GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY: NELLORE
(AUTONOMOUS)

NELLORE–524317 (A.P) INDIA

B.TECH – COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE AND SYLLABI UNDER RG 22 REGULATIONS

GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY: NELLORE

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

VISION

To evolve as a leading computer science and engineering center producing competent technocrats to meet the demands of ever-changing industry and society.

MISSION

M1: Impart quality education through innovative teaching learning processes

M2: Motivate the learners to upgrade technical expertise by promoting learner centric activities.

M3: Inculcate values and interpersonal skills in the learners towards overall development.

M4: Upgrade knowledge in cutting edge technologies keeping pace with industrial standards through collaborations.

Program Educational Objectives (PEOs)

After few years of graduation, the graduates of B.Tech (CSE) will be:

PEO-1: Outperform in professional career or higher learning by upgrading skills in Computer Science and Engineering stream.

PEO-2: Provide computing solutions for complex problems to meet industry demands and societal needs.

PEO-3: Offer ethical, socially sensitive solutions as professionals and as entrepreneurs in Computer Science and other engineering disciplines.

PEO-4: Leverage new computing technologies by engaging in perpetual learning.

Program Outcomes

On successful completion of the Program, the graduates of B.Tech(CSE) Program will be able to:

PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, andsynthesis of the information to provide valid conclusions.
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, andmodern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge toassess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, andneed for sustainable development
PO8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities andnorms of the engineering practice.
PO9	**Individual and team work**: Function effectively as an individual, and as a member orleader in diverse teams, and in multidisciplinary settings.
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

PSO 1: Apply the expertise in adaptive algorithms to develop quality software applications.

PSO 2: Demonstrate the capabilities in basic and advanced technologies to towards getting employed or to become an entrepreneur.

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B. TECH Computer Science & Engineering

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 andmathematical 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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B. TECH Computer Science & Engineering

Course Structure (RG22)

Semester - 1 (Theory-4, Lab-5)							
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	22A0006T	Chemistry	3	0	0	3
3	ESC	22A0203T	Basic Electrical & Electronics Engineering	3	0	0	3
4	ESC	22A0501T	Problem Solving using C	3	0	0	3
5	ESC(LAB)	22A0304P	Engineering Workshop	1	0	4	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)	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)	12
Total	19.5

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B. TECH Computer Science & Engineering

Course Structure (RG22)

Semester - 2 (Theory-5, Lab-3)							
Sl. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**
				L	**T**	**P**	**C**
1	BSC	22A0002T	Differential Equations & Vector 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	22A0302T	Engineering Drawing	3	0	0	3
5	ESC(LAB)	22A0504T	Data Structures	0	0	3	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)	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)	7.5
Humanities and Social science Course(HSC)	4.5
Total	19.5

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-3 (Theory-6, Lab-3, SC-1, MC-1)							
Sl. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**
				L	**T**	**P**	**C**
1	BSC	22A0016T	Probability & Statistics	3	0	0	3
2	PCC	22A0506T	Computer Organization	3	0	0	3
3	PCC	22A0507T	Object Oriented Programming through Java	3	0	0	3
4	ESC	22A0410T	Digital Electronics and Micro Processors	3	0	0	3
5	PCC	22A0508T	Software Engineering	3	0	0	3
6	HSC	22A0021T	Universal Human Values	3	0	0	3
7	PCC(Lab)	22A0509P	Object Oriented Programming through Java Lab	0	0	3	1.5
8	ESC(Lab)	22A0411P	Digital Electronics and Micro Processors Lab	0	0	3	1.5
9	PCC(Lab)	22A0510P	Software Engineering Lab	0	0	3	1.5
10	SC	22A0511	**Skill Oriented Course** Basic Web Design	1	0	2	2
11	MC	22A0028T	**Mandatory Course** Environmental Science	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**	**C**
1	BSC	22A0017T	Discrete Mathematical Structures	3	0	0	3
2	PCC	22A0512T	Database Management Systems	3	0	0	3
3	PCC	22A0513T	Operating Systems	3	0	0	3
4	PCC	22A0514T	Python Programming	3	0	0	3
5	HSC	22A0022T	Managerial Economics & Financial Analysis	3	0	0	3
6	PCC(LAB)	22A0515P	Database Management Systems Lab	0	0	3	1.5
7	PCC(LAB)	22A0516P	Operating Systems Lab	0	0	3	1.5
8	PCC(LAB)	22A0517P	Python Programming Lab	0	0	3	1.5
9	SC	22A0518	**Skill Oriented Course** Linux Programming	1	0	2	2
10	MC	22A0030T	**Mandatory Course** Constitution of India	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**

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**	**C**
1	PCC	22A0541T	Theory of Computation	3	0	0	3
2	PCC	22A0520T	Computer Networks	3	0	0	3
3	PCC	22A0521T	Design and Analysis ofAlgorithms	3	0	0	3
4	PEC	22A0522Ta 22A0522Tb 22A0522Tc	**Professional Elective-I:** 1. Object Oriented Analysis and Design 2. Data warehousing and Mining 3. Cyber security	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)	22A0523P	Computer Networks Lab	0	0	3	1.5
7	PCC(Lab)	22A0524P	Design and Analysis of Algorithms Lab	0	0	3	1.5
8	SC	22A0525P	**Skill Advanced Course:** Full Stack Development	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**

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-1 MC-1)							
Sl. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**
				L	**T**	**P**	**C**
1	PCC	22A0527T	Compiler Design	3	0	0	3
2	PCC	22A0528T	Machine Learning	3	0	0	3
3	PCC	22A0529T	Cloud Computing	3	0	0	3
4	PEC	22A0530Ta 22A0530Tb 22A0530Tc	**Professional Elective-II:** 1. Software Testing 2. Applied data science 3. Cryptography and Network Security	3	0	0	3
5	OEC	22A0431T 22A0215T 22A0150T 22A0329Tb	**Open Elective-II:** 1. Micro Controllers and Applications 2. Control Systems Engineering 3. Environmental Economics 4. Introduction to Composites	3	0	0	3
6	PCC(Lab)	22A0531P	Compiler Design Lab	0	0	3	1.5
7	PCC(Lab)	22A0532P	Machine Learning Lab	0	0	3	1.5
8	PCC(Lab)	22A0533P	Cloud Computing 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**

Category	Credits
Professional Core Courses (PCC)	13.5
Professional Elective Courses (PEC)	3
Open Elective Courses (OEC)	3
Skill Oriented Course (SC)	2
Industrial / Research Internship (Mandatory) 2 Months	-
Total	21.5

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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	22A0534Ta 22A0534Tb 22A0534Tc	**Professional Elective-III:** 1. Software Project Management 2. Big Data Technologies 3. Internet of Things	3	0	0	3
3	PEC	22A0535Ta 22A0535Tb 22A0535Tc	**Professional Elective-IV:** 1. Agile Methodologies 2. Information Retrieval Systems 3. Adhoc and Wireless Sensor Networks	3	0	0	3
4	PEC	22A0536Ta 22A0536Tb 22A0536Tc	**Professional Elective-V:** 1. Design Patterns 2. Deep Learning 3. Block Chain Technology	3	0	0	3
5	OEC	22A0241T 22A0432T 22A0151T 22A0329Tc	**Open Elective-III:** 1. Smart Grid 2. Basic VLSI Design 3. Disaster management 4. Measurements and Mechatronics	3	0	0	3
6	OEC	22A0236T 22A0433T 22A0152T 22A0333Tb	**Open Elective-IV:** 1. Hybrid Electric Vehicles 2. Industrial Electronics 3. Construction Management 4. Introduction to Robotics	3	0	0	3
7	SC	22A0537P	**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**

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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Semester-8 (Project)							
Sl. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**
				L	**T**	**P**	**C**
1	Major Project	22A0538	Project Work	0	0	24	12
						Total credits	12

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B. TECH Computer Science & Engineering

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 andmathematical 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-4, Lab-5)							
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	22A0006T	Chemistry	3	0	0	3
3	ESC	22A0203T	Basic Electrical & Electronics Engineering	3	0	0	3
4	ESC	22A0501T	Problem Solving using C	3	0	0	3
5	ESC(LAB)	22A0304P	Engineering Workshop	1	0	4	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)	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)	12
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.

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

Learning outcomes: 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).

Learning outcomes: 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", 3 rd 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/

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,YashwantKanetkar, 6th Edition , BPB
2. C Programming and Data Structures, P.Padmanabham, Third Edition, BS Publications
3. C Programming, E.Balagurusamy, 3rd edition, TMHPublishers
4. Programming in C, Ashok N. Kamthane, AmitKamthane, 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 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. (l3)
- Build different objects with metal sheets in real world applications. (l3)
- Apply fitting operations in various applications. (l3)
- Apply different types of basic electric circuit connections. (l3)
- Use soldering and brazing techniques. (l2)

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 dissembling 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. Crimpling 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, 2nd edition.
2. Sunitha Rattan, "Experiments in Applied Chemistry", S.K. Kataria& Sons, New Delhi, 2nd edition.

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB

(Common to all branches)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0011P	0:0:3:0	1.5	CIE:30 SEE:70	3 Hours	ESC

Course Objectives:

This course will enable students to:

- 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 | **Total Hours: 48**

List of Experiments

1. Verification of Kirchhoff's Laws.
2. Verification of Superposition Theorem.
3. Determination of Phase Angle for RL&RC series circuit.
4. Brake Test on DC-Shunt Motor. Determination of Performance curves.
5. OC & SC Tests on Single Phase Transformer.
6. Brake Test on Three Phase Induction Motors. Determination of Performance curves
7. V-I Characteristics of Solar Cell.
8. V-I Characteristics of PN junction Diode and 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.

(**Any 10 experiments from the above list)**

Course Outcomes:

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

- Experimentally verify the basic circuit theorems, KCL and KVL
- Measure power, power factor and phase angle in RL&RC circuits experimentally.
- Acquire hands on experience of conducting various tests on dc shunt motor, single phase transformers and three phase induction motors and obtaining their performance indices using standard analytical as well as graphical methods
- Draw the characteristics of different semiconductor devices like PN junction Diode, Zener Diode, BJT and JFET by conducting suitable experiments.
- Experimentally verify the working of half and full wave rectifier by using PN Junction diodes

Text Book(s):

1. Fundamentals of Electric Circuits Charles K. Alexander and Matthew. N. O. Sadiku, Mc Graw Hill, 5th Edition, 2013.
2. Engineering circuit analysis William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 7th Edition, 2006.
3. Circuit Theory Analysis & Synthesis A. Chakrabarti, Dhanpat Rai & Sons, 7th Revised Edition, 2018

Reference Book(s):

1. Network Analysis M.E Van Valkenberg, Prentice Hall (India), 3rd Edition, 1999.
2. Electrical Engineering Fundamentals V. Del Toro, Prentice Hall International, 2nd Edition, 2019.
3. Electric Circuits- Schaum's Series, Mc Graw Hill, 5th Edition, 2010.
4. Electrical Circuit Theory and Technology John Bird, Routledge, Taylor&Francis, 5thEdition, 2014.

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*T*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) $S = ut+1/2at^2$
   (iii) $T=2*a+\sqrt{b}+9c$
   (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+……. +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
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B. TECH Computer Science & Engineering

Course Structure (RG22)

Semester - 2 (Theory-5, Lab-3)							
Sl. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**
				L	**T**	**P**	**C**
1	BSC	22A0002T	Differential Equations & Vector 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	22A0302T	Engineering Drawing	3	0	0	3
5	ESC(LAB)	22A0504T	Data Structures	0	0	3	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)	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)	7.5
Humanities and Social science Course(HSC)	4.5
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 furnishthe 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, Wronskean, 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.
- Calcify 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 Mathmatic I & II, by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S. Chand publication.

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 doublerefraction - 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 ntype- 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. 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

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 Involutes 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. (l2)
- Show projections of solids and sections graphically. (l2)
- Draw the development of surfaces of solids. (l3)

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.

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:

1. Classic Data Structures, Second Edition, Debasissamanta, PHI
2. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S.Sahni and Susan Anderson Freed, Universities Press

References:

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

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

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	Course Type
22A0010P	0:0:3:0	1.5	CIE:30 SEE:70	3 Hours	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 asemiconductor.
- 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 ChandPublishers, 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. 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

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

1. Write C program that use both recursive and non-recursive functions to perform Linear search for a key value in a given list.
2. Write C program that use both recursive and non-recursive functions to perform Binary search for a key value in a given list.
3. Write a C program that uses functions to perform the following operations on singly linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
4. Write a C program that uses functions to perform the following operations on doubly linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
5. Write a C program that uses functions to perform the following operations on circular linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
6. Write a C program that implement stack (its operations) using
   i) Arrays ii) Pointers
7. Write a C program that implement Queue (its operations) using
   i) Arrays ii) Pointers
8. Write a C program that Uses Stack Operations to Convert Infix expression into Postfix expression
9. Write a C program that Uses Stack Operations to Evaluate the Postfix expression
10. Write a C program that uses functions to perform the following
    i) creating a binary tree of integers ii) Traversing the above binary tree in preorder, inorder and post order
11. Write a C program that uses functions to perform the following operations on Binary search Tree.:
    i) Creation ii) Insertion iii) Deletion
12. Write a program that implements the following sorting methods to sort a given list of integers in ascending order
    i) Quick sort ii) Merge sort
13. 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):

1. Classic Data Structures, Second Edition, Debasissamanta, PHI
2. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S.Sahni and Susan Anderson Freed, Universities Press 3. Circuit Theory Analysis & Synthesis A. Chakrabarti, Dhanpat Rai & Sons, 7th Revised Edition, 2018

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

GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY

Unit of USHODAYA EDUCATIONAL SOCIETY

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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**	**C**
1	BSC	22A0016T	Probability & Statistics	3	0	0	3
2	PCC	22A0506T	Computer Organization	3	0	0	3
3	PCC	22A0507T	Object Oriented Programming through Java	3	0	0	3
4	ESC	22A0410T	Digital Electronics and Micro Processors	3	0	0	3
5	PCC	22A0508T	Software Engineering	3	0	0	3
6	HSC	22A0021T	Universal Human Values	3	0	0	3
7	PCC(Lab)	22A0509P	Object Oriented Programming through Java Lab	0	0	3	1.5
8	ESC(Lab)	22A0411P	Digital Electronics and Micro Processors Lab	0	0	3	1.5
9	PCC(Lab)	22A0510P	Software Engineering Lab	0	0	3	1.5
10	SC	22A0511	**Skill Oriented Course** Basic Web Design	1	0	2	2
11	MC	22A0028T	**Mandatory Course** Environmental Science	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), $\chi 2$ - test for goodness of fit, $\chi 2$ - 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.		
Reference Books: 1. Probability & Statistics by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad S. Chand publication. 2. B.V.Ramana, "Higher Engineering Mathematics", Mc Graw Hill publishers. 3. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968. 4. Mathematical Foundations of Statistics by K. C. Kapoor & Gupta, S. Chand Publications.		
Web References: 1. https://onlinecourses.nptel.ac.in/noc21_ma74/preview		

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

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0506T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students to:

- Illustrate the fundamental concepts of computer organization.
- Determine the Machine Instructions, develop programs.
- Develop Arithmetic Operations on Integers and Floating Point Numbers.
- Demonstrate types of memories, use of I/O devices.
- Illustrate concepts of Pipelining, Large Computer Systems.

