CURRICULUM AND SYLLABUS

FOR

B.E. DEGREE (COMPUTER SCIENCE & ENGINEERING) PROGRAMME

REGULATIONS 2020

CHOICE BASED CREDIT SYSTEM

FOR THE STUDENTS ADMITTED FROM THE

ACADEMIC YEAR 2020-2021 ONWARDS

Sri Ramakrishna Institute of Technology
(An Autonomous Institution)
Pachapalayam, Perur Chettipalayam, Coimbatore – 641 010
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CURRICULUM STRUCTURE

SEMESTER – I

S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	20HSG01	Technical English – I	HS	2	0	2	4	3
2	20MHG01	Calculus and Linear Algebra	BS	3	1	0	4	4
3	20CHG01	Engineering Chemistry	BS	3	1	0	4	4
4	20ITG01	Programming for problem solving using C	ES	3	0	0	3	3
5	20EEG01	Basic Electrical and Electronics Engineering	ES	3	0	0	3	3
PRACTICALS								
6	20MEG01	Engineering Graphics	ES	0	0	4	4	2
7	20CHG02	Engineering Chemistry Laboratory	BS	0	0	3	3	1.5
8	20ITG02	Programming in C Laboratory	ES	0	0	4	4	2
			Total	**14**	**2**	**13**	**29**	**22.5**

SEMESTER – II

S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	20HSG02	Universal Human Values – II : Understanding Harmony	HS	3	0	0	3	3
2	20MHG02	Differential Equations and Complex Variables	BS	3	1	0	4	4

3	20PHG01	Engineering Physics	BS	3	1	0	4	4
4	20CSG01	Object Oriented Programming using C++	ES	3	0	0	3	3
5	20HMG02	Professional Ethics	HM	3	0	0	3	3
6	20AC001	Environmental Science and Engineering	AC	3	0	0	3	0
PRACTICALS								
7	20MEG02	Engineering Workshop	ES	0	0	4	4	2
8	20PHG02	Engineering Physics Laboratory	BS	0	0	3	3	1.5
9	20CSG02	Programming in C++ Laboratory	ES	0	0	4	4	2
			Total	**18**	**2**	**11**	**31**	**22.5**

SEMESTER – III

S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	20MHG06	Probability and Statistics (C)	BS	3	1	0	4	4
2	20ECG02	Digital Principles and System Design (C)	ES	3	0	0	3	3
3	20CS001	Computer Organization and Architecture (C)	PC	3	0	0	3	3
4	20CS002	Data Structure	PC	3	0	0	3	3
5	20IT002	Java Programming (C)	PC	3	0	0	3	3
6	20HSG03	Heritage of Tamils	HS	1	0	0	1	1
7		Open Elective I	OE	3	0	0	3	3
PRACTICALS								
8	20CS003	Data Structures Laboratory	PC	0	0	4	4	2
9	20IT004	Java Programming Laboratory (C)	PC	0	0	3	3	1.5
			Total	**18**	**1**	**7**	**26**	**23.5**

SEMESTER – IV

S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	20MHG04	Discrete Mathematics	BS	3	1	0	4	4
2	20IT007	Database Management System (C)	PC	3	0	0	3	3
3	20IT008	Operating Systems (C)	PC	3	0	0	3	3
4	20CS004	Software Engineering (C)	PC	3	0	0	3	3
5	20CS005	Analysis of Algorithms	PC	3	0	0	3	3
6		Open Elective II	OE	3	0	0	3	3
7	20AC002	Constitution of India	AC	3	0	0	3	0
8	20HSG04	Tamils and Technology	HS	1	0	0	1	1
PRACTICALS								
9	20IT009	Database Management System Laboratory (C)	PC	0	0	3	3	1.5
10	20IT010	Operating Systems Laboratory (C)	PC	0	0	3	3	1.5
			Total	**21**	**1**	**6**	**28**	**23**

SEMESTER – V

S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	20CS006	Theory of Computation	PC	3	1	0	4	4
2	20CS007	Object Oriented Analysis and Design (C)	PC	3	0	0	3	3
3	20CS008	Design of Computer Networks	PC	3	0	0	3	3
4	20CS009	Artificial Intelligence	PC	3	1	0	4	4
5		Professional Elective I	PE	3	0	0	3	3
6		Open Elective III	OE	3	0	0	3	3
PRACTICALS								
7	20CS010	Networks Laboratory	PC	0	0	4	4	2
8	20CS011	CASE Tools Laboratory (C)	PC	0	0	3	3	1.5
			Total	**18**	**2**	**7**	**27**	**23.5**

