divisive Algorithms, Markov Clustering, Multi-level Graph Partitioning, Spectral Algorithms, Modularity Maximization, Other Approaches, Evaluating communities					

Module-IV	Predictive Analytics in Social Networks	10 Hrs
Link prediction problem, Link prediction measures, Feature based Link Prediction, Evaluation Node classification problem Node classification: Problem definition and applications; Iterative classification methods; Label propagation method; Graph regularization method; Evaluation		
Module-V	Current Research in Social Networks	9 Hrs
Social Influence Analysis, privacy in social networks, integrating sensors and social networks, multimedia information networks in social media and social tagging and applications.		
Text Book: 1. Newman, M. E. J. (2010), “Networks: An introduction. “Oxford University Press. 2. Alexander Kouznetsov, “Social Network Analysis for Start-ups: Finding connections on the social web”, Shroff publishers and distributors Pvt. Ltd		
Reference Books: 1. Tanmay Chakraborty “Social Network analysis” Wiley 2. Newman, M. E. J. (2010). Networks: an introduction. Oxford; New York: Oxford University Press. 3. Aggarwal, C. C. (2011). An introduction to social network data analytics. In Social network data analytics (pp. 1-15). Springer, Boston, MA. 4. Barabási, A. L. (2013). Network science. Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences, 371(1987), 20120375.		
Web References: https://social-network-analysis.in/		



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INTERNET OF THINGS					
(Common to CSE, AI&ML, DS, CS)					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0534Tc	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PEC
Course Objectives:					
This course will enable students to:					
- Understand the terminology of IOT, technology and its applications - Understand the concept of M2M (machine to machine) with necessary protocols - Understand the Python Scripting Language which is used in many IoT devices - Understand the Raspberry PI platform, that is widely used in IoT applications - Understand the implementation of web based services on IoT devices					
Course Outcomes (CO):					
After completion of the course, the students will be able to					
- Interpret the impact and challenges posed by IoT networks leading to new architectural models(L2) - Compare and contrast the deployment of smart objects and the technologies to connect them to network(L4) - Appraise the role of IoT protocols for efficient network communication(L2) - Elaborate the need for Data Analytics and Security in IoT(L2) - Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry(L2)					
Syllabus				Total Hours:48 Hrs	
Module-I	Introduction to IoT			10 Hrs	
Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle					
Module-II	IoT and M2M			8 Hrs	
IoT and M2M – Software defined networks, network function virtualization, difference between SDN and NFV for IoT Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER					
Module-III	Introduction to Python			10Hrs	

Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib		
Module-IV	IoT Physical Devices and Endpoints	10 Hrs
IoT Physical Devices and Endpoints - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, and reading input from pins		
Module-V	IoT Physical Servers and Cloud Offerings	10 Hrs
IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs Web server – Web server for IoT, Cloud for IoT, Python web application framework designing a Restful web API		
Text Books: 1. Arshdeep Bahga and Vijay Madisetti, “Internet of Things - A Hands-on Approach”, UniversitiesPress, 2015. 2. Matt Richardson & Shawn Wallace, “Getting Started with Raspberry” PiO'Reilly (SPD), 2014		
Reference Books: 1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos,David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014. 2. Pethuru Raj,Anupama C. Raman, “The Internet of Things, Enabling technologies and use cases” CRC Press.		
Web References 1. https://www.arduino.cc/ 2. https://www.raspberrypi.org/		



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FOG COMPUTING (Common to CSE, AI&ML, DS, CS)					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A3312Td	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PEC
Course Objectives:					
This course will enable students to: - Extend the students' knowledge of fog computing & edge computing - Enhance their expertise in area of wearable computing enjoiment - Carry out real life application of fog computing.					
Course Outcomes (CO):					
On completion of this course, the students will be able to - Understand the basic concepts of Fog Computing(L2) - Understand the architecture and Components of Fog Computing System(L2) - Understand different Fog Protocols(L2) - Understand the Security Methods of Fog computing system(L2) - Understand the applications of Fog Computing(L2)					
Syllabus				Total Hours:50	
Module-I	Introduction to Fog Computing			10 Hrs	
Introduction to Fog Computing: Fog Computing-Definition-Characteristics-Application Scenarios - Issues –Fog. Computing and Internet of Things-Pros and Cons-Myths of Fog Computing -Need and Reasons for Fog Computing Fog Computing and Edge Computing-IoT,FOG, Cloud Benefits.					
Module-II	Architecture			8 Hrs	
Architecture: Working Procedure -Performance Evaluation Components- Software Systems – Architecture-Modeling and Simulation –Challenges.					
Module-III	Fog Protocols			10Hrs	
Fog Protocols: Fog Protocol-Fog Kit- Proximity Detection Protocols- DDS/RTPS computing protocols.					
Module-IV	Management of Data and Security Analysis:			10 Hrs	
Management of Data and Security Analysis: Smart Management of Big Data-Smart Data-Structure of Smart Data- Smart Data Life. Cycle-System Architecture-Multi-dimensional Payment Plan Security and Privacy. Issues-Multimedia Fog Computing-Architecture- Deduplication-Hybrid Secure. Deduplication- Security Challenges-Security Requirements					
Module-V	Applications of Fog Computing			12 Hrs	
CASE STUDY: Case Study: Wind Farm - Smart Traffic Light System, Wearable Sensing. Devices, Wearable Event Device, Wearable System, Demonstrations					

Text Books:

Assad Abbas, Samee U. Khan "Fog Computing: Theory and Practice " wiley India May2020.

Reference Books:

- 1.Jennifer Greene & Andrew Stellman, Stojan Kitanov , "Introduction to Fog Computing" IGI Global Publication.Head First PMP, O'Reilly,2007
- 2.Ivan Stojmenovic, Sheng Wen ,” The Fog Computing Paradigm: Scenarios and Security Issues” Proceedings of the 2014 Federated Conference on Computer Science and Information Systems pp. 1–8
- 3.Amir Vahid Dastjerdi and Rajkumar Buyya “Fog Computing: Helping the Internet of Things Realize its Potential

Web References:

<https://archive.nptel.ac.in/courses/106/105/106105218/>



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Speech Recognition and Synthesis (Common to CSE, AI&ML, DS, CS)					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A3313T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PEC
Course Objectives:					
This course will enable students to: - Understand the concepts of Speech Recognition and synthesis - Understand different methods of feature extraction from speech - Implement different speech recognition algorithms					
Course Outcomes (CO):					
On completion of this course, the students will be able to - Understand the concepts of speech and signal Processing(L2) - Implement edge detection algorithms and feature extraction methods such as MFCCs for speech recognition tasks(L3) - Utilize the Baum-Welch algorithm to estimate HMM parameters from observed data(L3) - Evaluate the effectiveness of LVCSR systems in real-world applications(L3) - Implement a basic TTS system using sub word units(L3) - Execute procedures for TTS waveform generation(L3)					

Syllabus		Total Hours:48
Module-I	Speech Fundamentals	9 Hrs
Basic Concepts: Articulatory Phonetics – Production and Classification of Speech Sounds; Acoustic Phonetics – acoustics of speech production; Review of Digital Signal Processing concepts; Short-Time Fourier Transform, Filter-Bank and LPC Methods.		
Module-II	Speech Analysis	10 Hrs
Features, Feature Extraction and Pattern Comparison Techniques: Speech distortion measures – mathematical and perceptual – Log Spectral Distance, Cepstral Distances, Weighted Cepstral Distances and Filtering, Likelihood Distortions, Spectral Distortion using a Warped Frequency Scale, LPC, PLP and MFCC Coefficients, Time Alignment and Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths		
Module-III	Speech Modeling	10 Hrs

Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum-Welch Parameter Re-estimation, Implementation issues		
Module-IV	Speech Recognition	10Hrs
Large Vocabulary Continuous Speech Recognition: Architecture of A Large Vocabulary Continuous Speech Recognition System – Acoustics and Language Models – N grams, Context Dependent Sub-Word Units; Applications and Present Status.		
Module-V	Speech Synthesis	9 Hrs
Text-to-Speech Synthesis: Concatenative and Waveform Synthesis MethodsSub word Units for TTS, Intelligibility and Naturalness – Role of Prosody, Applications and Present Status.		
Text Books: 1. Lawrence Rabiner and Biing-Hwang Juang, “Fundamentals of Speech Recognition”, Pearson Education, 2003.		
Reference Books: 1. Daniel Jurafsky and James H Martin, “Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, Pearson Education. 2. .Steven W. Smith, “The Scientist and Engineer’s Guide to Digital Signal Processing”, California Technical Publishing. 3. Thomas F Quatieri, “Discrete-Time Speech Signal Processing – Principles and Practice”, Pearson Education.		
Web References: https://nptel.ac.in/courses/112105293 https://archive.nptel.ac.in/courses/112/105/112105293/		



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DATA SCIENCE (Common to CSE, AI&ML, DS, CS)					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A3314Tb	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PCC
Course Objectives:					
This course will enable students to: - Explore the fundamental concepts required for Data science - Explain the basic concepts of data science. - Be familiarize with Python libraries for Data Visualization. - Elucidate various Machine Learning algorithms					
Course Outcomes (CO):					
On completion of this course, student will be able to - Understand the basic concepts of Data Science. (L2) - Learn about types of data and data preprocessing(L2) - Visualize the data using NumPy, Pandas and Matplotlib(L3) - Solve decision making problems using k-NN, Naïve Bayes, SVM and Decision(L3) - Demonstrate the way to use machine Learning algorithms using python(L3)					
Syllabus				Total Hours:48	
Module-I	Introduction to Data science			10Hrs	
Introduction: What Is Data Science? How Does Data Science Relate to Other Fields? Data Science and Statistics, Computer Science, Engineering and Business Analytics. Data Science, Social Science, and Computational Social Science, The Relationship between Data Science and Information Science, Information vs. Data, Skills for Data Science, Tools for Data Science.					
Module-II	Types of Data			9 Hrs	
Data: Introduction, Data Types, Structured Data, Unstructured Data, Challenges with Unstructured Data, Data Collections, Open Data, Social Media Data, Multimodal Data, Data Storage and Presentation.					
Module-III	Techniques and Introduction to Libraries			10 Hrs	
Data: Data Pre-processing, Data Cleaning, Data Integration, Data Transformation, Data Reduction, Data Discretization. Introduction to NumPy, Pandas, Matplotlib, Exploratory Data Analysis (EDA), Descriptive Statistics, Basic tools (plots, graphs and summary statistics) of EDA.					
Module-IV	Machine Learning for Data Science-1			10 Hrs	
Machine Learning for Data Science-1: Supervised machine learning algorithms: what is regression, simple linear regression, multiple regression and Logistic regression, classification algorithms: k-Nearest Neighbors, Naive Bayes, SVM					

Module-V	Machine Learning for Data Science-2	9 Hrs
Machine Learning for data Science-2: Unsupervised learning algorithms overview: what is clustering, types of clustering algorithms, hierarchical clustering, k means clustering, what is Association, Differences between supervised and un supervised learning algorithms		
Text Books: 1. Chirag Shah, “A Hands-On Introduction to Data Science”, Cambridge University Press. 2. Allen B. Downey, “Think Python”, 2nd edition, SPD/O’Reilly, 2016. 3. Joel Grus, “Data Science from Scratch, First Principles with Python” O’Reilly, First Edition.		
Reference Books: 1. Field Cady ,”The Data Science Handbook” , WILEY. 2. Jeffrey M. Stanton, Jeffrey Stanton, “An Introduction to Data Science”, 2012 3. Cathy O’Neil, Rachel Schutt, “Doing Data Science”, Straight Talk from the Frontline. O’Reilly,2013. 4. Christopher Bishop, “Pattern Recognition and Machine Learning”, Springer, 2007 5. Dr. Gypsy Nandi, Dr. Rupa Kumar Sharma. “Data Science Fundamentals and Practical Approaches”.		



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ADHOC AND WIRELESS SENSOR NETWORKS (Common to AI&ML, DS, CS)					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0535Tc	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PEC
Course Objectives:					
This course will enable students to: - Understand the state-of-the-art research in the emerging subject of Adhoc and Wireless Sensor Networks - Solve the issues in real-time application development based on ASN. - Conduct further research in the domain of ASN					
Course Outcomes (CO):					
On completion of this course, the students will be able to - Understand the concepts of Wireless Sensor Networks(L2) - Understand the data transmission in Wireless Adhoc Networks(L2) - Understand the protocols of Wireless Sensor Networks(L2) - Understand the layered architecture of Adhoc networks(L2)					
Syllabus				Total Hours:48	
Module-I	Introduction to Adhoc Networks			9 Hrs	
Introduction to Ad Hoc Networks - Characteristics of MANETs, Applications of MANETs and Challenges of MANETs. Routing in MANETs - Criteria for classification, Taxonomy of MANET routing algorithms, Topology- based routing algorithms- Proactive: DSDV; Reactive: DSR, AODV; Hybrid: ZRP; Position-based routing algorithms- Location Services -DREAM, Quorum-based; Forwarding Strategies: Greedy Packet, Restricted Directional Flooding-DREAM, LAR.					
Module-II	Data Transmission			10 Hrs	
Data Transmission - Broadcast Storm Problem, Rebroadcasting Schemes -Simple-flooding, Probability-based Methods, Area-based Methods, Neighbor Knowledge-based: SBA, Multipoint Relaying, AHBP. Multicasting: Tree-based: AMRIS, MAODV; Mesh-based: ODMRP, CAMP; Hybrid: AMRoute, MCEDAR.					
Module-III	Geo Casting			9 Hrs	
Geocasting: Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR. TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc					
Module-IV	Lower Layers of Sensor Networks			10Hrs	

Basics of Wireless, Sensors and Lower Layer Issues: Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.		
Module-V	Upper Layers of Sensor Networks	10Hrs
Upper Layer Issues of WSN: Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots.		
Text Books: 1. Carlos Corderio Dharma P. Aggarwal, “Ad Hoc and Sensor Networks – Theory and Applications”, World Scientific Publications, March 2006. 2. Feng Zhao, Leonidas Guibas, “Wireless Sensor Networks: Information Processing Approach”, Elsevier Science		
Reference Books: 1. A. Grama, A. Gupta, G. Karypis and V. Kumar, “An Introduction to Parallel Computing: Design and Analysis of Algorithms”, Second Edition - Pearson. Feng Zhao and Leonides Guibas, "Wireless Sensor Networks", Elsevier Publication - 2002. 2. Holger Karl and Andreas Willig “Protocols and Architectures for Wireless Sensor Networks”, Wiley, 2005		
Web References: 1. NPTEL: Computer Science and Engineering - NOC: Wireless Adhoc and Sensor Networks		