Course Outcomes(CO):

On completion of this course, student will be able to

- Determine the basic concepts of Computer Organization.
- Interpret the Machine Instructions and basic Input / Output Operations.
- Demonstrate Arithmetic Operations on signed and unsigned numbers, design of Control Unit.
- Differentiate types of memories and distinguish I/O Devices.
- Illustrate the concepts of Pipelining.
- Illustrate the concepts of Large Computer Systems

Syllabus		Total Hours:48
Module-I	**Basic Structure of Computers**	**9Hrs**

Basic Structure of Computer: Computer Types, Functional Units, Basic operational Concepts, Bus Structure, Software, Performance, Multiprocessors and Multi computer.

Module-II	Machine Instructions and Programs	10Hrs

Machine Instructions and Programs: Numbers, Arithmetic Operations and Programs, Instructions and Instruction Sequencing, Addressing Modes, Basic Input/output Operations, Stacks and Queues, Subroutines.

Module-III	Computer Arithmetic and Micro Programmed Control Unit	10Hrs

Computer Arithmetic: Addition and Subtraction, Multiplication algorithms, Division algorithms, Floating point arithmetic operations.
Micro Programmed Control Unit: Control memory, address sequencing, design of control unit.

Module-IV	The Memory System and Input / Output Organization	10Hrs

The Memory System: RAM, ROM, Cache Memory, Virtual Memory, And Secondary Storage.
Input / Output Organization: Accessing I/O Devices, Interrupts, Direct Memory Access, Buses, Standard I/O Interfaces.

Module-V	Pipelining, Large Computer Systems	9Hrs

Pipelining: Basic Concepts, Data Hazards, and Instruction Hazards.
Large Computer Systems: Forms of Parallel Processing, The Structure of General-Purpose multiprocessors, Interconnection Networks.

Text Books:

1. Carl Hamacher, Zvonko Vranesic, SafwatZaky, “Computer Organization”, 5th Edition, McGraw Hill Education, 2013.
2. M.Morris Mano, RajibMall, ”Computer System Architecture”, Revised Third Edition, Pearson Education India.

Reference Books:

1. Themes and Variations, Alan Clements, “Computer Organization and Architecture”, CENGAGE Learning.
2. Smruti Ranjan Sarangi, “Computer Organization and Architecture”, McGraw Hill Education.

Web References:

1. https://archive.nptel.ac.in/courses/106/105/106105163/

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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

- Understand the Object-Oriented Programming Principles to develop java programs.
- Apply code reusability through inheritance, packages and interfaces.
- Inspect Exception Handling and multi-threading mechanisms in real time applications.
- Develop applications by using I/O streams for better performance.
- Construct GUI based applications using applets, AWT and swings for internet and system-based applications.
- Compare AWT and Swing classes for GUI based applications.

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 & Multi threading	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 sub classes.

Multi threading: The Java thread model, creating threads, Thread priorities, Synchronizing threads, Inter thread 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

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_cs47/preview

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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

- Differentiate various number systems and binary codes**.**
- Solve the Boolean Expressions using Boolean algebra and k-maps.
- Implement different combinational and Sequential circuits
- Explain the internal architecture and organization of the 8086 microprocessor.
- Demonstrate the assembly level language programming for 8086 and 8051.
- Describe the architecture, hardware details and memory organization of 8051 microcontroller.

Syllabus		Total Hours:48
Module-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.

Module-II	**Combinational Circuits**	**9Hrs**

Combinational Logic Circuits: Adders & Subtractors, magnitude Comparators, Multiplexers, De-multiplexers, Encoders, Decoders, Programmable Logic Devices..

Module-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

Module-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.

Module-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.

Reference Books:

1. Advanced microprocessors and peripherals-A.K Ray and K.M.Bhurchandani, TMH, 2nd edition, 2006.
2. Thomas L. Floyd, Digital Fundamentals – A Systems Approach, Pearson, 2013.
3. Charles H. Roth, Fundamentals of Logic Design, Cengage Learning, 5th, Edition, 2004.
4. D.V.Hall, Microprocessors and Interfacing. TMGH, 2nd edition, 2006.

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_ee55/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
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**	**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:

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

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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 differentday-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**

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**

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 hole 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 beused), 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 Defectiveness 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 andmanagers
b. At the level of society: as mutually enriching institutions and organizationsSum up.

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

Text Books:

1. 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
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values andProfessional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books:

1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 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. FSchumacher. "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)

Web References:

1. https://archive.nptel.ac.in/noc/courses/noc19/SEM1/noc19-ee24/

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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	1.5	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 multi threading.
- Design reliable programs using Java exception handling features.
- Extend the programming functionality supported by Java.
- Select appropriate programming constructs to solve a problem.
- Develop the programs in swings and mouse events.

Syllabus | **Total Hours:48**

List of Experiments

Experiment-1

a. 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.

b. Write a to Java program that prints all real solutions to the quadratic equation ax2+bx+c=0. Read in a, b, c and use the quadratic formula.

Experiment- 2

a. Write a Java program find the factorial of given number
b. Write a Java program to find whether given number is prime or not
c. 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.

Experiment-3

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

Experiment-4

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

Experiment-5

a. 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

Experiment-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.

Experiment-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

Experiment-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

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Experiment-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.

Experiment-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.

Experiment-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.

Experiment-12

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

Reference Books:

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

Web References:

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

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DIGITAL ELECTRONICS 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**

List of Experiments

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

DIGITAL ELECTRONICS:

Experiment-1

- Verification of Truth Table for AND, OR, NOT, NAND, NOR and EX-OR gates.

Experiment-2

- Realization of NOT, AND, OR, EX-OR gates with only NAND and only NOR gates.

Experiment-3

- Karnaugh map Reduction and Logic Circuit Implementation.

Experiment-4

- Verification of DeMorgan's Laws.

Experiment-5

- Implementation of Half-Adder and Half-Subtractor.
- Implementation of Full-Adder and Full-Subtractor.

Experiment-6

- Four Bit Binary Adder
- Four Bit Binary Subtractor using 1's and 2's Complement.

MICROPROCESSORS (8086 Assembly Language Programming)

Experiment-7

- 8 Bit Addition and Subtraction.
- 16 Bit Addition.

Experiment-8

- BCD Addition.
- BCD Subtraction.

Experiment-9

- 8 Bit Multiplication.
- 8 Bit Division.

Experiment-10

- 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.

Reference Books:

1. N. Senthil Kumar, M. Saravanan, S. Jeevanathan, Microprocessor and Microcontrollers, Oxford Publishers, 2010.
2. Advanced microprocessors and peripherals-A.K ray and K.M.Bhurchandani, TMH, 2nd edition, 2006.
3. Thomas L. Floyd, Digital Fundamentals – A Systems Approach, Pearson, 2013.
4. Charles H. Roth, Fundamentals of Logic Design, Cengage Learning, 5th, Edition, 2004.
5. D.V.Hall, Microprocessors and Interfacing. TMGH, 2nd edition, 2006.
6. Kenneth. J. Ayala, The 8051 microcontroller, 3rd edition, Cengage Learning, 2010

Web References:

1. https://www.vlab.co.in/

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SOFTWARE ENGINEERING LAB

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

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0510P	0:0:3:0	1.5	CIE: 30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students to:

- To learn and implement the fundamental concepts of Software Engineering.
- To explore functional and non-functional requirements through SRS.
- To practice the various design diagrams.
- To learn to implement various software testing strategies.

Course Outcomes(CO):

On completion of this course, student will be able to

- Familiarize with historical and modern software methodologies(L3)
- Apply the phases of software projects and practice the activities of each phase(L3)
- Determine SRS document(L3)
- Apply cohesion, coupling and metrics in project management(L3)
- Sketch UML diagrams for various applications(L3)
- Apply various test cases and determine quality attributes for a given problems(L 3)

Syllabus | **Total Hours:48**

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. Usecases

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.

Experiment-22

Define a complete call graph for any C/C++ code. (Note: The student may use any tool that generates call graph for source code)

Reference Books:

1. Software Engineering? A Practitioner‟ s Approach, Roger S. Pressman, 1996, MGH.
2. Software Engineering by Ian Sommerville, Pearson Edu, 5th edition, 1999
3. 3. An Integrated Approach to software engineering by Pankaj Jalote , 1991 Narosa

Web References:

1. http://vlabs.iitkgp.ac.in/se/

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Basic Web Design (SKILL)

(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

- Construct websites with valid HTML,CSS.
- Create responsive monitors.
- Develop websites using jQuery and bootstrap to provide interactivity and engaging user experiences
- Design and Develop JavaScript applications.
- Embed Google chart tools in a website for better visualization of data.
- 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.

Experiment-1

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.

Experiment-2

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

Module-3:

HTML(continued):HTML Tables

Experiment-3

Design HTML page to display Class Timetable

Module-4:
HTML Frames and Frameset.

Experiment-4 Design college website.

Module-5:
HTML Form Elements.

Experiment-5

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

Experiment-6

Apply CSS on student registration form.

Module - 7:
Bootstrap - CSS Framework: Layouts (Containers, Grid system), Forms, Other Components

Experiment-7

Style the student registration Form designed in Module-5still 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.

Experiment-8

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

Module-9:
JavaScript: Variables, Data Types, Operators.

Experiment-9

Design a simple JavaScript program to perform arithmetic operations.

Module-10:
JavaScript objects, conditions, loops and functions.

Experiment-10

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.

Experiment-11

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, Prentice Hall, 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.,―WebTechnology, PrenticeHall of India,2011.

Web References:

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-CSSFramework: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. GoogleCharts:https://developers.google.com/chart
9. Wordpress:https://wordpress.com

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ENVIRONMENTAL STUDIES

(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		**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

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

a. Grassland ecosystem. b. Desert ecosystem

Module-III	Biodiversity And Its Conservation	10Hrs

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

Definition, Cause, effects and control measures of :

Air pollution 2. Water pollution 3. Noise pollution

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

Module-V	Social Issues and The Environment	10Hrs

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 Pubilishers.

Reference Books:

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

Web References:

1. https://onlinecourses.nptel.ac.in/noc23_hs155/preview

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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**	**C**
1	BSC	22A0017T	Discrete Mathematical Structures	3	0	0	3
2	PCC	22A0512T	Database Management Systems	3	0	0	3
3	PCC	22A0513T	Operating Systems	3	0	0	3
4	PCC	22A0514T	Python Programming	3	0	0	3
5	HSC	22A0022T	Managerial Economics & Financial Analysis	3	0	0	3
6	PCC(LAB)	22A0515P	Database Management Systems Lab	0	0	3	1.5
7	PCC(LAB)	22A0516P	Operating Systems Lab	0	0	3	1.5
8	PCC(LAB)	22A0517P	Python Programming Lab	0	0	3	1.5
9	SC	22A0518	**Skill Oriented Course** Linux Programming	1	0	2	2
10	MC	22A0030T	**Mandatory Course** Constitution of India	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**

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.

Web Resources:

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

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DATABASE MANAGEMENT SYSTEMS
(Common to CSE, AI&ML, DS, CS)

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**

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

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

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

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

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, Corlos 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

Web References:

1. https://www.coursera.org/learn/database-management
2. https://www.coursera.org/learn/sql-data-science
3. https://www.w3schools.com/sql/
4. https://www.youtube.com/watch?v=fHAfc7Hjq28&list=PLWPirh4EWFpGrpcMfZ6UcdI786QdtSxV8
5. https://www.youtube.com/watch?v=HwmEcudlv44&list=PL4OCRJojkV1jN-Ed6RkQpWfBvqe0utRd6
6. http://www.w3schools.in/dbms/
7. https://www.geeksforgeeks.org/dbms/
8. https://www.javatpoint.com/dbms-tutorial
9. https://www.edureka.co/blog/dbms-tutorial/

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

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0513T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students to:

- Choose different Scheduling Algorithms.
- Solve Classic problems of synchronization.
- Apply various memory management techniques.
- Analyzing disk management functions and techniques.
- Implement files and directories.
- Analyze the Protection and Security mechanisms.