*(C) – Common with B.E.(CSE) & B.TECH (IT) Programme

SEMESTER – VI

S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	20CS012	Principles of Compiler Design	PC	3	1	0	4	4
2	20CS013	Full Stack Programming	PC	3	0	0	3	3
3		Professional Elective II	PE	3	0	0	3	3
4		Open Elective IV	OE	3	0	0	3	3
PRACTICALS								

5	20CS014	Compiler Design Lab	PC	0	0	4	4	2
6	20CS015	Full Stack Programming Laboratory	PC	0	0	4	4	2
7	20CS901	Design Project	EC	0	0	8	8	4
			Total	**12**	**1**	**16**	**29**	**21**

SEMESTER – VII

S. NO.	**COURSE CODE**	**COURSE NAME**	**CATEGORY**	**PERIODS PER WEEK**			**TOTAL CONTACT PERIODS**	**CREDITS**
				L	**T**	**P**		
THEORY								
1	20CS016	Cloud Computing Techniques	PC	3	0	0	3	3
2		Professional Elective III	PE	3	0	0	3	3
3		Professional Elective IV	PE	3	0	0	3	3
4		Professional Elective V	PE	3	0	0	3	3
5	20CS902	Final Year Project - I	EC	0	0	6	6	3
			Total	**12**	**0**	**6**	**18**	**15**

SEMESTER – VIII

S. NO.	**COURSE CODE**	**COURSE NAME**	**CATEGORY**	**PERIODS PER WEEK**			**TOTAL CONTACT PERIODS**	**CREDITS**
				L	**T**	**P**		
THEORY								
1		Professional Elective VI	PE	3	0	0	3	3
2	20CS903	Final Year Project - II	EC	0	0	16	16	8
			Total	**3**	**0**	**16**	**19**	**11**

TOTAL NUMBER OF CREDITS: 160

PROFESSIONAL ELECTIVES

ELECTIVE – I [NETWORKING]

S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	20CSP11	Mobile Networks	PE	3	0	0	3	3
2	20CSP12	Storage Area Networks	PE	3	0	0	3	3
3	20CSP13	Wireless Sensor Networks	PE	3	0	0	3	3
4	20CSP14	Mobile Computing	PE	3	0	0	3	3
5	20CSP15	Software Defined Networks	PE	3	0	0	3	3
6	20CSP16	Social Network Analysis	PE	3	0	0	3	3
7	20CSP17	Distributed Systems	PE	3	0	0	3	3

ELECTIVE – II [INFORMATION SECURITY]

S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	20CSP21	Cryptography and Network Security	PE	3	0	0	3	3
2	20CSP22	Cyber Forensics	PE	3	0	0	3	3
3	20CSP23	Network and Web Security	PE	3	0	0	3	3
4	20CSP24	Ethical Coding and Risk Management	PE	3	0	0	3	3
5	20CSP25	Python Programming	PE	3	0	0	3	3
6	20CSP26	Problem Solving using Python Programming	PE	2	0	2	4	3

ELECTIVE – III [HUMAN COMPUTER INTERACTION]

S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	20CSP31	Augmented Reality and Virtual Reality	PE	3	0	0	3	3
2	20CSP32	Design Oriented HCI	PE	3	0	0	3	3
3	20CSP33	User Interface Design	PE	3	0	0	3	3
4	20CSP34	Human Computer Interaction	PE	3	0	0	3	3
5	20CSP35	Image Processing	PE	3	0	0	3	3
6	20CSP36	Internet of Things	PE	3	0	0	3	3

ELECTIVE – IV [SOFTWARE PROJECT ENGINEERING]

S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	20CSP41	Software Project Management	PE	3	0	0	3	3
2	20CSP42	Agile Software Development	PE	3	0	0	3	3
3	20CSP43	Software Requirements Engineering	PE	3	0	0	3	3
4	20CSP44	Software Quality Assurance and Testing	PE	3	0	0	3	3
5	20CSP45	Robotic Process Automation	PE	3	0	0	3	3

ELECTIVE – V [RECENT COMPUTING ADVANCEMENTS I]