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CLOUD SECURITY (Common to CSE, AI&ML, DS, CS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A3315Td	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PEC
Course Objectives:					
This course will enable students to: • Impart fundamental concepts in the area of virtualization. • Impart knowledge in infrastructure as a service. • Explain monitoring, management and applications. • Understand the concept of design patterns. • Learn to design the trusted cloud computing system.					
Course Outcomes (CO):					
On completion of this course, student will be able to • Use the fundamentals of virtualization(L3) • Analyze the cloud service models(L4) • Apply the cloud monitoring, management and applications(L3) • Build a cloud security application(L3) • Create a scenario for threat protection(L3).					
Syllabus				Total Hours:48	
Module-I	Fundamentals			10Hrs	
Fundamentals: System Modeling, Clustering and Virtualization: distributed system models and enabling technologies, computer clusters for scalable parallel computing, virtual machines and virtualization of clusters and data centers. introduction to cloud computing, migrating into cloud, enriching the integration of service paradigm for cloud era, the enterprise cloud computing paradigm					
Module-II	Infra Structure as Service			9 Hrs	
Infra Structure as Service: Virtual machine provisioning and migration services, on the management of virtual machines for cloud infrastructure, enhancing cloud computing environments using a cluster as service, secure distributed data storage in cloud computing Aneka, comet cloud, T-systems, work flow engine for clouds, understanding scientific applications for cloud environments.					
Module-III	Cloud Data Security			10 Hrs	
Data Protection (rest, at transit, in use), Data Information lifecycle, Cloud Data Audit (Intro, Audit, Best Practice): Aws — EBS, S3, Azure — SAS, Demo-Aws cli & powershell & Amazon, Azure portal, Key management, Cloud Key management Audit (Intro, Audit, Best Practice): Aws —KMS, Azure — Azure Key Vault					

Module-IV	Identity and Access Management	10 Hrs
Introduction to Identity and Access Management, Introduction to Federated Identity Management, Case Study, Cloud IAM Audit (Intro, Audit, Best Practice): Aws —IAM, Demo -Aws Cli & Amazon portal		
Module-V	Cloud Application Security	9 Hrs
Cloud Application Challenges, OWSAP Top 10, Secure SDLC, Dev Sec Ops, Cloud Trail, Cloud watch, Lambda		
Text Books: 1. Ronald L. Krutz, Russell Dean Vines, “Cloud Security: A Comprehensive Guide to Secure Cloud Computing”, 30 July 2010		
Reference Books: 1. Charlie Kaufman, “Network Security: Private Communication in a Public World”, 2nd edition, Prentice Hall. A tul Kahate 2008. 2. Robert Bragg, Mark Rhodes “Cryptography and Network Security”, 2nd edition, Tata Mc Grawhill, India., 2004.		



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LARGE LANGUAGE MODELS					
(Common to CSE, AI&ML, DS, CS)					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A3316Ta	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PEC
Course Objectives:					
This course will enable students to: - Explore the fundamental Natural Language Processing - Understand the basic concepts of Linguistic fundamentals for NLP. - Be familiarize with Data Collection and Pre-processing for Language Modeling. - Understand the Neural Networks in Language Modeling, Transformer-based Models for Language Modeling					
Course Outcomes (CO):					
On completion of this course, student will be able to - Understand the basic concepts of Natural Language Processing(L2) - Learn about Linguistic fundamentals for NLP(L2). - Analyze Data Collection and Pre-processing for Language Modeling(L4) - Apply Neural Networks in Language Modeling(L3) - Apply Transformer-based Models for Language Modeling(L3)					
Syllabus				Total Hours:48	
Module-I	Fundamentals of Natural Language Processing			10Hrs	
Introduction, Structure, Objectives, The definition and applications of NLP, The history and evolution of NLP, The components of NLP					
Module-II	Linguistic fundamentals for NLP			9 Hrs	
The challenges of NLP, Introduction to Language Models, A brief history of language models and their evolution, Types of language models, Autoregressive and auto encoding language models, Examples of large language models, Training basic language models					
Module-III	Data Collection and Pre-processing for Language Modeling			10 Hrs	
Introduction, Data acquisition strategies, Data cleaning techniques, Text pre-processing: preparing text for analysis, Data annotation, Managing noisy and unstructured data, Data privacy and security					
Module-IV	Neural Networks in Language Modeling			10 Hrs	
Introduction, Introduction to neural networks, Backpropagation, Gradient descent, Neural Network Architectures for Language Modeling, Understanding shallow and deep neural networks, Fundamentals of RNN, Types of RNNs:					

Module-V	Transformer-based Models for Language Modeling	9 Hrs
Introduction, Key concepts, Transformer architecture, Advantages and limitations of transformers, Training Large Language Models, Building a tiny language model, Building a character-level text generation model Building effective LLMs		
Text Books: 1.Sanket Subhash Khandare, “Mastering Large Language Models”, BPB Publications		
Reference Books: 1. Lior Gazit, Meysam Ghaffari, ”Mastering NLP from Foundations to LLMs”, Packt Publishing 2. Gilbert Mizrahi, ”Unlocking the Secrets of Prompt Engineering”, Packt Publishing		



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BIG DATA TECHNOLOGIES (Common to CSE, AI&ML, DS, CS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0534Tb	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PEC
Course Objectives:					
This course will enable students to: - Understand the basic concepts and importance of Big Data - Familiarize with the installation of Hadoop and how to analyze the Big Data - Understand the design concepts of HDFS - Provide good insight for developing a MapReduce applications - Understand Hadoop environment. - Explore the concepts of Pig, Hive, Spark and HBase					
Course Outcomes (CO):					
After the completion of the course students will able to - Understand the concepts and tools of big data(L2) - Analyzing the Data with Hadoop(L4) - Develop MapReduce application(L3) - Illustrate the Anatomy of MapReduce and Hadoop environment Determine why existing technologies are inadequate to analyze the large data(L2) - Apply large-scale analytic tools to solve some of the open big data problems(L3)					
Syllabus				Total Hours:48	
Module-I	Introduction to Big Data			10Hrs	
Introduction to Big Data: Big data fundamentals, importance of big data, Structuring Big Data, Big Data Analytics, Meet Hadoop: Data, Data Storage and Analysis, History of Apache Hadoop, Hadoop Ecosystem, Installation of Hadoop, Analyzing the Data with Hadoop, Scaling Out.					
Module-II	HDFS and MapReduce			9Hrs	
HDFS: HDFS Concepts, HDFS Architecture, The Command-Line Interface, Data flow: Anatomy of a file read and Anatomy of a file write. Map Reduce: Developing a Map Reduce application: The Configuration API, setting up the Development Environment, Running Locally on Test Data, Running on a Cluster.					
Module-III	How Map Reduce Works and Hadoop Environment			10Hrs	
How MapReduce Works: Anatomy of a Map Reduce Job Run, Failures, Shuffle and Sort. Hadoop Environment: Setting up a Hadoop Cluster, Cluster specification, Cluster Setup and Installation, Hadoop Configuration.					
Module-IV	Data Analyzation using Pig as a tool			9Hrs	
Pig: Pig Concepts, Apache Pig Architecture, Installing and Running Pig, Comparison with Databases,					