Course Outcomes (CO):

On completion of this course, student will be able to

- Illustrate the overall view of operating system structure. (L3)
- Analyze process scheduling algorithms and Synchronization methods. (L4)
- Solve Deadlock problems using various synchronization techniques. (L3)
- Apply memory management techniques in the design of operating systems (L3).
- Identify efficient file allocation methods for optimal disk utilization. (L3).
- Analyze Security and Protection Mechanism in Operating System (L4).

Syllabus		Total Hours:48
Module-I	**Operating Systems Overview and Structures**	**10 Hrs**

Introduction, Operating System Operations, Types of Operating Systems, functions of Operating Systems, Operating System Services, System Calls, System Programs, Operating System Structure.

Module-II	Process Management and Synchronization	10 Hrs

Process Management: Process Concepts, Process Scheduling, Operations on Processes, Inter-process Communication, Thread Models, Implementing Threads in User Space and the Kernel

Process Synchronization: Critical - Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization.

Module-III	Deadlocks and Memory Management	10 Hrs

Deadlocks: System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Deadlock Detection, Recovery from Deadlock.

Memory Management: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation, Virtual Memory Management, Page-Replacement Algorithms, Thrashing, Kernel memory allocation.

Module-IV	Mass – Storage Structure and File Systems	9Hrs

Mass – Storage Structure: Disk Structure, Disk Scheduling, RAID Structure.

File Systems: Files, Directory, File System Structure, File- System Implementation, Directory Implementation.

Module-V	System Protection, System Security	9 Hrs

System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights.

System Security: Introduction, Program threats, System and network threats.

Text Books:

1. Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2016.
2. Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (Topics: Distributed Systems)

Reference Books:

1. Tanenbaum A S, Woodhull A S, Operating Systems Design and Implementation, 3rd edition, PHI, 2006.
2. Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw Hill, 2012.
3. Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009.
4. Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004.

Web References:

1. https://nptel.ac.in/courses/106/106/106106144/
2. http://peterindia.net/OperatingSystems.html

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PYTHON PROGRAMMING

(Common to CSE, AI&ML)

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:

- 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	Strings, Lists, Tuples, and Dictionaries	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 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.

Web References:

1. https://nptel.ac.in/courses/106/106/106106145/
2. https://www.youtube.com/watch?v=MEPlLAjPvXY

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MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

(Common to All Branches)

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:

- To understand the concepts of managerial economics and financial analysis this helps in optimal decision making in business environment.
- To have a thorough knowledge on the production theories and cost while dealing with the production and factors of production.
- To have a thorough knowledge regarding market structure and forms of business organizations in the market.
- To understand the concept of capital and capital budgeting in selecting the proposals.
- 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.
- Assess the functional relationship between Production and factors of production and list out various costs associated with production
- Compute breakeven point to illustrate the various uses of breakeven analysis.
- Outline the different types of business organizations and provide a framework for analyzing money in its functions as a medium of exchange.
- Interpret various techniques for assessing the proposals of project for financial position of the business.
- Identify the principles of accounting to record, classify and summarize various transactions in books of accounts for preparation of final accounts.

Syllabus		Total Hours:48
Module-I	**INTRODUCTION TO MANAGERIAL ECONOMICS &DEMAND**	**9Hrs**

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 ANDFORMS OF BUSINESS ORGANIZTIONS	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**	**10Hrs**
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 Hl “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

Web References:

1. https://nptel.ac.in/courses/110101005
2. https://onlinecourses.nptel.ac.in/noc23_mg65/preview

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DATABASE MANAGEMENT SYSTEMS LAB
(Common to CSE, AI&ML, CS, DS)

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:

- Illustrate the different issues involved in the design and implementation of a databasesystem.
- Use data 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 modeling, 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**

Experiment 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.

Experiment 2:
Draw E-R diagram for library management system

Experiment 3:
Draw E-R diagram for university management system

Experiment 4:
Draw E-R diagram for hospital management system

Experiment 5:
Implement all DDL Commands

Experiment 6:
Implement all DML Commands

Experiment 7:
Implement all TCL and DCL Commands

Experiment 8:
a) Create relationship between the tables using Nested Queries
b) Implement different types of joins on tables

Experiment 9:
Implement set operations on tables

Experiment 10:
Create a table and apply various key constraints.

Experiment 11:
Views – Create a Virtual table based on the result set of an SQL statement.

Experiment 12:
a) Write a PL/SQL program to swap two numbers.
b) Write a PL/SQL program to find the largest of three numbers.

Experiment 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.

Experiment 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.

Experiment 15:
Write PL/SQL programs to implement procedures and functions.

Experiment 16:
Write a PL/SQL Program on cursors

Experiment 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 Books:

1. RamezElmasri, Shamkant, B. Navathe, "Database Systems", Pearson Education, 6th Edition, 2013.
2. Peter Rob, Carles Coronel, "Database System Concepts", Cengage Learning, 7th Edition, 2008.

Web References:

1. http://www.scoopworld.in
2. http://vlabs.iitb.ac.in/vlabs-dev/labs/dblab/index.php

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OPERATING SYSTEMS LAB
(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0516P	0:0:3:0	1.5	CIE: 30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students to:

Design and implement the concepts of operating systems such as

- CPU scheduling
- Process Management
- Memory Management
- File systems and deadlock handling using C language.

Course Outcomes (CO):

On completion of this course, student will be able to

- Analyze and simulate CPU Scheduling Algorithms.
- Solve process Synchronization problems using different algorithms.
- Apply algorithms to avoid deadlock problems.
- Implement memory management schemes and page replacement schemes.
- Analyze and simulate Disk Scheduling Algorithms.
- Simulate file allocation and organization techniques.

Syllabus | **Total Hours: 48**

Experiment 1:
Write a C program to simulate the following non-pre-emptive CPU scheduling algorithms to find turnaround time and waiting time.

a) FCFS b) SJF

Experiment 2:
Write a C program to simulate the following pre-emptive CPU scheduling algorithms to find turnaround time and waiting time.

a) Round Robin b) Priority

Experiment 3:
Write a C program to simulate producer-consumer problem using semaphores

Experiment 4:
Write a C program to simulate the concept of Dining-Philosophers problem

Experiment 5:
Write a C program to simulate Banker's algorithm for the purpose of deadlock avoidance.

Experiment 6:
Write a C program to simulate page replacement algorithms

a) FIFO b) LRU

Experiment 7:
Write a C program to simulate the following contiguous memory allocation techniques
a) Worst-fit b) Best-fit c) First-fit

Experiment 8:
Write a C program to simulate page replacement algorithms
a) Optimal b) LFU

Experiment 9:
Write a C program to simulate paging technique of memory management

Experiment 10:
Write a C program to simulate disk scheduling algorithms
a) FCFS b) SCAN

Experiment 11:
Write a C program to simulate the following file organization techniques
a) Single level directory b) Two level directory c) Hierarchical

Experiment 12:
Write a C program to simulate the following file allocation strategies.
a) Sequential b) Indexed

Reference Books:

1. "Operating System Concepts", Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Eighth Edition, John Wiley.
2. "Operating Systems: Internals and Design Principles", Stallings, Sixth Edition–2009, Pearson Education
3. "Modern Operating Systems", Andrew S Tanenbaum, Second Edition, PHI.
4. "Operating Systems", S. Haldar, A. A. Aravind, Pearson Education.
5. "Principles of Operating Systems", B. L. Stuart, Cengage learning, India Edition.2013-2014
6. "Operating Systems", A. S. Godbole, Second Edition, TMH.
7. "An Introduction to Operating Systems", P.C.P. Bhatt, PHI

Web References:

1. https://www.cse.iitb.ac.in/~mythili/os/
2. http://peterindia.net/OperatingSystems.html

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PYTHON PROGRAMMING LAB
(Common to CSE, AI&ML)

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**

Experiment 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

Experiment 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

Experiment 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

Experiment 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

Experiment 5:

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

Experiment 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

Experiment 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

Experiment 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
   d. Searching in the Strings

Experiment 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

Experiment 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

Reference Books:

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

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_cs26/preview
2. https://onlinecourses.swayam2.ac.in/cec22_cs20/preview

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LINUX PROGRAMMING (SKILL)

(Common to CSE, AIML, 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 shell scripting/programming.
- Understand system administration processes by providing a hands-on experience.

Course Outcomes (CO):

On completion of this course, student will be able to

- Understand the Basic commands and utilities in Linux Environment.
- Identify and use Linux utilities to create and manage simple file processing operations,
- organize directory structures with appropriate security.
- Analyze the Linux utilities and Linux environment.
- Use shell script to automate different tasks as Linux.
- Illustrate file processing operations such as standard I/O and formatted I/O.
- 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

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

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

Experiment 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.

Experiment 4:

Session-1

a) Log into the system
b) Use vi editor to create a file called myfile.txt which contains some text.
c) Correct typing errors during creation.
d) Save the file
e) logout of the system

Session-2

a) Log into the system
b) open the file created in session 1
c) Add some text
d) Change some text
e) Delete some text
f) Save the Changes
g) Logout of the system

Experiment 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.

Experiment 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.

Experiment 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.

Experiment 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 toit.

Experiment 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.

Experiment 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

Experiment 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.

Experiment12:

Simulate the following commands

a) Simulate cat command b) Simulate cp command

Experiment 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 Books:

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. Stephen G. Kochan, Patrick Wood, "Unix Shell Programming", Sams publications, 3rd Edition, 2007.
4. T. Chan, "Unix System Programming using C++", Prentice Hall India, 1999.

Web References:

1. https://nptel.ac.in/courses/117106113
2. https://archive.nptel.ac.in/courses/117/106/117106113/

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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 – Centre State 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**	**10Hrs**

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, Zilla Parishath - Block level Organizational Hierarchy - (Different departments) - Village level - Role of Elected and Appointed officials - Importance of grass root democracy

Module-V	Election Commission	9Hrs

Election Commission - Election Commission- Role of Chief Election Commissioner and Election Commissione rate - 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 Trust3. R RGaur,RAsthana,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 ConstitutionalLaw, Prentice – Hall of India Pvt. Ltd.. New Delhi
4. J.C. Johri, Indian Government and Politics Hans
5. M.V. Pylee, "Indian Constitution)

Web References:

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-5 (Theory-5, Lab-2, SC-1, MC-1)							
Sl. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**
				L	**T**	**P**	**C**
1	PCC	22A0541T	Theory of Computation	3	0	0	3
2	PCC	22A0520T	Computer Networks	3	0	0	3
3	PCC	22A0521T	Design and Analysis ofAlgorithms	3	0	0	3
4	PEC	22A0522Ta 22A0522Tb 22A0522Tc	**Professional Elective-I:** 1. Object Oriented Analysis and Design 2. Data warehousing and Mining 3. Cyber security	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)	22A0523P	Computer Networks Lab	0	0	3	1.5
7	PCC(Lab)	22A0524P	Design and Analysis of Algorithms Lab	0	0	3	1.5
8	SC	22A0525P	**Skill Advanced Course:** Full Stack Development	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**

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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THEORY OF COMPUTATION
(Common **to CSE, AI&ML, CS, DS**)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0541T	3: 0:0:0	3	CIE:30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students :

- Understand formal definitions of machine models
- To illustrate finite state machines to solve problems in computing
- Understanding of formal grammars
- To explain the hierarchy of problems arising in the computer sciences.
- Understanding of undecidable problems

Course Outcomes(CO):

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

- Understand the fundamental concepts of Formal Languages and Automata
- Apply the knowledge of Automata Theory, Grammars & Regular Expressions for solving various problems.
- Design of Context Free Grammar for formal language
- Construct push down automaton for the given language
- Make use of Turing machine concept to solve the simple problems
- Explain decidability or undecidability of various problems

Syllabus		Total Hours:48
Module-I	**Finite Automata**	**10Hrs**

Why Study Automata Theory? The Central Concepts of Automata Theory, Automation, Finite Automation, 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 Є-Transition, Minimization of Finite Automata, Mealy and Moore Machines, Applications and Limitation 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**

ContextFree 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	Pushdown Automata	9Hrs
Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description Language Acceptance of pushdown Automata, Design of Pushdown Automata, Deterministic and Non – Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context Free Grammars Conversion, Two Stack Pushdown Automata, Application of Pushdown Automata.		
Module-V	**Turing Machine**	**10Hrs**
Turing Machine, Definition, Model, Representation of Turing Machines-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Design of Turing Machines, Types of Turing Machines, Church's Thesis, Universal Turing Machine, Restricted Turing Machine, Decidable and Un-decidable Problems, Halting Problem of TMs, Post's Correspondence Problem, Modified PCP.		

Text Books:

1. Introduction to Automata Theory, Languages and Computation, J.E.Hopcroft, R.Motwani and J.D.Ullman, 3rd Edition, Pearson, 2008.

Reference Books:

1. Theory of Computer Science-Automata, Languages and Computation, K.L.P.Mishra and N.Chandrasekaran, 3rd Edition, PHI, 2007.
2. Introduction to Automata Theory, Formal Languages and Computation, Shyamalendu Kandar, Pearson, 2013.

Web References:

1. https://onlinecourses.nptel.ac.in/noc21_cs83/preview
2. https://nptel.ac.in/courses/106104028

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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	PCC

Course Objectives:

This course will enable students :

- 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
- Apply the reference model of a computer network
- Solve the error correction and detection in existing protocols
- Predict path for routing, and congestion control algorithms
- Determine the functionality of TCP and UDP
- Use the appropriate application layer applications

Syllabus		Total Hours:48
Module-I	**The Internet , Reference Models and Physical Layer**	**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	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.