S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	20CSP51	Salesforce	PE	3	0	0	3	3
2	20CSP52	Fundamentals of AWS	PE	3	0	0	3	3
3	20CSP53	Machine Learning & Deep Learning Techniques	PE	3	0	0	3	3
4	20CSP54	Entrepreneurship Development	PE	3	0	0	3	3
5	20CSP55	Soft Computing	PE	3	0	0	3	3
6	20CSP56	Data Mining	PE	3	0	0	3	3
7	20CSP57	Block chain Technology and Applications	PE	3	0	0	3	3

ELECTIVE – VI [RECENT COMPUTING ADVANCEMENTS II]

S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	20CSP61	Intellectual Property Rights	PE	3	0	0	3	3
2	20CSP62	Microsoft Azure	PE	3	0	0	3	3
3	20CSP63	Big Data Analytics	PE	3	0	0	3	3
4	20CSP64	Basics of Tensor Flow and Keras	PE	3	0	0	3	3
5	20CSP65	Machine Vision	PE	3	0	0	3	3
6	20CSP66	Foundation Skills in Integrated Product Development	PE	3	0	0	3	3
7	20CSP67	Information Security	PE	3	0	0	3	3

OPEN ELECTIVES

S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
OFFERED BY B.E (ELECTRONICS AND COMMUNICATION ENGINEERING) PROGRAMME								
1	20ECE01	Electronic Measurements and Instrumentation	OE	3	0	0	3	3
2	20ECE02	Microcontrollers and its Applications	OE	3	0	0	3	3
3	20ECE03	Introduction to Embedded Systems	OE	3	0	0	3	3
4	20ECE04	Nano Electronics and Sensors	OE	3	0	0	3	3
5	20ECE05	Principles of VLSI Systems	OE	3	0	0	3	3
OFFERED BY B.E (ELECTRICAL AND ELECTRONICS ENGINEERING) PROGRAMME								
1	20EEE01	Energy Management Systems	OE	3	0	0	3	3
2	20EEE02	Medical Instrumentation	OE	3	0	0	3	3
3	20EEE03	PLC Programming	OE	3	0	0	3	3
4	20EEE04	Renewable Energy Systems	OE	3	0	0	3	3
5	20EEE05	Virtual Instrumentation & Data Acquisition	OE	3	0	0	3	3
6	20EEE06	Electric Vehicles	OE	3	0	0	3	3
OFFERED BY B.E (MECHANICAL ENGINEERING) PROGRAMME								
1	20MEE01	Automotive Fundamentals	OE	3	0	0	3	3
2	20MEE02	Computer Aided Design	OE	3	0	0	3	3
3	20MEE03	Introduction to Power Plant Engineering	OE	3	0	0	3	3

4	20MEE04	Introduction to Robotics	OE	3	0	0	3	3
5	20MEE05	3D Printing	OE	3	0	0	3	3

SYLLABUS

FIRST SEMESTER SYLLABUS

20HSG01	TECHNICAL ENGLISH	L	T	P	C
		2	0	2	3

COURSE OBJECTIVE:

The primary objective of this course is enhancement of listening, speaking, reading, writing skills of students. It further enables them to develop corporate test-taking strategies as well as employability skills through various grammar exercises for academic and workplace context.

COURSE CONTENT:

Importance of Communication

Listening: Importance of listening in the corporate world. Exposure to structured talks
Speaking: Self-introduction, Peer introduction, Extempore
Reading: Skimming and Scanning, Note-Making
Writing: Parts of Speech, Tense, Subject-Verb Agreement, Prepositions, Instructions Formal Letters (Quotations, Clarification, Placing orders & Complaint letter)

Formal Communication

Listening: Listening to motivational talks / TED talks, Note-taking practice.
Speaking: Describing a product/place, Conversation practice, Telephonic Conversation.
Reading: Reading Comprehension, Reading for specific information.
Writing: Voices, Compound Nouns, Paragraph Writing, Recommendations, Email writing, Analytical and issue based essays.

Writing Strategies

Listening: Listening to Announcements, Listening to Product description and Process
Speaking: Role-Play, Picture description.
Reading: Cloze reading, Introduction to Blogs, Social media etiquette.
Writing: Cause and Effect, Gerunds and Infinitives, Tag Questions, Modal Verbs, Checklist.

Presentation Skills

Listening: Listening to Group Discussion and Interview Skills.
Speaking: Presentation on the technical topic, Sales talk.
Reading: Interpreting pictures of visual graphics.
Writing: If Conditional Clause, Use of sequence words, Process Description.

Technical Communication

Listening: Listening to talks of scientific nature, Listening for specific information.
Speaking: Giving impromptu talks, Giving a summary of an article.
Reading: Journals, Articles both general and technical.