Pig Latin, User Defined Functions, Data Processing Operators.		
Module-V	Open-Source tools for Big Data: Hive, Spark and HBase	10Hrs
Hive: Hive concepts, Hive Architecture, Installing Hive, Comparison with traditional Databases, HiveQL, Tables, Querying Data. Spark: Spark Concepts, Architecture of Spark, Installing Spark, Anatomy of a Spark Job Run. HBase: Introduction to HBase, HBase Architecture, Installation.		
Text Books: 1. Tom White, “Hadoop: The Definitive Guide”Fourth Edition, O’reilly Media, 2015. 2. “Big Data Black Book”, DT Editorial services ,Dreamtech Press		
Reference Books: 1. Michael Minnelli, Michelle Chambers, and Ambiga Dhiraj, “Big Data, Big Analytics: Emerging business intelligence and analytic trends for today’s businesses”, Wiley Cio Series 2. Glenn J. Myatt, “Making Sense of Data” , John Wiley & Sons, 2007 Pete Warden,Big Data Glossary, O’Reilly, 2011. 3. Michael Berthold, David J.Hand,” Intelligent Data Analysis”, Spingers, 2007. 4. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos,”Uderstanding Big Data : Analytics for Enterprise Class Hadoop and Streaming Data”, McGraw Hill Publishing, 2012. 5. Anand Rajaraman and Jeffrey David UIIman, “Mining of Massive Datasets”, Cambridge University Press, 2012		
Web References: 1. https://onlinecourses.swayam2.ac.in/arp19_ap60/preview 2. https://www.shiksha.com/online-courses/big-data-analytics-courses-certification-training-by-nptel-st601-tg91		



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BLOCK CHAIN TECHNOLOGY (Common to CSE, AI&ML, DS, CS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0536Tc	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PEC
Course Objectives:					
This course will enable students to: • Illustrate the fundamental concepts of black chain. • Determine the crypto currency primitives. • Compare and contrast the bit coins and Crypto currency • Illustrate the different security features					
Course Outcomes (CO):					
On completion of this course, student will be able to • Describe the basic concepts and technology used for block chain(L2) • Describe the primitives of the distributed computing and cryptography related to block chain(L2) • Illustrate the concepts of Bit coin and their usage(L2) • Implement Ethereum block chain contract(L3) • Apply security features in block chain technologies(L3) • Use smart contract in real world applications(L3)					
Syllabus				Total Hours:48	
Module-I	Introduction			9Hrs	
Need for Distributed Record Keeping, Modeling faults and adversaries, Byzantine Generals problem, Consensus algorithms and their scalability problems, Nakamoto’s concept with Block chain based crypto currency, Technologies Borrowed in Block chain – hash pointers, consensus, byzantine fault-tolerant distributed computing, digital cash etc					
Module-II	Basic Distributed Computing & Crypto primitives			10Hrs	
Atomic Broadcast, Consensus, Byzantine Models of fault tolerance, Hash functions, Puzzle friendly Hash, Collison resistant hash, digital signatures, public key crypto, verifiable random functions, Zero-knowledge systems					
Module-III	Bitcoin Basics			10Hrs	
Bitcoin blockchain, Challenges and solutions, proof of work, Proof of stake, alternatives to Bitcoin consensus, Bitcoin scripting language and their use					
Module-IV	Ethereum Basics			10Hrs	
Ethereum and Smart Contracts, The Turing Completeness of Smart Contract Languages and verification challenges, Using smart contracts to enforce legal contracts, comparing Bitcoin scripting vs. Ethereum Smart Contracts, Writing smart contracts using Solidity & JavaScript					

Module-V	Privacy, Security issues in Block chain	9Hrs
Pseudo-anonymity vs. anonymity, Zcash and Zk-SNARKS for anonymity preservation, attacks on Block chains: Sybil attacks, selfish mining, 51% attacks advent of algorand; Sharding based consensus algorithms to prevent these attacks		
Text Books: 1. Josh Thompson, 'Block chain: The Block chain for Beginnings, Guild to Block chain Technology and Block chain Programming', Create Space Independent Publishing Platform, 2017. 2. Narayanan, Bonneau, Felten, Miller and Goldfeder, "Bitcoin and Cryptocurrency Technologies – A Comprehensive Introduction", Princeton University Press.		
Reference Books: 1. Imran Bashir, "Mastering Block chain: Distributed ledger technology, decentralization, and smart contracts explained", Packt Publishing. 2. Merunas Grincalaitis, "Mastering Ethereum: Implement Advanced Block chain Applications Using Ethereum-supported Tools, Services, and Protocols", Packet Publishing.		
Web References: 1. https://onlinecourses.nptel.ac.in/noc22_cs44/preview 2. https://nptel.ac.in/courses/106104220		



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HIGH PERFORMANCE COMPUTING (Common to CSE, AIML, CS& DS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A3317Td	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PEC
Course Objectives:					
This course will enable students to: - Learn concepts of parallel processing as it pertains to high-performance computing. - Solve problems a raised in Parallel Processing. - Design and analyze parallel programs on high performance computing resources using parallel programming paradigms					
Course Outcomes (CO):					
On completion of this course, student will be able to - Understand the basic concepts of Parallel Processing(L2) - Understand the concept of Message Passing Programming(L2) - Understand the concept of Pipelined computations(L2) - Understand the concept of Load Balancing(L2) - Understand the concept of Shared Memory Multiprocessors(L2)					
Syllabus				Total Hours:48	
Module-I	Parallel Computers			9Hrs	
The Demand for Computational Speed, Potential for Increased Computational Speed, Types of Parallel Computers, Cluster Computing					
Module-II	Message Passing Computing			9Hrs	
Basics of Message - Passing Programming, Using a Cluster of Computers, Evaluating Parallel Programs, Debugging and Evaluating Parallel Programs Empirically					
Module-III	Pipelined Computations and Synchronous Computations			10Hrs	
Pipeline Technique, Computing Platform for Pipelined Applications, Pipeline Program Examples, Synchronization, Synchronization Computations, Synchronous Iteration Program Examples					
Module-IV	Load Balancing and Termination Detection			10Hrs	
Load Balancing, Dynamic Load Balancing, Distributed Termination Detection Algorithms, Program Example					
Module-V	Programming with Shared Memory			10Hrs	
Shared Memory Multiprocessors, Constructs for Specify Parallelism, Sharing Data, Parallel Programming Languages and Constructs, Performance Issues					

Text Books:

1. Parallel Programming: Techniques and Applications using Networked Work-stations and Parallel Computers" (2nd ed.) by B. Wilkinson and M. Allen, Prentice Hall..

Reference Books:

1. An Introduction to Parallel Computing: Design and Analysis of Algorithms, Second Edition - A.Grama, A. Gupta, G. Karypis and V. Kumar, Pearson.

Web References:

1. <https://nptel.ac.in/courses/112105293>
2. <https://archive.nptel.ac.in/courses/112/105/112105293/>



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SMART GRID (Open Elective-III) (Common to CSE, AI&ML, CS, DS, ECE, EEE, ME)					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0241Ta	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OEC
Course Objectives:					
This course will enable students to gain knowledge on: • Overview of the technologies required for the smart grid • Switching techniques and different means for data communication • Standards for information exchange and smart metering • Methods used for information security on smart grid • Smart metering and protocols for smart metering • Power quality management with upgraded technologies.					
Course Outcomes (CO):					
On completion of this course, the students will be able to • Understand the concepts and design of Smart grid(L2) • Understand the various communication technologies in smart grid(L2) • Understand the various measurement technologies in smart grid(L2) • Understand the analysis and stability of smart grid(L2) • Learn the renewable energy resources and storages integrated with smart grid(L2) • Familiarize the high-performance computing for Smart Grid applications(L2)					
Syllabus				Total Hours: 48	
Module-I	Introduction to Smart Grid			10 Hrs	
Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid drivers, functions, opportunities, challenges and benefits, Difference between conventional & Smart Grid, Concept of Resilient &Self-Healing Grid, Present development & International policies in Smart Grid, Diverse perspectives from experts and global Smart Grid initiatives					
Module-II	Smart Grid Technologies			8 Hrs	
Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation, Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control, Distribution systems: DMS, Volt/VAR control, Fault Detection, Isolation and service restoration, Outage management, High Efficiency Distribution Transformers, Phase Shifting Transformers, Plug in Hybrid Electric Vehicles (PHEV).					
Module-III	Smart Meters			10 Hrs	