Reference Books:

1. Forouzan, Datacommunications and Networking, 5th Edition, McGraw Hill Publication.
2. Youlu Zheng, Shakil Akthar, "Networks for Computer Scientists and Engineers", Oxford Publishers, 2016.
3. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", 6th edition, Pearson, 2019.

Web References:

1. https://archive.nptel.ac.in/courses/106/105/106105183/
2. https://www.coursera.org/learn/illinois-tech-computer-networking

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DESIGN AND ANALYSIS OFALGORITHMS
(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 demonstrate the importance of algorithms in computing.
- To explain the analysis of algorithms
- To illustrate the method of finding the complexity of algorithms
- To explain the advanced algorithm design and analysis techniques.
- To introduce special classes of algorithms NP – completeness and the classes P and NP

Course Outcomes(CO):

On completion of this course, student will be able to

- 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
- To apply Divide and Conquer method and Greedy Method to different problems and compute their time complexity
- To apply Dynamic Programming method to different problems
- To apply Backtracking method to different real-world problems
- To apply branch and bound to different problems
- To apply NP-hard and Np-Complete concepts for different problems

Syllabus		Total Hours:48
Module-I	**Introduction to Algorithm & 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 and Branch & Bound	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, Anany Levitin:, 2rd 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.

Web References:

1. https://onlinecourses.nptel.ac.in/noc19_cs47/preview
2. https://nptel.ac.in/courses/106106131

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OBJECT ORIENTED ANALYSIS AND DESIGN
(Common to CSE, AI&ML, DS, CS)

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
- Unified approach,& Understand 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.
- Identify the classes and vocabulary of the problem domain.
- Illustrate the importance of modeling and software development life cycle.
- Draw the class and object diagrams for various applications.
- Apply the basics of behavioral modeling to behavioral diagrams.
- Model the various components and deployment diagram for the applications.

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, the Evolution of Object Model, Foundation of Object Model, Elements of object Model, Applying object Model. .(Text Book 1)

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.(Text Book 1)

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. (Text Book 2)

Module-IV	**Structural Modeling**	**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. (Text Book 2)

Module-V	**Behavioral Modeling**	**10Hrs**

Basic Behavioral Modeling: 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 Book 2)

Text Books:

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

Reference Books:

1. "Object-oriented analysis and design using UML", Mahesh P. Matha, PHI
2. "Head first object-oriented analysis and design", Brett D. McLaughlin, Gary Pollice, Dave West, O'Reilly
3. "Object-oriented analysis and design with the Unified process", John W. Satzinger, Robert B. Jackson, Stephen D. Burd, Cengage Learning

Web References:

1. https://onlinecourses.nptel.ac.in/noc19_cs48/preview

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DATA WAREHOUSING & MINING					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
22A0522Tb	**3:0:0:0**	**3**	**CIE: 30 SEE:70**	**3 Hours**	**PCC**

Course Objectives:

This course will enable students to:

- To know the basic concepts and principles of Data Warehouse.
- Study the Data Mining and Major Issues in Data Mining.
- Learn pre-processing techniques and Data Transformation.
- 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.
- Determine the Data Warehouse Design and Data Warehouse Schemas.
- Use the Data Mining Technologies and Major Issues in Data Mining
- Apply pre-processing techniques for data cleaning.
- Apply the Frequent Patterns and Classification Methods for item sets.
- Determine the performance of the different Cluster algorithms.

Syllabus		**Total Hours:48**
Module-I	**Data Warehousing and Online Analytical Processing**	**10 Hrs**
Data Warehouse: Basic Concepts, Data Warehouse Modeling: Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Schemas for Decision Support, Data Warehouse Implementation.		
Module-II	**Introduction to Data Mining**	**10 Hrs**
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**	**10 Hrs**
Basic Concepts, Frequent Item set 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. Data Mining: concepts and techniques / Jiawei Han, Micheline Kamber, Jian Pei. – 3rd ed.

Reference Books:

1. Data Mining Techniques, Arun K Pujari, Second Edition, Universities Press.
2. Data Warehousing in the Real World, Sam Aanhory & Dennis Murray Pearson EdnAsia.
3. Insight into Data Mining, K. P. Soman, S. Diwakar, V. Ajay, PHI,2008.
4. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson Education.

Web References:

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

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0522Tc	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PEC

Course Objectives:

This course will enable students to:

- The Cyber security Course will provide the students with foundational Cyber Security principles, Security architecture, risk management, attacks, incidents, and emerging IT and IS technologies.
- Students will gain insight into the importance of Cyber Security and the integral role of Cyber Security professionals.
- Evaluate the trends and patterns that will determine the future state of cyber security.

Course Outcomes(CO):

On completion of this course, student will be able to

- Cyber Security architecture principles
- Identifying System and application security threats and vulnerabilities
- Identifying different classes of attacks
- Identify cybercrimes in wireless devices and Mobiles
- Cyber Security incidents to apply appropriate response
- Describing risk management processes and practices

Syllabus		Total Hours:48
Module-I	**Introduction to Cybercrime**	**9 Hrs**

Introduction to Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens

Module-II	Cyber Offenses	10 Hrs

How Criminals Plan Them –Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cyber Cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector Backdoors-Steganography-SQL Injection.

Module-III	Cybercrime Mobile and Wireless Devices	9 Hrs

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile.

Module-IV	Tools and Methods Used in Cybercrime	10Hrs

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, DoS and DDoS Attacks, Buffer Overflow, Attacks on Wireless Networks, Phishing and Identity Theft: Introduction, Phishing, Identity Theft (ID Theft).

Module-V	Cyber Crimes and security	10Hrs
Cyber Security –Organizational implications-cost of cybercrimes and IPR issues Web threats for organizations: the evils and Perils-Social media marketing Security and privacy Implications-Protecting people privacy in the organizations Forensic best practices for organizations. Cases.		

Text Books:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole, Sunit Belapure, Wiley.

Reference Books:

1. Information Security, Mark Rhodes, Ousley, MGH.
2. Principles of Information Security, Micheal E.Whitman and Herbert J.Mattord, Cengage Learning

Web References:

1. https://onlinecourses.swayam2.ac.in/nou19_cs08/preview
2. https://onlinecourses.nptel.ac.in/noc23_cs127/preview

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PRINCIPLES OF COMMUNICATION SYSTEMS
(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0430T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	OEC

Course Objectives:

This course will enable students to:

- To understand the concept of various modulation schemes and multiplexing.
- To apply the concept of various modulation schemes to solve engineering problems.
- To analyse various modulation schemes.
- To evaluate various modulation scheme in real time applications.

Course Outcomes(CO):

On completion of this course, student will be able to

- Understand the concept of various modulation schemes.
- Understand the concept of Different multiplexing techniques.
- Apply the concept of various modulation schemes to solve engineering problems.
- Analyse various modulation schemes.
- Evaluate various modulation schemes in real time applications.
- Understand the concept of various Communication systems.

Syllabus		Total Hours:48
Module-I	**Amplitude Modulation**	**10Hrs**

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. Theta notation (Θ), Mathematical analysis of Non-Recursive and recursive Algorithms with Examples.

Module-II	Frequency Modulation	9Hrs

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	10Hrs

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	9Hrs

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	NP-Complete and NP-Hard problems	10Hrs

Communication Systems: Satellite, RADAR, Optical, Micro wave communication, Mobile and Computer Communication (Block diagram approach only).

Text Books:

1. Herbert Taub, Donald L Schilling and Goutam Saha, “Principles of Communication Systems”, 3 rd Edition, Tata McGraw-Hill Publishing Company Ltd., 2008.

Reference Books:

1. B. P. Lathi, Zhi Ding and Hari M. Gupta, “Modern Digital and Analog Communication Systems”, 4th Edition, Oxford University Press, 2017.
2. K. Sam Shanmugam “Digital and Analog Communication Systems”, Wiley India Edition, 2008.

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_ee05/preview
2. https://archive.nptel.ac.in/courses/108/104/108104091/

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APPLICATIONS OF POWER ELECTRONICS TO POWER SYSTEMS
(Common to CSE, AI&ML, DS, CS)

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:

Student will be able to,

- To develop the understanding of uncompensated lines and their behavior under heavy loading conditions.
- To understand the concept and importance controllable parameters of FACTS controllers.
- To emphasize the objectives of Shunt compensation, and basic operation of SVC and STATCOM.

Course Outcomes(CO):

On completion of this course, student 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

Syllabus		Total Hours:48
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	08Hrs

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

Reference Books:

1. Y.H.Song, A.T.Johns, Flexible A.C.Transmission System, IEE, London, 1999Edition, Pearson, 2010

Web References:

1. https://onlinecourses.nptel.ac.in/noc24_ee130/preview

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BUILDING MATERIALS

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

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:

To identify the traditional materials that is used for building constructions.

- To explain basic concepts of building components such as stair case and masonry
- To know the causes of dampness in structures and its preventive measures
- To understand the building rules, building bye laws and acoustics of building

Course Outcomes(CO):

On completion of this course, student will be able to

- To understand the characteristics of different building materials
- Differentiate brick masonry, stone masonry construction and bonds used in construction of walls of buildings
- To know about the causes of dampness in buildings and its ill effects
- To understand the principles of planning in buildings
- Describe capable of understanding building rules and knowledge about, bye-laws and building elements.

Syllabus		Total Hours:48
Module-I	**MATERIALS**	**9Hrs**
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**	**9Hrs**
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**	**10Hrs**
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**	**10Hrs**
Elements of building planning- basic requirements-orientation-planning for energy efficiency-planning based on utility-other requirements		
Module-V	**BUILDING RULES AND BYE-LAWS**	**10Hrs**
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.		

Text Books:

1. Building Drawing by M.G. Shah, C.M. Kale and S.Y. Patki, Tata McGraw-Hill, New
2. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, ‚Building Construction' - Laxmi Publications (P) Ltd., New Delhi

Reference Books:

1. Building Materials, S. K. Duggal, New Age International Publications.
2. N. Kumaraswamy, A. Kameswara Rao, building planning and drawing, 7th Ed, Charotar

Web References:

1. http://nptel.ac.in/courses/105104103/
2. http://www.academicpub.org/jwrhe/
3. http://www.peo.on.ca/index.php/ci_id/21843/la_id/1

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

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0323Ta	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	OEC

Course Objectives:

This course will enable students :

- 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
- Explain the working of various parts like engine and brakes
- Describe the working of steering and the suspension systems.
- Summarize the wheels and tires
- Outline the future developments in the automobile industry

Syllabus		Total Hours:48
Module-I	**Introduction to vehicle structure and engine components**	**9Hrs**

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	9Hrs

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	10Hrs

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. Bosch, Automotive Hand Book, 6/e, SAE Publications, 2007.
2. K. Newton and W. Steeds, The motor vehicle, 13/e, Butterworth-Heinemann Publishing Ltd, 1989.
3. Joseph Heitner, Automotive Mechanics Principles and Practices, 2/e, CBS publishing 2004 .
4. David A. Corolla, Automotive Engineering: Powertrain, Chassis System and Vehicle Body, Butterworth-Heinemann Publishing Ltd, 2009.
5. Richard Stone, Jeffrey K. Ball, Automotive Engineering Fundamentals" SAE International, 2004

Web References:

1. https://archive.nptel.ac.in/courses/107/106/107106088/
2. https://nptel.ac.in/courses/107106088

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COMPUTER NETWORKS LAB
(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0523P	0:0:3:0	1.5	CIE: 30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students to:

- Understand the basic concepts of Computer Networks
- Understand the functionalities of various layers of OSI model
- Apply the data link layer framing mechanisms
- Apply the error detection mechanisms
- Implement the routing protocols.

Course Outcomes(CO):

On completion of this course, student will be able to

- Use the basic components of a Computer Networks
- Determine different hardware devices in computer networks
- Determine the data link layer framing mechanisms
- Use the error detection mechanisms
- Apply the shortest routing protocols to transmit data
- Determine spanning tree for a subnet

Syllabus | **Total Hours:48**

List of Experiments:

Experiment 1:
Explain the basic networking commands.

Experiment 2:
Explain about network devices such as repeaters, hub, switch, bridge, router and gateway.

Experiment 3:
Implement the data link layer framing method as character count

Experiment 4:
Implement the data link layer framing method as character stuffing

Experiment 5:
Implement the data link layer framing method as bit stuffing

Experiment 6:
Implement parity check method.

Experiment 7:
Implement on a data set of characters the CRC polynomials CRC 12

Experiment 8:
Implement Dijkstra's algorithm to compute the shortest path through a graph

Experiment 9:
Implement distance vector routing algorithm.

Experiment 10:
Implement leaky bucket algorithm.

Reference Books:

1. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 5th Edition, PEARSON.

Web References:

1. https://onlinecourses.swayam2.ac.in/cec19_cs07/preview
2. https://onlinecourses.nptel.ac.in/noc20_cs23/preview

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DESIGN AND ANALYSIS OF 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:

- Implement searching and sorting mechanisms.
- Design and implement efficient algorithms for a specified application.
- Strengthen the ability to identify and apply the suitable algorithm for the given real world problem

Course Outcomes(CO):

On completion of this course, student will be able to

- Apply binary search and implement them
- Apply sorting mechanisms
- Apply Divide and Conquer method to different problems and implement them
- Apply Greedy Method to different problems and compute their time complexity
- Apply Dynamic Programming method to different problems and implement them
- Apply Backtracking method to different real-world problems

Syllabus — **Total Hours:48**

List of Experiments

Experiment 1:
Implementation of binary search

Experiment 2:
Implement of quick sort

Experiment 3:
Implementation of Finding Maximum and minimum

Experiment 4:
Implementation of Optimal solution for a Knap Sack Problem using Greedy Method.

Experiment 5:
Implementation of minimum cost spanning tree using Prim‟s Algorithm.

Experiment 6:
Implementation of minimum cost spanning tree using Kruskal‟s Algorithm.