Writing: Purpose and Function, extended definitions Wh- questions, Resume Writing, Report (Industrial visit reports, Accident report, Feasibility Reports) Proposals.

List of Laboratory Exercises

1. Speaking - Self and Peer Introduction
2. Speaking - General Conversation on Business Context
3. Listening to short recordings
4. Listening to conversation
5. Technical Presentation (PPT)

COURSE OUTCOMES:

CO1: Ability to make use of listening skills in business and workplace environment
CO2: Ability to relate in oral communication confidently
CO3: Ability to infer reading skills in different genres of texts and graphics through extensive reading.
CO4: Ability to utilize appropriate writing strategies in technical and business context.

REFERENCES:

1. Ian wood, Anne Williams with Anna Cowper, "Pass Cambridge BEC Preliminary", Second Edition, Cengage Learning, 2015.
2. Whitby, Norman, "Business Benchmark Pre-intermediate to Intermediate Business preliminary", First Edition Cambridge University Press, 2014.
3. Rizvi M.Ashraf, "Effective Technical Communication", Tata McGraw-Hill Publishing Company Limited, Fourth Edition, 2010.
4. Gerson Sharon J, Steven M.Gerson, "Technical Writing-Process and Product", Pearson Education Pvt. Ltd. Third Edition, 2009.
5. Sanborn Pfeiffer, Padmaja, "Technical Communication, A Practical Approach" Pearson Publication, Sixth Edition, 2007.

20MHG01	CALCULUS AND LINEAR ALGEBRA	L	T	P	C
		3	1	0	4

COURSE OBJECTIVE:

This course provides an understanding on various concepts of matrices, differential calculus, integral calculus and apply them in various Engineering fields.

COURSE CONTENT:

Matrices

Introduction – Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of eigenvalues and eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms – Stretching of an Elastic Membrane – Vibrating System of two masses on two springs.

Differential Calculus

Limit of function – One sided limit – Limit Laws – Continuity – left and right continuity – types of discontinuities – Intermediate Value Theorem – Derivatives of a function - Differentiation rules – Chain rule – Implicit differentiation – logarithmic differentiation – Maxima and minima – Mean value theorem.

Functions of Several Variables

Partial derivatives – Total derivative – Differentiation of implicit functions – Change of variables – Jacobian – Partial differentiation of implicit functions – Taylor's series for functions of two variables Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

Integral Calculus

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

Multiple Integrals

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

COURSE OUTCOMES:

CO1: Ability to solve practical problems that can be expressed as matrix algebra
CO2: Ability to classify the theorems in differential calculus
CO3: Ability to apply differential calculus on several variable functions
CO4: Ability to apply integral calculus including multiple integrals to solve problems on area and volume

REFERENCES:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India, 2016.
2. Grewal. B.S, "Higher Engineering Mathematics", 44rd Edition, Khanna Publications, Delhi, 2017
3. James Stewart, "Calculus, Early Transcendental", 7th Edition, Cengage learning, New Delhi, 2018.
4. Joel Hass, Christopher Heil and Maurice D.Weir, Thomas "Calculus", Pearson, 14th Edition, New Delhi, 2018.
5. Srimanta Paul and Subodh C. Bhunia, "Engineering Mathematics", Oxford University Press, 1st Edition, 2015.

20CHG01	ENGINEERING CHEMISTRY	L	T	P	C
		3	1	0	4

COURSE OBJECTIVE:

The objective of the course is to provide knowledge on Electrochemistry, Battery Technology, Photochemistry, Spectroscopy, Water chemistry and Nanochemistry in the practice of engineering.

COURSE CONTENT:

Electrochemistry

Electrochemical cells – Nernst Equation (Problems), Electrode potential – Representation of a cell -Galvanic cell-Construction and working - Electrodes – Standard Hydrogen Electrode (SHE), Saturated Calomel Electrode (SCE) and Glass Electrode –Electrochemical Series and its applications - Conductometric titrations (Acid -Base Titration).

Batteries

Batteries – Characteristics – Current, Power, Capacity, Classification of batteries – Primary (Dry and Alkaline battery) – Secondary batteries (Lead acid and Nickel – Cadmium) and Flow batteries (Hydrogen – Oxygen and Methanol – Oxygen fuel cells) – Modern batteries – Lithium Ion batteries – Applications.