Introduction to Smart Meters, Advanced Metering infrastructure (AMI) drivers and benefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement Unit (PMU), Intelligent Electronic Devices (IED) & their application for monitoring & protection.		
Module-IV	Power Quality Management in Smart Grid	10 Hrs
Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit.		
Module-V	High Performance Computing	10 Hrs
Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN), Broadband over Power line (BPL), IP based Protocols, Basics of Web Service and CLOUD Computing to make Smart Grids smarter, Cyber Security for Smart Grid.		
Textbooks: 1. Janaka Ekanayake, Liyanage, Wu, Akihiko Yokoyama, Jenkins, “Smart Grid”, Wiley Publications, 2012, Reprint 2015. 2. James Momoh, “Smart Grid: Fundamentals of Design and Analysis”, Wiley, IEEE Press., 2012, Reprint 2016.		
Reference Books: 1. Clark W. Gellings,” The Smart Grid – Enabling Energy efficiency and demand response”, P.E., CRC Press, Taylor & Francis group, First Indian Reprint. 2015. 2. Lars Torsten Berger, Krzysztof Wisniewski,” Smart Grid – Applications, Communications, and Security”, WILEY, 2012, Reprint 2015. 3. Cobus Strauss, “Practical Electrical Network Automation and Communication Systems”, ELSVIER, 2003		
Web References: https://onlinecourses.nptel.ac.in/noc22_ee82/preview		



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BASIC VLSI DESIGN					
(Common to CSE, AI&ML, CS, DS, ECE, EEE, ME)					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0432T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OEC
Course Objectives:					
This course will enable students to					
- Gain exposure to different steps involved in fabrication Process of PMOS & NMOS transistors, CMOS & BICOM Inverters. - Gain knowledge on electrical properties of MOS & BICMOS devices to analyze the behavior of inverters designed with various loads. - Gain knowledge on Basic Circuit Concepts of VLSI Design - Apply the design Rules and draw layout of a given logic circuit and basic circuit concepts to MOS circuits. - Apply the design for testability methods for combinational & sequential CMOS circuits					
Course Outcomes:					
After the completion of the course students will able to:					
- Acquire qualitative knowledge about the fabrication process of integrated circuit using MOS transistors(L2) - Understand the concept of Basic Electrical Properties of MOS/Bi-CMOS Devices(L2) - Apply the basic circuit concepts to MOS circuits(L3) - Understand the concept of Scaling of MOS circuits and Limitations of Scaling(L2) - Apply the design Rules to draw the Stick diagram & layout of a given logic circuit(L3) - Interpret the need for testability and testing methods in VLSI(L2)					
Syllabus				Total Hours: 48	
Module-I	Introduction to Fabrication Process			10 Hrs	
Introduction: Brief Introduction to IC technology, Moore’s Law, Different modes MOSFET operation, Fabrication Process of PMOS, NMOS, CMOS & Bi-CMOS devices, Comparison between CMOS and Bi-polar Technologies. Fabrication Steps: Wafer Preparation, Oxidation, Photolithography, Etching, Ion Implantations, Metallization, Testing.					
Module- II	Basic Electrical Properties of MOS/BiCMOS devices			10 Hrs	
Basic Electrical Properties: Ids Vs Vds relationships, MOS transistor Threshold Voltage-VT, figure of merit-ω0, Transconductance - gm, Output conductance-gds, Pass transistor logic, NMOS Inverter, Pull-up to Pull-down Ratio for NMOS inverter driven by another NMOS inverter, and through one or more pass transistors Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.					

Module– III	Basic Circuit Concepts	9 Hrs
Basic Circuit Concepts: Sheet Resistance R_s and concepts to MOS, Area Capacitances calculations, Inverter Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out		
Module– IV	VLSI Circuit Design Processes	10 Hrs
VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, Lambda(λ)-based design rules for wires, contacts and Transistors, Layout Diagrams for NMOS and CMOS Inverters Logic Gates and Various MOS Circuits. Scaling of MOS circuits, Limitations of Scaling.		
Module– V	CMOS Testing	9 Hrs
CAD Tools for Design and Simulation, Aspects of Design Tools, Design for Testability, Testing Combinational Logic, Testing Sequential Logic, Practical Design for Test (OFT) Guidelines, Scan Design Techniques, Built-In-Self-Test (BIST), Future Trends.		
Text Books: 1. Kamran Eshraghian, “Essentials of VLSI Circuits and Systems”, Douglas and A. Pucknell and SholehEshraghian, Prentice-Hall of India Private Limited, 2005 Edition. 2. Behzad Razavi , “Design of Analog CMOS Integrated Circuits”, McGraw Hill, 2003		
References Books: 1. Modern VLSI Design – Wayne Wolf, 3 Ed., 1997, Pearson Education. 2. Jan M. Rabaey, “Digital Integrated Circuits”, AnanthaChandrakasan and Borivoje Nikolic, Prentice-Hall of India Pvt.Ltd, 2nd edition, 2009. 3. John P. Uyemura, “Introduction to VLSI Circuits and Systems”, John Wiley & Sons, reprint 2009 4. CMOS VLSI Design-A Circuits and Systems Perspective, Neil H.E Weste, David Harris, Ayan Banerjee, 3rd Edn, Pearson, 2009.		
Web References: https://nptel.ac.in/courses/117106092 https://www.digimat.in/nptel/courses/video/108107129/L01.html		



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DISASTER MANAGEMENT					
(Common to CSE, AI&ML, CS, DS, ECE, EEE, ME)					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0151T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OEC
Course Objectives:					
This course will enable students to					
- Develop an understanding of why and how the modern disaster manager is involved with pre-disaster and post-disaster activities. - Develop an awareness of the chronological phases of natural disaster response and refugee relief operations - Describe the three planning strategies useful in mitigation - Describe public awareness and economic incentive possibilities - Understand the tools of post-disaster management					
Course Outcomes:					
On completion of this course, student will be able to					
- Know about the natural hazards and its management(L2) - Know about the fire hazards and solid waste management(L2) - Understand about the emerging infectious diseases and aids their management(L2) - Know about the regulations of building codes and land use planning related to risk and vulnerability(L2) - Impart the education related to risk reduction in schools and communities(L2)					
Syllabus				Total Hours: 48	
Module-I	Natural Hazards and Disaster Management			9 Hrs	
Introduction of DM – Inter disciplinary -nature of the subject– Disaster Management cycle – Five priorities for action. Case study methods of the following: floods, draughts – Earthquakes – global warming, cyclones & Tsunamis – Post Tsunami hazards along the Indian coast – landslides					
Module-II	Man Made Disaster			9 Hrs	
Fire hazards – transport hazard dynamics – solid waste management – post disaster – bio terroritirm - threat in mega cities, rail and air craft’s accidents, and Emerging infectious diseases & Aids and their management.					
Module–III	Risk And Vulnerability			10 Hrs	