Experiment 7:
Implementation of All pairs shortest path problem using dynamic programming.

Experiment 8:
Implementation of Optimal solution for a 0/1 Knap Sack Problem using dynamic programming.

Experiment 9:
Implementation of sum of subsets problem using back tracking.

Experiment 10:
Implementation of n-queen's problem using back tracking.

Reference Books:

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

Web References:

1. https://onlinecourses.nptel.ac.in/noc19_cs47/preview
2. https://nptel.ac.in/courses/106106131

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FULL STACK DEVELOPMENT
(Common to CSE, AIML, CS, DS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0525P	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PEC

Course Objectives:

This course will enable students to:

- To Learn the core concepts of both the frontend and backend programming course
- To Get familiar with the latest web development technologies
- To Learn all about NoSQL databases
- To Learn complete web development process

Course Outcomes(CO):

On completion of this course, student will be able to

- Build a custom website with HTML, CSS, and little JavaScript.
- Demonstrate the usage of fundamental concepts to implement simple applications in ReactJS
- Practice on the real time application implementation using React JS.
- Implement real time applications practice using ReactJS , API's and calling NodeJS
- Demonstrate the usage of Mongo DB concepts to implement CRUD operations

Syllabus		Total Hours:48
Module-I	**Overview of HTML, CSS and JAVA SCRIPT**	**10Hrs**

HTML Common tags- List, Tables, images, forms, Frames; Cascading Style sheets;
Client-side Scripting: Introduction to JavaScript, JavaScript language – declaring variables, scope of variables, functions. event handlers (on click, on submit etc.), Document Object Model, Form validation

1. Build a responsive web application for shopping cart with registration, login, catalog and cart pages using CSS3 features
2. Make the above web application responsive web application java script on Click and on Submit
3. Use JavaScript for doing client – side validation of the pages implemented in experiment 1 and experiment 2

Module-II	Introduction to ReactJS	9Hrs

Introduction, ES6 Features, Advanced Javascript, React Native, React vs React Native, Styling & Layout, Original DOM vs Virtual DOM, Elements, Components, React Components with JSX, Refactor, App Setup (Resources), Component Architecture,

1. Installation of reactJs with resources setup in windows and Linux
2. Build a simple search filter functionality to display a filtered list based on the search query entered by the user
3. Create a simple React component that displays "Hello, World!" on a web page.
4. Create a react application for the student management system having registration

Module-III	ReactJS Components and Forms	10Hrs

Functional Components, State Management, Forms, Table, Events, Applying Filters, Redux Store, Reducer, Validations, Backend calls, Stateful/Stateless Components, Applying Styles, Local Storage, Routing /Parameters Routing/ Gaurds, Master Pages, Prop-Types, Lifecycle Methods, Component State Navigation (Resources)

1. Create a form in React that captures user input (e.g., name and email) and displays it below the form

2. Creating a simple counter using React which increments or decrements count dynamically on-screen as the user clicks on the button
3. Create a react application for the student management system having login, contact, about pages and implement routing to navigate through these pages and validate it.

Module-IV	ReactJS UI and API's	9Hrs

Browser-Router, Link, UI Setup, REST API , Store, Reducer, Actions, Redux Dev Tool, Integration of Maps, Calling Node API service calls, Material UI

1. Write a simple code to Integrate the Google Maps API into React Applications
2. Fetch data from a REST API (e.g., a list of users) and display it in a table using React
3. Create a service in react that fetches the weather information from open weathermap.org and the display the current and historical weather information using graphical representation using chart.js

Module-V	Introduction to Mango DB	10Hrs

Introduction to NoSQL Database, Introduction & Overview of MongoDB, MongoDB Installation CRUD Operation in MongoDB, Data Modeling, Storage Classes, Indexing and Performance Considerations, Aggregation,MongoDB Replication

1. Installation of MongoDB on Windows & Linux.
2. Implementation of mongo Shell, Create database and display the database.
3. Execute the Commands of MongoDB and operations in MongoDB: Insert, Query, Update, Delete and Projection.
4. Implementation of Where Clause, AND, OR operations in MongoDB.
5. Execute Aggregation Pipeline and its operations.

Text Books:

1. Vasan Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node, 2 nd Edition, A Press.

Reference Books:

1. Jon Duckett, Beginning HTML, XHTML, CSS, and JavaScript, Wrox Publications, 2010
2. Bryan Basham, Kathy Sierra and Bert Bates, Head First Servlets and JSP, O'Reilly Media, 2nd Edition, 2008.

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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	2	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.
- Explain the fundamentals of Design Thinking and innovation
- Apply the design thinking techniques for solving problems in various sectors.
- Analyse to work in a multidisciplinary environment
- Evaluate the value of creativity
- Formulate specific problem statements of real time issues

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. Change by design, Tim Brown, Harper Bollins (2009)
2. Design Thinking for Strategic Innovation, Idris Mootee, 2013, John Wiley & Sons

Reference Books:

1. Design Thinking in the Classroom by David Lee, Ulysses press
2. Design the Future, by Shrrutin N Shetty, Norton Press
3. Universal principles of design- William lidwell, kritinaholden, Jill butter.
4. The era of open innovation – chesbrough.H

Web References:

1. https://onlinecourses.swayam2.ac.in/aic23_ge17/preview
2. https://onlinecourses.nptel.ac.in/noc22_mg32/preview
3. https://onlinecourses.nptel.ac.in/noc20_de03/preview

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Semester-6 (Theory-5, Lab-3, SC-1 MC-1)							
Sl. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**
				L	**T**	**P**	**C**
1	PCC	22A0527T	Compiler Design	3	0	0	3
2	PCC	22A0528T	Machine Learning	3	0	0	3
3	PCC	22A0529T	Cloud Computing	3	0	0	3
4	PEC	22A0530Ta 22A0530Tb 22A0530Tc	**Professional Elective-II:** 1. Software Testing 2. Applied data science 3. Cryptography and Network Security	3	0	0	3
5	OEC	22A0431T 22A0215T 22A0150T 22A0329Tb	**Open Elective-II:** 1. Micro Controllers and Applications 2. Control Systems Engineering 3. Environmental Economics 4. Introduction to Composites	3	0	0	3
6	PCC(Lab)	22A0531P	Compiler Design Lab	0	0	3	1.5
7	PCC(Lab)	22A0532P	Machine Learning Lab	0	0	3	1.5
8	PCC(Lab)	22A0533P	Cloud Computing 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**

Category	Credits
Professional Core Courses (PCC)	13.5
Professional Elective Courses (PEC)	3
Open Elective Courses (OEC)	3
Skill Oriented Course (SC)	2
Industrial / Research Internship (Mandatory) 2 Months	-
Total	21.5

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COMPILER DESIGN

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

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0527T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students :

- To learn the various phases of compiler.
- To learn the various parsing techniques.
- To understand intermediate code generation and run-time environment.
- To learn the various optimization techniques
- To learn to implement code generator.

Course Outcomes(CO):

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

- Discuss the major phases of compilers and use the knowledge of the Lex tool
- Develop the parsers and experiment with the knowledge of different parsers design
- Describe intermediate code representations using syntax trees and DAG's as well as use this knowledge to generate intermediate code
- Classify various storage allocation strategies and explain various data structures used in symbol tables
- Summarize various optimization techniques and Implement these in dataflow analysis
- Examine the design issues of code generator and generate machine code from the source code of a language.

Syllabus		Total Hours:48
Module -I	**Introduction & Lexical Analysis**	**10Hrs**

Introduction: Language processors, The Structure of a Compiler, the science of building a complier **Lexical Analysis**: The Role of the lexical analyzer, Input buffering, Specification of tokens, Recognition of tokens, The lexical analyzer generator Lex, Design of a Lexical Analyzer generator. (Text Book 1)

Module -II	**Syntax Analysis**	**10Hrs**

Syntax Analysis: Introduction, Context Free Grammars, Writing a grammar, TOP Down Parsing, Bottom Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers, Using ambiguous grammars, Parser Generators. (Text Book 1)

Module -III	**Intermediate Code Generation**	**9Hrs**

Syntax Directed Translation: Syntax Directed Definitions, Evaluation orders for SDD's, Application of SDT, SDT schemes, Implementing L-attribute SDD's.

Intermediate Code Generation: Variants of syntax trees, three address code, Types and declarations, Translations of expressions, Type checking. (Text Book 1)

Module -IV	**Run Time Environment & Symbol Table**	**9Hrs**

Run Time Environment : storage organization, , Stack allocation of space, Access to non-local data

on stack , Heap management. (Text Book 1)

Symbol Table: Introduction, symbol table entries, operations on the symbol table, symbol table organizations, non block structured language, block structured language.(Text Book 2)

Module –V	**Code Optimization & Code Generation**	**10Hrs**

Code Optimization: Introduction, where and how to optimize, principle source of optimization, function preserving transformations, loop optimizations, global flow analysis, machine dependent optimization. (Text Book 1)

Code Generation: Issues in the design of a code generator, The Target language, Basic blocks and flow graphs, optimization of basic blocks, a simple code generator, register allocation and assignment, optimal code generation for expressions, dynamic programming code generation. (Text Book 1)

Text Books:

1. Compilers Principles, Techniques and Tools‖, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman., Pearson,2014.
2. Compiler Construction‖, K.V.N Sunitha, Pearson, 2013

Reference Books:

1. Compilers Principles and Practice‖, Parag H. Dave, Himanshu B. Dave, PEARSON.
2. Lex &Yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly .
3. Compiler Construction, Louden, Thomson.

Web References:

1. https://onlinecourses.nptel.ac.in/noc21_cs07/preview
2. https://nptel.ac.in/courses/106105190

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MACHINE LEARNING

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

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0528T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students to:

- Understand basic concepts of Machine Learning
- Study different learning algorithms
- Illustrate evaluation of learning algorithms

Course Outcomes(CO):

On completion of this course, student will be able to

- Interpret the basic concepts of Human Learning, Machine Learning, Building and Evaluating a Model, Classification, Regression and Clustering
- Building, training and evaluating a Model
- Apply different Classification algorithms to real world problems
- Apply different Regression techniques to real world problems
- Apply Partitioning Methods of Clustering to real world problems
- Apply Density-based methods of Clustering to real world Scenarios

Syllabus		Total Hours:48
Module-I	**Introduction – Human Learning & Machine Learning**	**10Hrs**

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	9Hrs

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	10Hrs

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	9Hrs

Clustering- Different types of clustering techniques, Partitioning Methods: K-Means Algorithm, K-Medoid's algorithm, Hierarchical Clustering Methods, Density based Clustering Methods- DBSCAN, DENCLUE, OPTICS

Text Books:

1. Machine Learning, SaikatDutt, Subramanian Chandramouli, Amit Kumar Das, Pearson, 2019.

Reference Books:

1. EthernAlpaydin, "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://onlinecourses.nptel.ac.in/noc20_cs29/preview
2. https://nptel.ac.in/courses/106106139

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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	PCC

Course Objectives:

This course will enable students to:

- To introduce the broad perceptive of cloud architecture and model
- To understand the concept of Virtualization and familiar with the lead players in cloud.
- To understand the features of cloud simulator and apply different cloud programming model
- To design of cloud Services and explore the trusted cloud Computing system

Course Outcomes(CO):

On completion of this course, student will be able to

- To Understand the basic concepts about cloud computing vision and its developments and gain the Knowledge of virtualization technology.
- Analyze the concepts of cloud services and the deployment models.
- Choose among various cloud technologies for implementing applications(GAE, Openstack,etc)
- Construct the virtual machines by using VMware simulator.
- Build scientific applications by using Cloud environment.
- Develop Business and Consumer Applications.

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. Mastering Cloud Computing by RajkumarBuyya, Christian Vecchiola, S.Thamarai Selvi from TMH 2013.

Reference Books:

1. Cloud computing for dummies- Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern Halper, Wiley Publishing, Inc, 2010.
2. Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011.
3. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2010.
4. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese, O 'Reilly, SPD, rp2011.
5. Essentials of Cloud Computing by K. Chandrasekaran. CRC Press. Cloud computing A Hands-On Approach by ArshdeepBahga and Vijay Madisetti.
6. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010.
7. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'Reilly

Web References:

1. https://onlinecourses.nptel.ac.in/noc21_cs14/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:

- To learn the criteria for test cases.
- To learn the design of test cases.
- To understand test management and test automation techniques.
- To apply test metrics and measurements

Course Outcomes(CO):

On completion of this course, student will be able to

- To interpret test cases suitable for a software development for different paths, domains and state graphs.
- Discover suitable tests to be carried out.
- Categorize Transaction flow testing and data flow testing.
- Illustrate Domain testing and Logic based testing.
- Solve path products and regular expressions.
- Connect state, state graphs and transition testing.

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. Boris Beizer,—Software Testing Techniques‖,DreamtechPress,2nd Edition,2003

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.
5. Srinivasan Desikan and Gopalaswamy Ramesh, —Software Testing – Principles and Practices, Pearson Education, 2006.

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_cs61/preview

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APPLIED DATA SCIENCE
(Common to CSE)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0530Tb	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PEC

Course Objectives:

This course will enable students to:

- Understand the skill sets and technologies required for data science.
- Gain knowledge of data science process and basic tools for Exploratory Data Analysis
- Learn various data science algorithms and its application domain.
- Understand and implement recommendation systems and social networks using fundamental mathematical and algorithmic ingredients.
- Understand the use of data visualization tool.

Course Outcomes(CO):

On completion of this course, student will be able to

- Apply statistical measures to fit a model to a data.
- Apply data science algorithms such as Linear Regression, k-Nearest Neighbors (k-NN), k-means, Naive Bayes to solve the given real-world problems.
- Apply Feature Selection algorithms such as Filters, Wrappers, Decision Trees, Random Forests to solve a given problem.
- Acquire real world data from different sources to build Recommendation Systems and social networks as well as represent knowledge using Visualization tools.