Photochemistry and Spectroscopy

Photochemistry: Laws of photochemistry - Grotthuss-Draper law, Stark-Einstein law and Lambert-Beer Law. Photo physical processes – Jablonski diagram. Chemiluminescence, photo-sensitization and photoquenching– mechanism and examples. Spectroscopy: Electromagnetic spectrum - absorption of radiation - electronic, vibrational and rotational transitions. Atomic absorption spectroscopy, UV-Vis and IR spectroscopy- principles, instrumentation (Block diagram) and applications.

Water Treatment

Importance of water – Water sources – Impurities – Carbonate and Non Carbonate Hardness (simple problems) – Potable water and its specifications, Steps involved in treatment of potable water – Disinfection methods – Internal Conditioning (Phosphate, Calgon, Carbonate and Colloidal conditioning method) - External Conditioning – Demineralisation process - Zeolite process– Desalination (Reverse Osmosis).

Nanochemistry

Basics-distinction between molecules, nanomaterials and bulk materials; size-dependent properties. Types –nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Characterization - Scanning Electron Microscope and Transmission Electron Microscope - Principle and instrumentation (block diagram). Properties (optical, electrical, mechanical and magnetic) and Applications of nanomaterials - medicine, agriculture, electronics and catalysis.

COURSE OUTCOMES:

CO1: Ability to discuss the concepts of electrochemistry
CO2: Ability to compare the materials best suited for construction of battery
CO3: Ability to understand the concepts of photo chemistry and spectroscopy techniques
CO4: Ability to understand the basic properties of water and its quality improvement for domestic and industrial purposes
CO5: Ability to apply basic concepts of Nanoscience and Nanotechnology as a key component for applications involving batteries, fuel cells and water treatment

REFERENCES:

1. Jain P. C. & Monica Jain., "Engineering Chemistry", 16th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2015.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 6th Edition, 2012.
3. Dara S. S, "A text book of Engineering Chemistry", Chand Publications, 2nd Edition, 2014.
4. Vairam.S, Kalyani.P, Suba Ramesh, "Engineering Chemistry", John Wiley & Sons, 1st Edition, 2016.
5. Palanna O G, "Engineering Chemistry", Tata McGraw – Hill Education, 1st Edition, 2009.
6. Shikha Agarwal, "Engineering Chemistry – Fundamentals and applications", Cambridge university press, 2nd Edition, 2019.

20ITG01	PROGRAMMING FOR PROBLEM SOLVING USING C	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

This course provides an introduction to computer hardware. The course further deals with problem solving techniques and their implementations through syntax and semantics of C language.

COURSE CONTENT:

Fundamentals of Computing

Basic concepts of computer organizations, Generation and classification of computers, Number System Representation, Fundamentals of algorithms, Pseudo code, Flow charts.

C Language Fundamentals

Introduction to C programming, Structure of a C program, Compilation and Linking Processes, Character Set, Identifiers, Keywords, Data Types, Constant and Variables, Statements, Expressions, Operators, Precedence of operators, Input-Output Operations, Control Structures, Decision Making, Branching & Looping. Application: Solving Simple Scientific and Mathematical Problems.

Arrays and Strings

Introduction to Arrays, One Dimensional Array, Multidimensional Array. Application: Matrix Operations, Sorting, Searching, Sum of Series and Statistical Problems. String Manipulation, String Arrays. Application: Solving problems using String Functions.

Functions and Pointers

User Defined and Standard Functions, Formal and Actual arguments, Function Prototypes, Parameter Passing, Call-by-Value, Call-by-Reference, Recursion. Application: Math Functions, Computation of Sine Series, Random Number Generation, Tower of Hanoi and Factorial using Recursive Functions. Pointers, Pointer Variables, Pointer Arithmetic, Passing Parameters by Reference, Pointer to Pointer, Pointers to Functions, Dynamic Memory Allocation. Application: Card shuffling and Dealing Simulation using Pointers.

Structures, Unions and File Handling

Declaration of Structures, Nested Structure, Pointer to Structure, Declaration of Unions, Pointer to Union, Application: Student Records. Storage Classes, Pre-Processor Directives. Files -Types of File Processing: Sequential Access, Random Access. Application: Transaction Processing Program.