Building codes and land use planning – social vulnerability – environmental vulnerability – Macroeconomic management and sustainable development, climate change risk rendition – financial management of disaster – related losses.		
Module –IV	Role of Technology in Disaster Management	10 Hrs
Disaster management for infra structures, taxonomy of infra structure – treatment plants and process facilities-electrical substations roads and bridges- mitigation programme for earth quakes –flowchart, geospatial information in agriculture drought assessment-multimedia technology in disaster risk management and training- transformable indigenous knowledge in disaster reduction.		
Module–V	Education and Community Preparedness	10 Hrs
Education in disaster risk reduction-Essentials of school disaster education-Community capacity and disaster resilience-Community based disaster recovery -Community based disaster management and social capital-Designing resilience- building community capacity for action.		
Text Books: 1. Rajib shah & R R Krishnamurthy “Disaster Management” – Global Challenges and Local Solutions’ Universities press. (2009), 2. Tushar Bhattacharya, “Disaster Science & Management” Tata McGraw Hill Education Pvt. Ltd., New Delhi		
Reference Books: 1. Harsh. K. Gupta “Disaster Management edited”, Universities press, 2003.		
Web References: 1. https://www.youtube.com/watch?v=DExlZTfKZAM&list=PLC4PaTsQiLcbejXqJR7S59Ohk2OK1rgEG		



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MEASUREMENTS AND MECHATRONICS (Common to CSE, AI&ML, CS, DS, ECE, EEE, ME)					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0327Tc	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OEC
Course Objectives:					
This course will enable students to - Understand the principles of interchangeable manufacture. - Understand basic principles of mechanical measurements. - Impart knowledge on mechatronics systems.					
Course Outcomes:					
Upon successful completion of the course, the students will be able to - Design the limit gauges for interchangeable manufacture(L3). - Apply the basic principles of mechanical measurements for engineering practice(L3) - Illustrate the role of mechatronics systems in manufacturing(L2) - Explain principles of mechanical, hydraulic, pneumatic and electrical actuating systems(L2)					
Syllabus				Total Hours: 48	
Module-I	Limits & Fits			10 Hrs	
Introduction, terminology pertaining to limits and fits – unilateral and bilateral tolerance system, hole and shaft basis systems – Interchangeability, deterministic & statistical tolerance, selective assembly. International Standard system of limits and fits Limit Gauges: Taylor’s principle – Classification and design of limit gauges.					
Module-II	Linear and Angular Measurements			10Hrs	
Line and end standards, slip gauges and length bars. bevel protractor – angle slip gauges – spirit levels and auto collimator. Interferometry Applied to Measurement: NPL flatness interferometer and NPL gauge interferometer. Surface Roughness Measurement: Differences between surface roughness and surface waviness- Numerical assessment of surface finish – CLA, R.M.S, Rz values, Methods of measurement of surface finish – Profilograph, Talysurf					
Module-III	Mechanical Measurements			10Hrs	
Introduction to measurement: Elements of generalized measurement system Displacement Measurement- Linear Variable Differential Transformer (LVDT), encoders, potentiometers.					

Temperature Measurement - Pyrometers, Resistance Temperature Detector (RTD) Strain Measurement-Electrical strain gauge – gauge factor – method of usage of resistance strain gauge		
Module-IV	Mechatronics Systems	10 Hrs
Mechatronics systems- Elements of mechatronics system, mechatronics design process, system - measurement systems, control systems, programmable logic controllers, case studies of mechatronic systems		
Module-V	Actuating Systems	8Hrs
Hydraulic and pneumatic actuating systems - fluid systems, hydraulic systems, and pneumatic systems, components, control valves. mechanical actuating systems and electrical actuating systems – basic principles and elements.		
Textbooks: 1. R.K. Jain, “Engineering Metrology”, Khanna Publishers. 2. BeckWith, Marangoni, Linehard, “ Mechanical Measurements”, 6th edition, PHI / PE.		
Reference Books: 1. W. Bolton , “Mechatronics – Electronic Control Systems in Mechanical and Electrical Engg.”, 4th Edition, Pearson, 2012. 2. IC Guptha,”Engineering Metrology “,Danpath Rai Publications. 3. Doeblin Earnest. O. Adaptation by Manik and Dhanesh,”Measurement Systems: Application and Design”, Tata Mc Graw Hill Publications.		
Web References: https://archive.nptel.ac.in/courses/112/107/112107242/		



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ELECTRIC VEHICLES (Open Elective-IV) (Common to all Except EEE)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0232Ta	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OEC
Course Objectives:					
This course will enable students to - Understand to Provide good foundation on hybrid and electrical vehicles. - Understand To address the underlying concepts and methods behind power transmission in hybrid and electrical vehicles - Familiarize energy storage systems for electrical and hybrid transportation - Design and develop basic schemes of electric vehicles and hybrid electric vehicles.					
Course Outcomes(CO):					
On completion of this course, student will be able to - Understand the working of hybrid and electric vehicles(L2) - Apply a suitable drive scheme for developing an hybrid and electric vehicles depending on resources(L3) - Develop the electric propulsion unit and its control for application of electric vehicles(L3) - Understand the proper energy storage systems for vehicle applications(L2) - Design and develop basic schemes of electric vehicles and hybrid electric vehicles(L3)					
Syllabus				Total Hours:50	
Module-I	Electric Vehicle Propulsion and Energy Sources			10 Hrs	
Introduction to electric vehicles, vehicle mechanics - kinetics and dynamics, roadway fundamentals propulsion system design - force velocity characteristics, calculation of tractive power and energy required, electric vehicle power source - battery capacity, state of charge and discharge, specific energy, specific power, Ragone plot. battery modeling - run time battery model, first principle model, battery management system- soc measurement, battery cell balancing. Traction batteries - nickel metal hydride battery, Li-Ion, Lipolymer battery.					
Module-II	Electric Vehicle Power Plant and Drives			10Hrs	
Introduction electric vehicle power plants. Induction machines, permanent magnet machines, switch reluctance machines. Power electronic converters-DC/DC converters - buck boost converter, isolated DC/DC converter. Two quadrant chopper and switching modes. AC drives PWM, current control method. Switch reluctance machine drives - voltage control, current control.					

Module–III	Hybrid And Electric Drive Trains	9Hrs
Introduction hybrid electric vehicles, history and social importance, impact of modern drive trains in energy supplies. Hybrid traction and electric traction. Hybrid and electric drive train topologies. Power flow control and energy efficiency analysis, configuration and control of DC motor drives and induction motor drives, permanent magnet motor drives, switch reluctance motor drives, drive system efficiency.		
Module–IV	Electric and Hybrid Vehicles - Case Studies	9 Hrs
Parallel hybrid, series hybrid -charge sustaining, charge depleting. Hybrid vehicle case study – Toyota Prius, Honda Insight, Chevrolet Volt. 42 V system for traction applications. Lightly hybridized vehicles and low voltage systems. Electric vehicle case study - GM EV1, Nissan Leaf, Mitsubishi Miev. Hybrid electric heavy-duty vehicles, fuel cell heavy duty vehicles.		
Module–V	Electric And Hybrid Vehicle Design	10Hrs
Introduction to hybrid vehicle design. Matching the electric machine and the internal combustion engine. Sizing of propulsion motor, power electronics, drive system. Selection of energy storage technology, communications, supporting subsystem. Energy management strategies in hybrid and electric vehicles - energy management strategies- classification, comparison, implementation.		
Text Books: 1. Iqbal Hussein, “Electric and Hybrid Vehicles: Design Fundamentals”, 2nd edition, CRC Press, 2003. 2. Amir Khajepour, M. Saber Fallah, AvestaGoodarzi, “Electric and Hybrid Vehicles: Technologies, Modeling and Control - A Mechatronic Approach”, illustrated edition, John Wiley & Sons, 2014.		
Reference Books: 1. Mehrdad Ehsani, YimiGao, Sebastian E. Gay, Ali Emadi, “Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design”, CRC Press, 2004. 2. James Larminie, John Lowry, “Electric Vehicle Technology”, Explained, Wiley, 2003. 3. John G. Hayes, G. Abas Goodarzi, “Electric Powertrain: Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles”, 1st edition, WileyBlackwell, 2018.		
Web References: https://onlinecourses.nptel.ac.in/noc23_ee01/preview https://onlinecourses.nptel.ac.in/noc21_ee112/preview		