Syllabus		Total Hours:48
Module-I	**INTRODUCTION**	**10Hrs**

Introduction to Data Science, Data vs. Big Data, Statistical Inference - Populations and samples, Statistical modeling, probability distributions, fitting a model. Data Science Process, Exploratory Data Analysis, Basic tools - plots, graphs and summary statistics of EDA. Introduction to R Programming.

Module-II	BASIC MACHINE LEARNING ALGORITHMS	9Hrs

Basic Machine Learning Algorithms - Linear Regression - K-Nearest Neighbors (K-NN) - Kmeans, K-Medoids, Naive Bayes. Case Study: Real Direct (online real estate firm), Filtering Spam - Linear Regression and K-NN and Naive Bayes for Filtering Spam. Data Wrangling: APIs and other tools for scrapping the Web - Feature Generation and Feature Selection (Extracting Meaning from Data) - Motivating Application and Case Study: User (customer) retention - Feature Generation - Feature Selection algorithms – Filters; Wrappers; Decision Trees; Random Forests.

Module-III	RECOMMENDATION SYSTEMS	10Hrs

Recommendation Systems: Building a User-Facing Data Product - Algorithmic ingredients of a Recommendation Engine - Dimensionality Reduction - Singular Value Decomposition - Principal Component Analysis

Module-IV	MINING SOCIAL-NETWORK GRAPHS	9Hrs

Mining Social-Network Graphs - Social networks as graphs - Clustering of graphs - Direct discovery of communities in graphs - Partitioning of graphs - Neighborhood properties in graphs.

Module-V	DATA VISUALIZATION	10Hrs

Data Visualization - Basic principles, ideas and tools for data visualization – Case Study 1 on industry projects – Case Study 2: Create Complex visualization dataset - Data Science and Ethical Issues - Discussions on privacy, security, ethics - Next-generation data scientists.

Text Books:

1. Sinan Ozdemir, Sunil Kakade. Principles of Data Science - Second Edition Released December 2018 Publisher(s): Packt Publishing ISBN: 9781789804546.
2. Cathy O'Neil and Rachel Schutt Doing Data Science, Straight Talk from The Frontline. O'Reilly. 2014.

Reference Books:

1. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman Mining of Massive Datasets v2.1, Cambridge University Press 2014 (free online).
2. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. ISBN 0262018020. 2013.
3. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. ISBN 1449361323. 2013.
4. Trevor Hastie, Robert Tibshirani and Jerome Friedman Elements of Statistical Learning, Second Edition ISBN 0387952845 2009 (free online).
5. Avrim Blum, John Hopcroft and Ravindran Kannan Foundations of Data Science (Note: this is a book currently being written by the three authors. The authors have made the first draft of their notes for the book available online. The material is intended for a modern theoretical course in computer science.)
6. Mohammed J. Zaki and Wagner Miera Jr. Data Mining and Analysis: Fundamental Concepts and Algorithms. Cambridge University Press. 2014.
7. Jiawei Han, MichelineKamber and Jian Pei Data Mining: Concepts and Techniques, Third Edition. ISBN 0123814790 2011.

Web References:

1. https://onlinecourses.nptel.ac.in/noc21_cs69/preview

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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 agorithms.
- 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
- Compare and contrast symmetric and asymmetric encryption systems and their vulnerability to attack
- Implement the various key distribution, management and message authentication Schemes to send the messages with security
- Identify information system requirements for Transport level, wireless network, E-Mail and IP
- Design a network security system by implementing all the concepts of encryption and decryption algorithms
- Design a web security system by implementing all the concepts

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, DiffieHellman 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, Wiley India, "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://nptel.ac.in/courses/106105031
2. https://onlinecourses.swayam2.ac.in/cec22_cs15/preview
3. https://onlinecourses.nptel.ac.in/noc22_cs90/preview

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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
22A0431T	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, student will be able to

- Understand the importance of Microcontroller
- Acquire the knowledge of Architecture of 8051 Microcontroller.
- Apply and Interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to using 8051 I/O ports.
- Develop the 8051 Assembly level programs using 8051 instruction set.
- Design the Interrupt system
- Understand the operation of Timers/Counters and Serial port of 8051.

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:

1. https://nptel.ac.in/courses/117104072
2. https://onlinecourses.nptel.ac.in/noc22_ee12/preview

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CONTROL SYSTEMS ENGINEERING

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

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0215T	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

- Evaluate the effective transfer function of a system from (i) block diagram reduction techniques (ii) Mason's gain formula
- Compute the steady state errors and transient response characteristics
- Determine the absolute stability and relative stability of a system
- Design a compensator to accomplish desired performance
- Derive state space model of a given physical system and solve the state equation

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 it's Properties. System response through State Space models. The concepts of controllability and observability

Text Books:

1. Modern Control Engineering, Katsuhiko Ogata, PEARSON, 1st Impression 2015.
2. Control Systems Engineering, I. J. Nagrath and M. Gopal, New Age International Publishers, 5th edition, 2007, Reprint 2012.

Reference Books:

1. Automatic Control Systems, Farid Golnaraghi and Benjamin. C. Kuo, WILEY, 9th Edition, 2010.
2. Control Systems, Dhanesh N. Manik, 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:

1. https://archive.nptel.ac.in/courses/107/106/107106081/
2. 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:

- To impart knowledge on sustainable development and economics of energy
- To teach regarding environmental degradation and economic analysis of degradation
- To inculcate the knowledge of economics of pollution and their management
- To demonstrate the understanding of cost benefit analysis of environmental resources
- To make the students to understand principles of economics of biodiversity

Course Outcomes(CO):

On completion of this course, student will be able to

- The information on sustainable development and economics of energy
- The information regarding environmental degradation and economic analysis of degradation
- The identification of economics of pollution and their management
- The cost benefit analysis of environmental resources
- The principles of economics of biodiversity

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

Reference Books:

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

Web References:

1. https://nptel.ac.in/courses/109107171

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INTRODUCTION TO COMPOSITES

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

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0329Tb	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	OEC

Course Objectives:

This course will enable students to:

- To be familiar with classification and characteristics of composite material and their applications.
- To gain the knowledge about manufacturing methods of composites.
- To know the testing methods related to composite materials.

Course Outcomes(CO):

To provide knowledge on characteristics of composites

- To get knowledge on manufacturing and testing methods and mechanical behaviour of composites.
- To get the exposure of different materials.

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, (1998), Composite Materials, Springer-Verlag, New York 2. B.T. Astrom, (1997),
2. Manufacturing of Polymer Composites, Chapman & Hall
3. Composite materials by J.N.Reddy

Reference Books:

1. Stuart M Lee, J. Ian Gray, Miltz, (1989), Reference Book for Composites Technology,CRC press
2. Frank L Matthews and R D Rawlings, (2006), Composite Materials: Engineering and Science, Taylor and Francis.

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COMPILER DESIGN LAB
(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0531P	0: 0:3:0	1.5	CIE: 30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students :

- To introduce LEX and YACC tools
- To learn to develop algorithms to generate code for a target machine
- To implement LL and LR parsers

Course Outcomes(CO):

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

- Design and implement fundamental concepts of finite Automata
- Design and implement a lexical analyzer for given language
- Use LEX and YACC tools for developing a scanner and a parser
- Design and implement LL and LR parsers
- Design algorithms to perform code optimization in order to improve the performance of program
- Design and implement code generation for given expression

Syllabus | **Total Hours:48**

List of Experiments:

Experiment 1:
Write program to find ε – closure of all states of any given NFA with ε transition.

Experiment 2:
Write program to convert NFA with ε transition to NFA without ε transition.

Experiment 3:
Write program to convert NFA to DFA

Experiment 4:
Design and implement a lexical analyzer for given language using C and the lexical analyzer should ignore redundant spaces, tabs and new lines.

Experiment 5:
Implementation of Lexical Analyzer using Lex Tool

Experiment 6:
Program to recognize a valid arithmetic expression that uses operator +, – , * and /.

Experiment 7:
Implementation of Calculator using LEX and YACC

Experiment 8:
Write program to find Simulate First and Follow of any given grammar.

Experiment 9:
Construct a recursive descent parser for an expression.

Experiment 10:
Construct a Shift Reduce Parser for a given language.

Experiment 11:
Write a program to perform constant propagation.

Experiment 12:
Implement Intermediate code generation for simple expressions

Reference Books:

- Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, Pearson. Compiler Construction-Principles and Practice, Kenneth C Louden, Cengage Learning.
- Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press.
- The Theory and Practice of Compiler writing, J. P. Tremblay and P. G. Sorenson, TMH
- Writing compilers and interpreters, R. Mak, 3rd edition, Wiley student edition.

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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

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
- Appreciate the importance of visualization in the data analytics solution
- Derive insights using Machine learning algorithms

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 Neighbour 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.

Reference Book:

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

Web Reference:

1. **https://www.udemy.com/course/machinelearning/**

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CLOUD COMPUTING LAB

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

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0533P	0:0:3:0	1.5	CIE: 30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students to:

- To develop web applications in cloud
- To learn the design and development process involved in creating a cloud based application
- Understand transfer of file form one virtual machine to another
- To learn to implement and use parallel programming using Hadoop

Course Outcomes(CO):

On completion of this course, student will be able to

- Configure various virtualization tools such as Virtual Box, VMware workstation.
- Design and deploy a web application in a PaaS environment.
- Learn how to simulate a cloud environment to implement new schedulers.
- Install and use a generic cloud environment that can be used as a private cloud.
- Manipulate large data sets in a parallel environment.

Syllabus | **Total Hours:48**

List of Experiments

Experiment 1:
Install VirtualBox/VMware Workstation with different flavours of Linux or windows OS on top of windows operating systems.

Experiment 2:
Install a C compiler in the virtual machine created using virtual box and execute Simple Programs

Experiment 3:
Install Google App Engine. Create hello world app and other simple web applications using python/java.

Experiment 4:
Use GAE launcher to launch the web applications.

Experiment 5:
Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.

Experiment 6:
Find a procedure to transfer the files from one virtual machine to another virtual machine.

Experiment 7:
Find a procedure to launch virtual machine using try stack (Online Open stack Demo Version)

Experiment 8:
Install Hadoop single node cluster and run simple applications like word count

Reference:

1. Google Cloud Computing Foundations Course - Course (nptel.ac.in)

Web References:

1. https://www.vmware.com/products/workstation-pro/workstation-pro-evaluation.html
2. http://code.google.com/appengine/downloads.html
3. http://code.google.com/appengine/downloads.html

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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:

- To encourage all round development of the students by focusing on soft skills.
- To make the students aware of critical thinking and problem-solving skills.
- To develop leadership skills and organizational skills through group activities.
- To 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.
- Interpret people at the emotional level through emotional intelligence.
- Apply critical thinking skills in problem solving.
- Analyze the needs of an organization for team building.
- Judge the situation and take necessary decisions as a leader.
- Develop social and work-life skills as well as personal and emotional well-being.

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. Personality Development and Soft Skills (English, Paperback, MitraBarunK.)Publisher: Oxford University Press; Pap/Cdr edition (July 22, 2012)
2. Personality Development and Soft Skills: Preparing for Tomorrow, Dr Shikha Kapoor Publisher : I K International Publishing House; 0 edition (February 28, 2018)

Reference Books:

1. Soft skills: personality development for life success by Prashant Sharma, BPB publications 2018.
2. Soft Skills By Alex K. Published by S.Chand
3. Soft Skills: An Integrated Approach to Maximise Personality Gajendra Singh Chauhan, Sangeetha Sharma Published by Wiley.
4. Communication Skills and Soft Skills (Hardcover, A. Sharma) Publisher: Yking books
5. SOFT SKILLS for a BIG IMPACT (English, Paperback, RenuShorey) Publisher: 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-R9hDl7lU
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:

- To understand the basic concepts of research and research problem
- To make the students learn about various types of data collection and sampling
- Design to enable them to know the method of statistical evaluation
- To make the students understand various testing tools in research
- To make the student learn how to write a research report
- To create awareness on ethical issues n research

Course Outcomes(CO):

On completion of this course, student will be able to

- Understand basic concepts and its methodologies
- Understand the concept of sampling and sampling design
- Design survey questionnaires for different kinds of research
- Read. comprehend and explain research articles in their academic discipline
- Analyze various types of testing tools used in research
- Design a research paper without any ethical issues

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. A Step by Step Guide for Beginners, "Research Methodology": Ranjit Kumar, 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. 3. S C Gupta, "Fundamentals of Statistics", 7th edition Himalaya Publications

Web Reference:

1. https://onlinecourses.swayam2.ac.in/cec20_hs17/preview
2. 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**	**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	22A0534Ta 22A0534Tb 22A0534Tc	**Professional Elective-III:** 1. Software Project Management 2. Big Data Technologies 3. Internet of Things	3	0	0	3
3	PEC	22A0535Ta 22A0535Tb 22A0535Tc	**Professional Elective-IV:** 1. Agile Methodologies 2. Information Retrieval Systems 3. Adhoc and Wireless Sensor Networks	3	0	0	3
4	PEC	22A0536Ta 22A0536Tb 22A0536Tc	**Professional Elective-V:** 1. Design Patterns 2. Deep Learning 3. Block Chain Technology	3	0	0	3
5	OEC	22A0241T 22A0432T 22A0151T 22A0329Tc	**Open Elective-III:** 1. Smart Grid 2. Basic VLSI Design 3. Disaster management 4. Measurements and Mechatronics	3	0	0	3
6	OEC	22A0236T 22A0433T 22A0152T 22A0333Tb	**Open Elective-IV:** 1. Hybrid Electric Vehicles 2. Industrial Electronics 3. Construction Management 4. Introduction to Robotics	3	0	0	3
7	SC	22A0537P	**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**

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)

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:

- To provide fundamental knowledge on Management, Administration, Organization & its concepts.
- To make the students understand the role of management in Production
- To impart the concept of HRM in order to have an idea on Recruitment, Selection, Training & Development, job evaluation and Merit rating concepts.
- To create awareness on identify Strategic Management areas & the PERT/CPM for better Project Management.
- To make the students 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.(L3)
- 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 & PROJECTMANAGEMENT	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. RAryasri, "Management Science",TMH,2 013
2. Stoner, Freeman, 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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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
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ENTREPRENEURSHIP AND INNOVATION
(Common to CSE, AI&ML, DS, CS)

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:

- To make the student understand about Entrepreneurship
- To enable the student in knowing various sources of generating new ideas in setting up of New enterprise
- To facilitate the student in knowing various sources of finance in starting up of a business
- To impart knowledge about various government sources which provide financial assistance to entrepreneurs / women entrepreneurs
- To 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	**STARTING UP NEW VENTURE**	**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 FINANACE**	**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)

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:

- To make the student understand about the business environment.
- To enable the min knowing the importance of fiscal and monitory policy.
- To facilitate the min understanding the export policy of the country.
- Impart knowledge about the functioning and role of WTO.
- Encourage the student in knowing the structure of stock market..