COURSE OUTCOMES:

CO1: Ability to apply the concepts of algorithm, pseudo code and flow chart to solve problems
CO2: Ability to build control structures to solve problems
CO3: Ability to choose data structures for managing user data
CO4: Ability to apply memory and I/O management constructs of C

REFERENCES:

1. Behrouz A. Forouzan, Richard F. Gilberg, "Computer Science: A Structured Programming Approach Using C", 3rd Edition, Course Technology Inc, 2005.
2. Byron Gottfried S. "Programming in C", Third Edition, (Indian Edition), Tata McGraw Hill,2010.
3. Balagurusamy E. "Programming in ANSI C", first Edition, Tata McGraw Hill Education,2014.
4. Paul Deitel, Harvey Deitel "C How to Program", Seventh Edition, Pearson Education Asia, 2012.
5. Brian Kernighan, Dennis Ritchie "The 'C' programming language", Second Edition Prentice Hall Software Series.
6. Greg Perry, Dean Miller, "C Programming Absolute Beginner's Guide", 3rd Edition, Pearson Education, 2014.

20EEG01	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

The course aims to provide the basic principles of electric circuits, electron devices, electrical writing and AC/DC machines for applications in real time engineering problems.

COURSE CONTENT:

Electric circuits and Domestic Wiring

Ohm's Law and Kirchhoff's laws - series and parallel circuits, equivalent resistance- Mesh and Nodal Analysis (Analysis with only independent source and DC circuits)- Superposition theorem, Thevenin's theorem, Norton's theorem. Types of wiring- Domestic wiring - Specification of Wires – Importance of Earthing.

AC Circuits

Concepts of AC circuits –RMS value, average value, form and peak factors. Power relations in single phase and three phase circuits- real and reactive power – power factor, Star connection – Delta connection –Balanced Loads.

Electrical Machines

Construction, Principle of operation and characteristics of DC separately excited generator and DC Shunt and Series motor, EMF equation of DC separately excited generator and Torque equation of DC Shunt and Series motor- applications. Construction and Principle of operation of transformer, EMF Equation- applications. Construction and Principle of operation of synchronous Motor. Construction and Principle of operation of single phase Induction motor - applications.

Semiconductor Devices and Applications

Introduction to semiconductors- PN junction diode - forward and reverse bias characteristics –Zener diode and its characteristics. Operation of Half wave and Full wave rectifiers – Capacitive filters- Zener diode Voltage regulators

Current Controlled Devices

Operation of PNP and NPN transistors - Early effect – Input and Output Characteristics of CB, CE, CC Configurations , Working principle and characteristics of SCR, UJT.

COURSE OUTCOMES:

CO1: Ability to understand the basic concepts of electric circuits, electronic devices &circuits and electric machines

CO2: Ability to understand the concepts related with electrical domestic wiring

CO3: Ability to apply the concepts of electrical machines for industrial applications

CO4: Ability to analyze the characteristics of electronic devices and circuits

REFERENCES:

1. A Fitzgerald , Charles Kingsley , Stephen Umans, “Electric Machinery”, 7th Edition, McGraw-Hill, 2013.
2. Robert Boylestad, Louis Nashelsky, “Electronic Devices and Circuit Theory”, Prentice Hall, 11th Edition 2015.
3. V K Mehta, Rohit Mehta , “ Principles of Electronics”, 11 th edition, S Chand Publishing company , 2016.
4. Mahmood Nahvi, Joseph A Edminister, “Electric Circuits”, McGraw-Hill Education, 5th Edition, 2010.
5. Bhattacharya.S.K, “Basic Electrical and Electronics Engineering”, 1st Edition, Pearson Education, 2011

20MEG01	ENGINEERING GRAPHICS	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE:

The objectives of this course are to impart knowledge to interpret engineering drawings and to enable the students to communicate the concepts, ideas, and basic designs through graphical representations as per related engineering conventions and standards.

COURSE CONTENT:

Curve Constructions and Orthographic Projection

Lettering – Types of lines – Dimensioning – Conics- Construction of ellipse, parabola and hyperbola by eccentricity method-Construction of cycloid- Construction of involutes of square and circle- Drawing of tangents and normal to these curves. Principles of Orthographic projection – Layout of views Orthographic projection of simple Engineering components using first angle Projection. Drawing of multiple views from pictorial views of objects

Projection of Points, Lines and Plane Surfaces

Projection of points – Projection of straight lines (only First angle projections) inclined to both the principal planes – Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces – Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method

Projection of Solids

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method and auxiliary plane method.

Projection of Sectioned Solids and Development of Surfaces

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids, cylinder and cone. Development of lateral surfaces of solids with cut-outs and holes.

Isometric and Perspective Projections

Principles of isometric projection – isometric scale – isometric projections of simple solids and truncated solids – Prisms, pyramids, cylinders, cones – Perspective projection of simple solids prisms, pyramids and cylinder by visual ray method and vanishing point method.