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INDUSTRIAL ELECTRONICS					
Common to (EEE, CSE, AI&ML, IT, CS, DS)					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0433T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OEC
Course Objectives:					
This course will enable students to: - Describe semi-conductor devices (such as PN junction diode & Transistor) and their switching characteristics. - Understand the characteristics of AC to DC converters. - Understand about the practical applications Electronics in industries. - Describe the ultrasonic and its application.					
Course Outcomes (CO):					
On completion of this course, student will be able to - Understand the semi-conductor devices and their switching characteristics(L2) - Apply the Ultrasonic waves with different applications(L3) - Understand the working of Transistor and its different configurations(L2) - Analyze the thermal effects of ultrasonic, soldering and welding by ultrasonic, ultrasonic Drying in the industry; interpret the characteristics of AC to DC converters(L4) - Develop the practical applications Electronics in industries(L3) - Apply the process of Resistance welding, Induction heating and Dielectric heating in the industry(L3)					
Syllabus				Total Hours:48	
Module-I	Scope of industrial Electronics			10 Hrs	
Scope of industrial Electronics, Semiconductors, Merits of semiconductors, crystalline structure, Intrinsic semiconductors, Extrinsic semiconductors, current flow in semiconductor, Open circuited p-n junction, Diode resistance, Zener diode, Photo conductors and junction photo diodes, Photo voltaic effect, Light emitting diodes (LED).					
Module-II	Junction Transistor			9 Hrs	
Introduction, The junction transistor, Conventions for polarities of voltages and currents, Open circuited transistor, Transistor biased in the active region, Current components in transistors, Currents in a transistor, Emitter efficiency, Transport factor and transistor- α , Dynamic emitter resistance, Transistor as an amplifier, Transistor construction, Letter symbols for semiconductor Devices, Characteristic curves of junction transistor in common configuration, static characteristic curves of PNP junction transistor in common emitter configuration, The transistor in common collector Configuration.					
Module-III	AC to DC converters			10 Hrs	

AC to DC converters- Introduction, Classification of Rectifiers, Half wave Rectifiers, Full wave Rectifiers, Comparison of Half wave and full wave rectifiers, Bridge Rectifiers, Bridge Rectifier meter, Voltage multiplying Rectifier circuits, Capacitor filter, LC Filter, Metal Rectifiers, Regulated Power Supplies, Classification of Voltage Regulators, Short period Accuracy of Regulators, Long period. Accuracy of Voltage Regulator, Principle of automatic voltage Regulator, Simple D.C. Voltage stabilizer using Zener diode, D.C. Voltage Regulators, Series Voltage Regulators, Complete series voltage regulator circuit, Simple series voltage regulator.		
Module-IV	Resistance welding controls	10 Hrs
Resistance welding controls: Introduction, Resistance welding process, Basic Circuit for A.C. resistance welding, Types of Resistance welding, electronic welding control used in Resistance welding, Energy storage welding. Induction heating: Principle of induction heating, Theory of Induction heating merits of induction heating, Application of induction heating, High frequency power source of induction heating. Dielectric heating: Principle of dielectric heating, theory of dielectric heating, dielectric properties of typical materials, electrodes used in dielectric heating, method of coupling of electrodes to the R.F. generator, Thermal losses in Dielectric heating, Applications.		
Module-V	Ultrasonics	9 Hrs
Ultrasonics: Introduction, Generation of Ultrasonic waves, Application of Ultrasonic waves, Ultrasonic stroboscope, ultrasonic as means of communication, ultrasonic flaw detection, Optical image on non-homogeneities, ultrasonic study of structure of matter, Dispersive study of structure of matter, Dispersive and colloidal effect of Ultrasonic, Coagulating action of Ultrasonic, separation of mixtures by ultrasonic waves, cutting and machining of hard materials by ultrasonic vibrations, Degassing of liquids by ultrasonic waves, Physio-chemical effects of ultrasonics, chemical effects of ultrasonics, Thermal effects of ultrasonics, soldering and welding by ultrasonics, Ultrasonic Drying		
Text Books: 1. Bogdan M Wilamowski, J David irwin,” Fundamentals of Industrial Electronics”, 2nd Edition, 2011. 2. G. K. Mithal and Maneesha Gupta,” Industrial and Power Electronics”, Khanna Publishers, 19th Ed., 2003.		
References: 1. J. Millman and C.C Halkias, “Integrated Electronics “, McGraw Hill, 1972. 2. Theodore. H. Bogart,” Electronic Devices and circuits” Pearson Education, 6thEdn., 2003. 3. Deboo and Burroughs, “Integrated Circuits and Semiconductor Devices”, ISE		
Web References: https://onlinecourses.nptel.ac.in/noc21_ee01/preview		



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CONSTRUCTION MANAGEMENT (ME, CSE, AI&ML, CS, DS, ECE, EEE)					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0152T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OEC
Course Objectives:					
This course will enable students to: • Be familiar with various construction activities, preparing construction schedule and maintaining documents and records of those activities • Understand various terms and technologies involved in earthwork of construction activities • Understand the concepts involved in project management like bar charts and milestone charts • Understand the concepts of time estimates involved in CPM and PERT, float and slack, critical path calculations					
Course Outcomes (CO):					
On completion of this course, student will be able to • Identify the various construction activities like preparing construction schedule and maintaining documents and records of those activities(L2) • Understand the concepts and techniques involved in earthwork activities(L2) • Understand about the emerging infectious diseases and aids their management(L2) • Understand the steps involved in developing a project scheduling and management and the application of bar charts and milestone charts(L2) • Understand the various elements of a network diagram like event, activity and dummy(L2) • Understand the concepts of calculation of time estimates of CPM and PERT(L2)					
Syllabus				Total Hours:48	
Module-I	Fundamentals of Construction Technology			9 Hrs	
Definitions and Discussion – Construction Activities –Construction Processes -Construction Works – Construction Estimating – Construction Schedule – Productivity and Mechanized Construction – Construction Documents – Construction Records – Quality – Safety – Codes and Regulations.					
Module-II	Earthwork			9 Hrs	
Classification of Soils – Project Site – Development – Setting Out - Mechanized Excavation – Groundwater Control – Trenchless (No-dig) Technology – Grading – Dredging.Rock Excavation – Basic Mechanics of Breakage – Blasting Theory – Drillability of Rocks – Kinds of Drilling – Selection					

of the Drilling Method and Equipment – Explosives – Blasting Patterns and Firing Sequence – Smooth Blasting – Environmental Effect of Blasting		
Module-III	Project Management and Bar Charts and Milestone Charts	10 Hrs
Project planning – Scheduling – Controlling – Role of decision in project management – Techniques for analyzing alternatives Operation research – Methods of planning and programming problems – Development of bar chart – Illustrative examples – Shortcomings of bar charts and remedial measures – Milestone charts		
Module-IV	Elements of Network and Development of Network	10 Hrs
Introduction – Event – Activity – Dummy – Network rules – Graphical guidelines for network – Common partial situations in network – Numbering the events – Cycles Problems.		
Module-V	PERT AND CPM	10Hrs
Time estimates – Frequency distribution – Mean, variance and standard deviation-Expected time Problems -Earliest expected time – Formulation for TE - Latest allowable occurrence time – Formulation for TL - Combined tabular computations for TE and TL problems. Introduction - Slack – Critical path-Illustrative examples Problems.		
Text Books: 1. Jha,” Construction project management”, Pearson publications, New Delhi 2nd Edition 2015 2. Subir K. Sarkar and Subhajit Saraswat “Construction Technology”, Oxford Higher Education Univ. Press, Delhi 2008 edition		
Reference Books: 1. Dr.B.C.Punmia, K.K.Khandelwal ,”Project Planning and Control with PERT and CPM”, Lakshmi Publications ,New Delhi 2022 editionDelhi 2. P.R.Bhave,”Optimal Design of Water Distribution Networks” Narosa Publishing house 2003. 3. P.K.JOY,”Total Project Management -The Indian context”,Mac Millan Publishers India Limited.		
Web References: https://nptel.ac.in/courses/105104161		