Course Outcomes(CO):

On completion of this course, student will be able to

- Understand various types of business environment. (L2)
- Evaluate fiscal and monitory policy (L3)
- 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 environment alanalysis.

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:

- Understanding 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, student will be able to

- Describe the purpose of project management from the perspectives of planning, tracking and completion of project.
- Determine the conventional software Management and Software Economics.
- Use the improving software processes and modern software management.
- Use the software Life Cycle Phases and artifact sets.
- Determine the Iterative Process Planning and Process Automation.
- Apply the quality indicators and Core Metrics

Syllabus — **Total Hours:48**

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	9 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	09 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. Software Project Management, Walker Royce, Pearson Education..

Reference Books:

2. Applied Software Project Management, Andrew Stellman & Jennifer Greene, O"Reilly, 2006
3. Head First PMP, Jennifer Greene & Andrew Stellman, O"Reilly,2007
2. Software Engineering Project Managent, Richard H. Thayer & Edward Yourdon, second edition,Wiley India, 2004.
3. Agile Project Management, Jim Highsmith, Pearson education, 2004
4. The art of Project management, Scott Berkun, O"Reilly, 2005.
5. Software Project Management in Practice, Pankaj Jalote, Pearson Education, 2002.

E-resources:

1. https://onlinecourses.nptel.ac.in/noc19_cs70/preview
2. https://archive.nptel.ac.in/courses/106/105/106105218/

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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.
- Analyzing the Data with Hadoop
- Develop MapReduce application
- Illustrate the Anatomy of MapReduce and Hadoop environment Determine why existing technologies are inadequate to analyze the large data
- Apply large-scale analytic tools to solve some of the open big data problems.
- Analyze analytic tools

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 Map Reduce	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 ReduceJob 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.

Reference Books:

1. Big Data, Big Analytics: Emerging business intelligence and analytic trends for today's businesses, Michael Minnelli, Michelle Chambers, and Ambiga Dhiraj, 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.
6. Big Data Black Book, DT Editorial services ,Dreamtech Press

Web References:

1. https://onlinecourses.swayam2.ac.in/arp19_ap60/preview
2. https://onlinecourses.nptel.ac.in/noc20_cs92/preview

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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:

- Introduce the fundamental concepts of IoT and physical computing; Expose the student to a variety of embedded boards and IoT Platform, Create a basic understanding of the communication protocols in IoT communications. Familiarize the student with application program interfaces for IoT and Enable students to create simple IoT applications.

Course Outcomes (CO):

On completion of this course, student will be able to

- Understand the Basic sensors and actuators for an IoT application.
- Select protocols for a specific IoT application
- Utilize the cloud platform and APIs for IoT applications
- Experiment with embedded boards for creating IoT prototypes.
- Design a solution for a given IoT application
- Able to understand the application areas of IOT.

Syllabus		Total Hours:48
Module-I	**Overview of IoT**	**10Hrs**

The Internet of Things: An Overview, The Flavor of the Internet of Things, The Internet of Things, The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things?

Design Principles for Connected Devices: Calm and Ambient Technology, Privacy, Web Thinking for Connected Devices, Affordances.

Prototyping: Sketching, Familiarity, Costs Vs Ease of Prototyping, Prototypes and Production, Open source Vs Close source, Tapping into the community

Module-II	Embedded Devices	9Hrs

Electronics, Embedded Computing Basics, Arduino, Raspberry Pi, Mobile phones and tablets, Plug Computing: Always – on Internet of Things

Module-III	Communication in the IoT	9Hrs

Internet Communications: An Overview, IP Addresses, MAC Addresses, TCP and UDP Ports, Application Layer Protocols

Prototyping Online Components:

Getting Started with an API, Writing a New API, Real-Time Reactions, Other Protocols Protocol

Module-IV	Business Models	10Hrs

Business Models: A short history of business models, The business model canvas, Who is the business model for, Models, Funding an Internet of Things startup, Lean Startups.

Manufacturing: What are you producing, Designing kits, Designing printed circuit boards.

Module-V	Manufacturing Process	10Hrs

Manufacturing continued: Manufacturing printed circuit boards, Mass-producing the case and other fixtures, Certification, Costs, Scaling up software.

Ethics: Characterizing the Internet of Things, Privacy, Control, Environment, Solutions.

Text Books:

1. Adrian McEwen, Hakim Cassimally - Designing the Internet of Things, Wiley Publications, 2012

Reference Books:

1. Arshdeep Bahga, Vijay Madisetti – Internet of Things: A Hands – On Approach, Universities Press,2014.
2. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C.Raman, CRCPress.

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc22_cs53/preview
2. https://nptel.ac.in/courses/106105166
3. https://archive.nptel.ac.in/courses/106/105/106105166/

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AGILE METHODOLOGIES

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0535Ta	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PEC

Course Objectives:

This course will enable students to:

- to ensure that development teams complete projects on time and within budget.
- improve communication between the development team and the product owner. Additionally, Agile development methodology can help reduce the risks associated with complex projects

Course Outcomes (CO):

On completion of this course, student will be able to

- understand the practices and philosophies of agile methods.
- apply critical thinking in analyzing a software engineering method.
- understand and apply Scrum
- tailor an agile method to the needs of the project.

Syllabus		Total Hours:48
Module-I	**Fundamentals of Agile**	**10Hrs**

The Genesis of Agile - Introduction and background, Agile Manifesto and Principles Overview of Scrum, Extreme Programming, Feature Driven development, Lean Software Development, Agile project management, Design and development practices in Agile projects, Test Driven Development, Continuous Integration, Refactoring, Pair Programming, Simple Design, User Stories, Agile Testing Agile Tools.

Module-II	Agile Scrum Framework	9Hrs

Introduction to Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, User story definition, Characteristics and content of user stories, Acceptance tests and Verifying stories, Project velocity Burn down chart, Sprint planning and retrospective, Daily scrum, Scrum roles, Product Owner Scrum Master, Scrum Team, Scrum Case Study, Tools for Agile project management.

Module-III	Agile Testing	9Hrs

The Agile lifecycle and its impact on testing, Test-Driven Development (TDD), Unit framework and tools for TDD, Testing user stories acceptance tests and scenarios, Planning and managing testing cycle, Exploratory testing, Risk based testing, Regression tests, Test Automation-Tools to support the Agile tester

Module-IV	Agile Software Design and Development	10Hrs

Agile design practices, Role of design Principles including Single Responsibility Principle, Open Closed Principle, Liskov Substitution Principle, Interface Segregation Principles, Dependency Inversion Principle in Agile Design, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version

Module-V	Industry Trends	10Hrs
Market Scenario and adoption of Agile, Agile ALM, Roles in an Agile project, Agile applicability, Agile in Distributed teams, Business benefits, Challenges in Agile, Risks and Mitigation, Agile projects on cloud, Balancing Agility with Discipline, Agile rapid development technologies		
Text Books: **1.** Ken Schawber, Mike Beedle, "Agile Software Development with Scrum", International Edition, Pearson. **2.** Robert C. Martin, "Agile Software Development, Principles, Patterns and Practices", First International Edition, Prentice Hall.		
Reference Books: 1. Andrew stellman, Jennifer Green, Head first Agile, O'Reilly, 2017. 2. Rubin K, Essential Scrum : A practical guide to the most popular Agile process, Addison-Wesley, 2013.		

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INFORMATION RETRIEVAL SYSTEMS

(Common to CSE, AIML, CS, DS)

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:

- learn the important concepts and algorithms in IRS
- understand the data/file structures that are necessary to design, and implement information retrieval (IR) systems.

Course Outcomes(CO):

On completion of this course, student will be able to

- apply IR principles to locate relevant information large collections of data
- design different document clustering algorithms
- Implement retrieval systems for web search tasks.
- Design an Information Retrieval System for web search tasks.

Syllabus		Total Hours:48
Module-I	**INTRODUCTION TO INFORMATION RETRIEVAL SYSTEMS**	**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	CATALOGING AND INDEXING	9Hrs

Cataloging 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	10Hrs

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters.

Module-IV	USER SEARCH TECHNIQUES	9Hrs

User Search Techniques: 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	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.

Text Books:

1. Information Storage and Retrieval Systems – Theory and Implementation, Second Edition, Gerald J. Kowalski, Mark T. Maybury, Springer

Reference Books:

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
2. Information Storage & Retrieval By Robert Korfhage – John Wiley & Sons.
3. Modern Information Retrieval By Yates and Neto Pearson Education.

Web References:

1. https://ugcmoocs.inflibnet.ac.in/index.php/courses/view_ug/349

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ADHOC AND WIRELESS SENSOR METHODS

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:

- To Appreciate the importance of Adhoc and sensor networks for applications like environment monitoring, habitat monitoring, health care and data acquisition systems.
- Understanding of data transmission technologies of the Adhoc and sensor devices with focus on channel access routing and security.
- The objective of this course is to study the fundamentals of Adhoc and Sensor Networks useful in data acquisition and IoT systems

Course Outcomes (CO):

On completion of this course, student will be able to

- Appreciate the importance of Adhoc and sensor networks for applications like environment monitoring, habitat monitoring, health care and data acquisition systems.
- Understanding of data transmission technologies of the Adhoc and sensor devices with focus on channel access routing and security.
- Appreciate the need and importance of converged networks, ubiquitous environment and Internet of things' in the context of Adhoc and sensor networks.
- Capable of model building ,new protocol design and strategies simulation of the systems.
- To understand the issues pertaining to sensor networks and the challenges involved in managing a sensor network.

Syllabus		Total Hours:48
Module-I	**AD HOC NETWORKS –INTRODUCTION AND ROUTING PROTOCOLS**	**10Hrs**

Elements of Ad hoc Wireless Networks, Issues in Ad hoc wireless networks, Example commercial applications of Ad hoc networking, Ad hoc wireless Internet, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols, Table Driven Routing Protocols – Destination Sequenced Distance Vector (DSDV), On–Demand Routing protocols –Ad hoc On–Demand Distance Vector Routing (AODV).

Module-II	**SENSOR NETWORKS – INTRODUCTION & ARCHITECTURES**	**9Hrs**

Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks, WSN application examples, Single-Node Architecture – Hardware Components, Energy Consumption of Sensor Nodes, Network Architecture – Sensor Network Scenarios, Transceiver Design Considerations, Optimization Goals and Figures of Merit.

Module-III	WSN NETWORKING CONCEPTS AND PROTOCOLS	9Hrs
MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts – S-MAC, The Mediation Device Protocol, Contention based protocols – PAMAS, Schedule based protocols – LEACH, IEEE 802.15.4 MAC protocol, Routing Protocols- Energy Efficient Routing, Challenges and Issues in Transport layer protocol.		
Module-IV	**SENSOR NETWORK SECURITY**	**10Hrs**
Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Layer wise attacks in wireless sensor networks, possible solutions for jamming, tampering, black hole attack, flooding attack. Key Distribution and Management, Secure Routing – SPINS, reliability requirements in sensor networks.		
Module-V	**SENSOR NETWORK PLATFORMS AND TOOLS**	**10Hrs**
Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms – TinyOS, nesC, CONTIKIOS, Node-level Simulators – NS2 and its extension to sensor networks, COOJA, TOSSIM, Programming beyond individual nodes – State centric programming.		

Text Books:

1. "Ad Hoc Wireless Networks: Architectures and Protocols" by MURTHY.

Reference Books:

1."AD HOC Wireless Networks: A Communication-Theoretic Perspective" by Ozan K Tonguz, Gianluigi Ferrari

Web References:

https://archive.nptel.ac.in/courses/106/105/106105160/

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

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0536Ta	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PEC

Course Objectives:

This course will enable students to:

- To understand design patterns and their underlying object oriented concepts.
- To understand implementation of design patterns and providing solutions to real world software design problems.
- To understand patterns with each other and understanding the consequences of combining patterns on the overall quality of a system.

Course Outcomes(CO):

On completion of this course, student will be able to

- Know the underlying object oriented principles of design patterns.
- Understand the creational patterns
- Understand the structural patterns
- Understand the behavioral patterns
- Understand the context in which the pattern can be applied.
- Understand how the application of a pattern affects the system quality and its tradeoffs.