COURSE OUTCOMES:

CO1: Ability to interpret and construct geometric entities, orthographic projection of engineering components

CO2: Ability to construct orthographic views of points and straight lines

CO3: Ability to apply orthographic principles to construct views of planes and solids

CO4: Ability to build orthographic projection of section of solids and develop the lateral surfaces of solids

CO5: Ability to develop isometric and perspective projections of solids

REFERENCES:

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2014.

2. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore, 2017.

3. Jolhe, D. A., Engineering drawing, Tata McGraw Hill, 2017.

4. Shah, M. B. and Rana, B. C., Engineering Drawing, Pearson Education, 2009

5. K.V. Natarajan, A text book of Engineering Graphics, Dhanalakshmi Publishers, Chennai, 2016.

6. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2018.

7. Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2015.

8. Sekkilar.S.M., "Engineering Graphics" Alpha Science International Ltd, 2018.

20CHG02	ENGINEERING CHEMISTRY LABORATORY	L	T	P	C
		0	0	3	1.5

COURSE OBJECTIVE:

The objective of the course is to enable the students to gain exposure in various experimental skills based on corrosion studies, waste water treatment, electrochemistry, battery and fuel cells that are essential for engineering applications. Further, the students are exposed to various tools and instruments like conductivity meter, potentiometer, pH meter, colorimeter, spectrophotometer and flame photometer to demonstrate their practical applications.

LIST OF EXPERIMENTS:

1. Estimation of acidity of industrial effluent by conductometric titration.
2. Determination of corrosion rate by weight loss method.
3. Determination of water of crystallization of $CuSO_4.5H_2O$
4. Estimation of hardness of water by complexometric method.
5. Determination of DO content of water sample by Winkler's method.
6. Determination of molecular weight of polyvinyl alcohol using Ostwald Viscometer.
7. Determination of strength of Hydrochloric acid using pH meter.
8. Determination of Alkalinity in the given water sample.
9. Estimation of iron content of the given solution using potentiometer.
10. Conductometric precipitation titration using Barium chloride and Sodium Sulphate
11. Determination of strength of acids in a mixture using conductivity meter.
12. Determination of Chloride content in the given water sample by Argentometric method.

COURSE OUTCOMES:

CO1: Ability to apply analytical techniques for the quality assessment of domestic and industrial waste water.

CO2: Ability to apply experimental chemistry for the investigation of corrosion related problems in industrial field.

CO3: Ability to measure the molecular weight of polymeric materials so as to use them for various engineering applications.

CO4: Ability to estimate the amount of metal ions present in unknown substances using titrimetric and instrumental methods.

REFERENCES:

1. Beran J.A , “Laboratory Manual for Principles of General Chemistry”, Wiley Publications,10th Edition, 2014.
2. Manoj Kumar Solanki, “Engineering Chemistry Laboratory Manual”, Educreation Publishing, 2019.
3. Jeffery G. H, and Basset J., “Vogel’s text book of quantitative chemical analysis”, Prentice Hall, 5th Edition, 2012.

20ITG02	PROGRAMMING IN C LABORATORY	L	T	P	C
		0	0	4	2

LIST OF EXPERIMENTS:

1. Problem Solving Techniques (Algorithm, Pseudo code, Flowcharts).
2. Program using Simple Statements and Expressions.
3. Scientific Problem Solving using Decision Making and Looping.
4. Program using Single and Multidimensional Array.
5. Program using String, Math Inbuilt Functions.
6. Program using User Defined Functions (string & array manipulation) and Storage Classes.
7. Program using Recursive Function.
8. Program using Dynamic Memory Allocation.
9. Program using Structures and Unions.
10. Program using Files.

COURSE OUTCOMES:

CO1: Ability to find solution methodology using different problem solving techniques

CO2: Ability to use appropriate data types and control structures for solving a given problem

CO3: Ability to apply the various concepts of C programming for solving engineering problems

CO4: Ability to analyse the problem solving techniques which is appropriate for solving real world problems

REFERENCES:

1. Behrouz A. Forouzan, Richard F. Gilberg, “Computer Science: A Structured Programming Approach Using C”, 3rd Edition, Course Technology Inc, 2005.
2. Byron Gottfried S. “Programming in C”, Third Edition, (Indian Edition), Tata McGraw Hill,2010.
3. Balagurusamy E. “Programming in ANSI C”, Eighth Edition, Tata McGraw Hill Education.
4. Paul Deitel, Harvey Deitel “C How to Program”, Seventh Edition, Pearson Education Asia, 2012.