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INTRODUCTION TO ROBOTICS					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0331Tc	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OEC
Course Objectives:					
The objectives of this course are to Identify robots and its peripherals for satisfactory operation and control of robots for industrial and non-industrial applications.					
Course Outcomes (CO):					
After the completion of the course, the students will be able to					
1. List and explain the basic elements of industrial robots(L2)					
2. Analyze robot kinematics and its control methods(L4)					
3. Classify the various sensors used in robots for better performance(L2)					
4. Summarize various industrial and non-industrial applications of robots(L2)					
Syllabus				Total Hours:48	
Module-I	Robot Basics			10 Hrs	
Automation and Robotics: Robot-Basic concepts, Need, Law, History, Anatomy, specifications. Robot configurations-cartesian, cylinder, polar and articulate. Robot wrist mechanism, Precision, accuracy, repeatability, work and volume of robot.					
Module-II	Robot Elements			10 Hrs	
End effectors-Classification- Types of Mechanical actuation, Gripper design, Robot drive system Types, Position and velocity feedback devices-Robot joints and links-Types, Motion interpolation					
Module-III	Robot Kinematics and Control			9 Hrs	
Robot kinematics – Basics of direct and inverse kinematics, Robot trajectories, 2D and 3D Transformation-Scaling, Rotation, Translation Homogeneous transformation. Control of robot manipulators – Point to point, Continuous Path Control, Robot programming					
Module-IV	Robot Sensors			9 Hrs	
Sensors in robot – Touch sensors -Tactile sensor – Proximity and range sensors. Force sensor-Light sensors, Pressure sensors, Introduction to Machine Vision and Artificial Intelligence.					
Module-V	Robot Applications			10 Hrs	

Industrial applications of robots-Medical, Household, Entertainment, Space, Underwater, Defense, Disaster management. Applications, Micro and Nanorobots, Future Applications.

Text Books:

1. Mikell P. Groover, Mitchell Weiss, Roger N Nagel, Nicholas G Odrey, “Industrial Robotics Technology,
2. Programming and Applications”, Tata –McGraw Hill Pub. Co., 2008.

Reference Books:

1. Deb.S.R and Sankha Deb, "Robotics Technology and Flexible Automation", Tata McGraw Hill Publishing Company Limited, 2010.
2. Klafter.R.D, Chmielewski.T.A, and Noggin's., “Robot Engineering: An Integrated Approach”, Prentice Hall of India Pvt. Ltd., 1994.
3. Fu.K.S, Gonzalez.R.C&Lee.C.S.G, “Robotics control, sensing, vision and intelligence”, Tata-McGraw Hill Pub. Co., 2008
4. Yu. “Industrial Robotics”, MIR Publishers Moscow, 1985

Web References:

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Generative AI (AI&ML)					
Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A3318P	1:0:2:0	2	CIE:30 SEE:70	3 Hours	SC
Course Objectives:					
This course will enable students to:					
- Describe generative AI and how it aligns to machine learning. - Define the importance of generative AI and explain its potential risks and benefits. - Identify business value from generative AI use cases. - Learn real-world application of Generative AI. - Apply generative AI models and popular tools					
Course Outcomes (CO):					
After the completion of the course, the students will be able to					
- Understand evolution of Generative AI(L2) - Identify Business Value(L2) - Learn Capabilities of Generative AI in different Domains(L2) - Understand Chat GPT(L2) - Create/Deploying of a Generative AI application(L2)					
Syllabus				Total Hours:48	
Module-I	Prompt Engineering Fundamentals			10Hrs	
Prompt Engineering Fundamentals: Prompt, Elements of a Prompt. Tips for Designing Prompt, Example prompts for various use cases					
Module-II	Generative Texts and Images			10 Hrs	
Generative Texts: Introduction to AI Chatbots, Working of AI Chatbots, Popular AI Chatbots, ChatGPT and its working, How to use ChatGPT, Use cases of ChatGPT for various users. Generative Images: Role of AI in Image Generation, Image Sourcing Vs, Image Generation, and Popular AI tools for Image Generation. Mid journey for Image Generation, Working of mid journey, Advantages and disadvantages of Mid journey, How to use Mid journey, Use cases of Mid journey					
Module-III	Generative Videos			9 Hrs	
Generative Videos: A: Tools in Video Making, Working of AI Video Makers, Benefits of AI Video Makers, Popular AI Video Makers, Introduction to Synthesia, Features of Synthesia, Who should use Synthesia? Compatibility of Synthesia, Pros and Cons of Synthesia, How to use Synthesia, How to make AI Videos in 10 minutes, Practical Case studies of Synthesia.					
Module-IV				10 Hrs	

Generative Codes: Role of AI Tools in Programming, Copilot by Github, Working of Copilot, Copilot Compatibility, Advantages and Drawbacks of Copilot, How to use Copilot, How to Install the GitHub Copilot Extension, Converting Comments to Code using Copilot, Auto filling Repetitive Code using Copilot, Running Tests using Copilot, Navigating, Unfamiliar Territory with Copilot, Creating an Application Entirely With Copilot, Some useful keyboard shortcuts for GitHub's Copilot		
Module-V	ChatGPT Alternatives	9 Hrs
ChatGPT Alternatives: Alternative Chatbots, Comparison of ChatGPT, Bard, LLAMA, Claude..		
List of experiments 1. Text Generation using Generative AI 2. Image Generation using Generative AI 3. Audio Generation using Generative AI 4. Video Generation using Generative AI 5. Code Generation using Generative AI 6. Image to Text Generation using Generative AI 7. Speech to Text generation using Generative AI 8. Develop a Transactional Chatbot using Generative AI 9. Develop a Social Chatbot using Generative AI 10. Develop a Scripted Chatbot using Generative AI		
Text Books: 1. Deep Learning" by Ian Good fellow, Yoshua Bengio, and Aaron Courville, 1st edition, 2016		
Reference Books: 3. Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play" by David Foster, 1st edition, 2019 4. "Generative Deep Learning: Deep Learning for Generative Models" by Rowel Atienza, 1st edition, 2019 " 5. "Deep Generative Models" by Aaron Courville, Ian Good fellow, and Yoshua Bengio, 1st edition, 2020 "Generative Adversarial Networks: An Overview" by Anton Bogushevsky and Vladimir		

Semester-8 (Project-1)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1	Major Project	22A3311	Project work, Seminar and Internship in industry	0	0	24	12
INTERNSHIP (6 MONTHS)							
Total credits							12