Syllabus		Total Hours:48
Module-I	**Introduction to Design Patterns**	**10Hrs**

Design Pattern Definition, Design Patterns in Small Talk MVC, Describing Design Patterns, Catalog of Design Patterns, Organizing the Catalog, Solving of Design Problems using Design Patterns, Selection of a Design Pattern, Use of Design Patterns.

Module-II	Designing A Document Editor	9Hrs

Design problems, Document structure, Formatting, Embellishing the User Interface, Supporting Multiple Look and Feel standards, Supporting Multiple Window Systems, User Operations, Spelling Checking and Hyphenation.

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

Module-III	Structural Patterns	10Hrs

Structural Patterns-1: Adapter, Bridge, Composite.

Structural Patterns-2: Decorator, Facade, Flyweight, Proxy, Discuss of Structural Patterns

Module-IV	Behavioral Patterns	9Hrs

Behavioral Patterns-1: Chain of Responsibility, Command, Interpreter, Iterator.

Behavioral Patterns-2: Mediator, Memento, Observer.

Module-V	Behavioral Patterns	10Hrs

Behavioral Patterns-2(cont'd): State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns. What to Expect from Design Patterns.

Text Books:

1. Design Patterns By Erich Gamma, Pearson Education

Reference Books:

1. Pattern's in JAVA Vol-I By Mark Grand, Wiley DreamTech.
2. Pattern's in JAVA Vol-II By Mark Grand, Wiley DreamTech.
3. JAVA Enterprise Design Patterns Vol-III By Mark Grand, Wiley DreamTech.
4. Head First Design Patterns By Eric Freeman-Oreilly-spd
5. Design Patterns Explained By Alan Shalloway,Pearson Education.
6. Pattern Oriented Software Architecture, F.Buschmann&others, John Wiley & Sons

Web References:

1. https://nptel.ac.in/courses/106105224

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

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0536Tb	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PEC

Course Objectives:

This course will enable students to:

- Demonstrate the major technology trends driving Deep Learning
- Build, train, and apply fully connected deep neural networks
- Implement efficient neural networks
- Analyse the key parameters and hyper parameters in a neural network's architecture

Course Outcomes(CO):

On completion of this course, student will be able to

- Apply Mathematical Operations on Neural Network.
- Choose proper Hyperparameters.
- Examine architecture of Deep Neural Network.
- Apply Convolutional Neural Networks in Image Classifications.
- Use RNN and LSTMs in Real time applications.
- Analyze different types of Auto encoders.

Syllabus		Total Hours:48
Module-I	**Linear Algebra**	**10Hrs**

Scalars, Vectors, Matrices and Tensors, Matrix operations, types of matrices, Norms, Eigen decomposition, Singular Value Decomposition, Principal Components Analysis.

Information Theory. Numerical Computation: Overflow and Underflow, Gradient-Based Optimization, Constrained Optimization, Linear Least Squares.

Module-II	Fundamentals of Neural Networks and Deep Learning	9Hrs

Neural Networks, Training Neural Networks, Activation Functions, Loss Functions, Hyper parameters, Building blocks of Deep Neural Networks.

Module-III	Convolutional Networks	10Hrs

The Convolution Operation, Pooling, Convolution, Basic Convolution Functions, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, Basis for Convolutional Networks..

Module-IV	Recurrent and Recursive Neural Networks	9Hrs

Recurrent Neural Network: Modelling Time Dimension, 3D Volumetric Input, General Recursive Neural Network Architecture, LSTM Networks, Applications.

Recursive Neural Network: Architecture, Varieties of RNN, Applications of RNN.

Module-V	Auto Encoders	10Hrs

Undercomplete Autoencoders, Regularized Autoencoders, Representational Power, Layer Size and Depth, Stochastic Encoders and Decoders, Denoising Autoencoders..

Text Book:

1. Ian Goodfellow, YoshuaBengio, Aaron Courville, “Deep Learning”, MIT Press,2016.
2. Josh Patterson and Adam Gibson, “Deep learning: A practitioner's approach”, O'Reilly Media, First Edition, 2017

Reference Books:

1. Fundamentals of Deep Learning, Designing next-generation machine intelligence algorithms, Nikhil Buduma, O’Reilly, Shroff Publishers, 2019.
2. Deep learning Cook Book, Practical recipes to get started Quickly, DouweOsinga, O’Reilly, Shroff Publishers, 2019.

Web References:

1. https://keras.io/datasets/
2. http://deeplearning.net/tutorial/deeplearning.pdf
3. https://www.deeplearningbook.org
4. https://nptel.ac.in/courses/106105215

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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.
- Describe the primitives of the distributed computing and cryptography related to block chain.
- Illustrate the concepts of Bit coin and their usage.
- Implement Ethereum block chain contract.
- Apply security features in block chain technologies.
- Use smart contract in real world applications.

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

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0241T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OEC

Course Objectives:

Student will be able to

- 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, student will be able to

- Understand the concepts and design of Smart grid.
- Understand the various communication technologies in smart grid.
- Understand the various measurement technologies in smart grid.
- Understand the analysis and stability of smart grid.
- Learn the renewable energy resources and storages integrated with smart grid.
- familiarize the high performance computing for Smart Grid applications

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, HighEfficiency 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. Smart Grid, JanakaEkanayake, Liyanage, Wu, Akihiko Yokoyama, Jenkins, Wiley Publications, 2012, Reprint 2015.
2. Smart Grid: Fundamentals of Design and Analysis, James Momoh, Wiley, IEEE Press., 2012, Reprint 2016.

Reference Books:

1. The Smart Grid – Enabling Energy efficiency and demand response, Clark W. Gellings, P.E., CRC Press, Taylor & Francis group, First Indian Reprint. 2015.
2. Smart Grid – Applications, Communications, and Security Edited by Lars Torsten Berger, Krzysztof Iniewski, WILEY, 2012, Reprint 2015.
3. Practical Electrical Network Automation and Communication Systems, Cobus Strauss, ELSVIER, 2003

Web References:

1. 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	3	CIE:30 SEE:70	3 Hours	OEC

Course Objectives:

- To give exposure to different steps involved in fabrication Process of PMOS & NMOS transistors, CMOS & BICOM Inverters.
- To provide knowledge on electrical properties of MOS & BICMOS devices to analyze the behaviour of inverters designed with various loads.
- To provide knowledge on Basic Circuit Concepts of VLSI Design
- To apply the design Rules and draw layout of a given logic circuit and basic circuit concepts to MOS circuits.
- To 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.
- Understand the concept of Basic Electrical Properties of MOS/Bi-CMOS Devices
- Apply the basic circuit concepts to MOS circuits.
- Understand the concept of Scaling of MOS circuits and Limitations of Scaling
- Apply the design Rules to draw the Stick diagram &layout of a given logic circuit.
- Interpret the need for testability and testing methods in VLSI.

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 Rs 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.

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1. https://nptel.ac.in/courses/117106092
2. 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:

- 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

- To know about the natural hazards and its management
- To know about the fire hazards and solid waste management
- To understand about the emerging infectious diseases and aids their management
- To know about the regulations of building codes and land use planning related to risk and vulnerability.
- To impart the education related to risk reduction in schools and communities

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 terrotirism - 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 MANAGEMENTS	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.

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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
22A0329Tc	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OEC

Course Objectives:

- To instruct the principles of interchangeable manufacture.
- To introduce basic principles of mechanical measurements.
- To 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.
- apply the basic principles of mechanical measurements for engineering practice.
- illustrate the role of mechatronics systems in manufacturing.
- explain principles of mechanical, hydraulic, pneumatic and electrical actuating systems.

Syllabus		Total Hours: 48
Module - I	**Limtis & 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**	**10 Hrs**

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**	**10 Hrs**

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:	8 Hrs
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.		
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HYBRID ELECTRIC VEHICLES
(Common to CSE, AI&ML, CS, DS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0236T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OEC

Course Objectives:

- 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
- Apply a suitable drive scheme for developing an hybrid and electric vehicles depending on resources
- Develop the electric propulsion unit and its control for application of electric vehicles.
- Understand the proper energy storage systems for vehicle applications
- Design and develop basic schemes of electric vehicles and hybrid electric vehicles

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**	**10 Hrs**

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**	**9 Hrs**

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**	**10 Hrs**

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, Avesta Goodarzi, "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.

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INDUSTRIAL ELECTRONICS
(Common to EEE,CSE, AI&ML, 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.
- Apply the Ultrasonic waves with different applications.
- Understand the working of Transistor and its different configurations.
- Analyze the thermal effects of ultrasonic, soldering and welding by ultrasonic, ultrasonic Drying in the industry; interpret the characteristics of AC to DC converters.
- Develop the practical applications Electronics in industries.
- Apply the process of Resistance welding, Induction heating and Dielectric heating in the industry.

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. Fundamentals of Industrial Electronics, Bogdan M Wilamowski, J David irwin, 2nd Edition, 2011.
2. Industrial and Power Electronics – G. K. Mithal and Maneesha Gupta, Khanna Publishers, 19th Ed., 2003.

References:

1. Integrated Electronics – J. Millman and C.C Halkias, McGraw Hill, 1972.
2. Electronic Devices and circuits – Theodore. H. Bogart, Pearson Education, 6thEdn., 2003.
3. Integrated Circuits and Semiconductor Devices – Deboo and Burroughs, ISE

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CONSTRUCTION MANAGEMENT
(Common to 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:

- To make the student familiar with various construction activities, preparing construction schedule and maintaining documents and records of those activities
- To teach the students about various terms and technologies involved in earthwork of construction activities
- To make the students familiar with concepts involved in project management like bar charts and milestone charts
- To teach the students 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
- Understand the concepts and techniques involved in earthwork activities
- To understand about the emerging infectious diseases and aids their management
- Understand the steps involved in developing a project scheduling and management and the application of bar charts and milestone charts.
- Understand the various elements of a network diagram like event, activity and dummy.
- Understand the concepts of calculation of time estimates of CPM and PERT

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. Construction project management by Jha ,Pearsonpublications, New Delhi 2nd Edition 2015
2. Construction Technology by SubirK.Sarkar and SubhajitSaraswati – Oxford Higher EducationUniv.Press, Delhi 2008 edition

Reference Books:

1. Project Planning and Control with PERT and CPM by Dr.B.C.Punmia, K.K.Khandelwal, Lakshmi Publications New Delhi 2022 editionDelhi
2. Optimal design of water distribution networks P.R.Bhave, Narosa Publishing house 2003.
3. Total Project management, the Indian context- by : P.K.JOY- Mac Millan Publishers India Limited.

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INTRODUCTION TO ROBOTICS
(Common to EEE,CSE, AI&ML, CS, DS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0333Tb	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	OEC

Course Objectives:

The objectives of this course are 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 students will able to

- List and explain the basic elements of industrial robots
- Analyze robot kinematics and its control methods.
- Classify the various sensors used in robots for better performance.
- Summarize various industrial and non-industrial applications of robots

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

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MOBILE APPLICATION DEVELOPMENT (SKILL)
(common to CSE, AIML, CS, DS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0537P	1:0:2:0	2	CIE: 30 SEE:70	3 Hours	SC

Course Objectives:

This course will enable students :

- To understand fundamentals of android operating systems.
- Illustrate the various components, layouts and views in creating android applications
- To understand fundamentals of android programming

Course Outcomes(CO):

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

- Define Android OS, gradle, Android Studio.
- Construct mobile application on physical device and emulator
- Develop mobile applications with various widgets
- Design mobile applications with various layouts
- Build mobile application along with Media
- Design and develop menus in mobile applications

Syllabus | **Total Hours:48**

Module 1:

Introduction to Android: Introduction**,** Understanding the Android Software Stack, installing the Android, Creating Android Virtual Devices, Creating the First Android Project, Using the Android Emulator, The Android Debug Bridge(ADB), Launching Android Applications on a Handset

Experiment 1:

Set Up Mobile Development Environment using Android

Experiment 2:

Create "Hello World" Application

1. Create a new Android Project
2. Run "Hello World" on the Emulator
3. On a Physical Device

Module 2:

Basic Widgets :Overview of the Android Project Files, Understanding Activities, Role of the Android Manifest File, Event Handling, Displaying Messages Through Toast, Using the Edit Text Control, Choosing Options with Checkbox, Choosing Mutually Exclusive Items Using Radio Buttons

Experiment 3:

Create an application using Text Edit control

Experiment 4:

Create an application by choosing Options with Checkbox

Experiment 5:

Create an application by choosing Mutually Exclusive Items Using Radio Buttons

Module 3:
Layouts: Introduction to Layouts, Linear Layout, Relative Layout, Using Image View, Frame Layout, Table Layout

Experiment 6:
Design an application using Relative Layout
Experiment 7:
Design an application using Frame Layout

Module 4:
Selection widgets: Using List View, Using the Spinner control
Experiment 8:
Create an application by choosing Options with List View
Experiment 9:
Create an application by choosing Options with Spinner

Module 5:
Utilizing Media: Switching States with Toggle Buttons, Creating an Images Switcher Application, Playing Audio, Playing Video
Experiment 10:
Create an application to play an Audio clip
Experiment 11:
Create an application to play the Video clip

Module 6:
Building Menus : Creating Interface Menus, Types of menus, Creating Menus Through XML
Experiment 12:
Create an application to display a Menu

Text Books:

1. Android Programming by B.M Harwani, Pearson Education, 2013.

Reference Books:

1. Professional Android 4 applications development, Reto Meier, Wiley India, 2012.
2. Beginning Android 4 applications development, Wei- Meng Lee, Wiley India,2013

Web References:

1. https://archive.nptel.ac.in/courses/106/106/106106156/

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Semester-8 (Project)							
Sl. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**
				L	**T**	**P**	**C**
1	Major Project	22A0538	Project Work	0	0	24	12
						Total credits	12