SECOND SEMESTER SYLLABUS

20HSG02	UNIVERSAL HUMAN VALUES – II : UNDERSTANDING HARMONY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- 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 CONTENT:

Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

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 Validationas 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 fulfilment of aspirations of every human being with their correct priority,5. 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.

Module 2: Understanding Harmony in the Human Being - Harmony in Myself!

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.

Module 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

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.

Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

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.

Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics:

a. Ability to utilize the professional competence for augmenting universal human order

b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems,

c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

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

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

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

COURSE OUTCOMES:

CO1: Ability to become more aware of themselves, and their surroundings (family, society, nature)

CO2: Ability to become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

CO3: Ability to have better critical ability.

CO4: Ability to become sensitive to their commitment towards what they have understood (human values, human relationship and human society).

CO5: Ability to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

READINGS:

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

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

REFERENCES:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

Relevant CDs, Movies, Documentaries & Other Literature:

1. Value Education website, *http://www.uptu.ac.in*
2. Story of Stuff, *http://www.storyofstuff.com*
3. Al Gore, *An Inconvenient Truth*, Paramount Classics, USA
4. Charlie Chaplin, *Modern Times*, United Artists, USA
5. IIT Delhi, *Modern Technology – the Untold Story*

20MHG02	DIFFERENTIAL EQUATIONS AND COMPLEX VARIABLES	L	T	P	C
		3	1	0	4

COURSE OBJECTIVE:

This course provides knowledge on various concepts of differential equations, vector calculus, complex differentiation, complex integration, Laplace transforms and apply them in various engineering problems.

COURSE CONTENT:

Second and Higher Order Linear Differential Equations

Linear equations of second and higher order with constant coefficients – Homogenous equations of Euler's and Legendre's type – Method of variation of parameters – First order Simultaneous linear equations with constant coefficients – Simple Applications.

Vector Calculus

Gradient and directional derivative – Divergence and curl - Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's theorem, Gauss divergence theorem and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

Analytic Function

Analytic functions – Necessary and sufficient conditions for analyticity– Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping – Mapping by functions $w = c + z,\ az,\ \frac{1}{z},\ z^2$ – Bilinear transformation – Temperatures in a Quarter-plane metallic sheet.

Complex Integration

Line integral – Cauchy's Integral theorem– Cauchy's Integral formula – Taylor's and Laurent's series – Singularities – Residues – Cauchy Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

Laplace Transform

Laplace transform – Sufficient condition for existence – Transform of elementary functions – Basic properties – Transforms of derivatives and integrals of functions – Derivatives and integrals of transforms – Transforms of unit step function and impulse function – Transform of periodic functions. Inverse Laplace transform – Convolution theorem – Initial and final

value theorems – Application to solution of linear ordinary differential equations with constant coefficients.

COURSE OUTCOMES:

CO1: Ability to apply higher order linear differential equations in simple applications

CO2: Ability to solve problems in the domain of fluid dynamics using vector calculus

CO3: Ability to construct analytic functions and use their conformal mapping property in application problems.

CO4: Ability to apply the Cauchy's integral formula and residue theorem to evaluate real and complex integrals.

CO5: Ability to apply Laplace transform for solving linear differential equations.

REFERENCES:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India, 2016.
2. Grewal. B.S, "Higher Engineering Mathematics", 43rd Edition, Khanna Publications, Delhi, 2016.
3. Ravish R Singh and Mukul Bhatt, "Engineering Mathematics", 1st Edition, Tata McGraw Hill Education, New Delhi, 2016.
4. Srimanta Paul and Subodh C. Bhunia, "Engineering Mathematics", Oxford University Press, 1st Edition, 2015.
5. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, 7th Edition, New Delhi, 2012.

20PHG01	ENGINEERING PHYSICS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVE:

This course imparts knowledge in basic concepts and advances in Acoustics, Mechanics, Optics and Electromagnetic waves and develops an intuitive understanding of Physics by emphasizing Quantum computing for engineering applications.

COURSE CONTENT:

Acoustics, Ultrasonics and Thermal Insulation

Classification of Sound - decibel - Weber - Fechner law - Sabine's formula - derivation using growth and decay method - Absorption Co efficient and its determination - factors affecting acoustics of buildings and their remedies - Production of ultrasonic– Piezoelectric generator – Detection of ultrasonic waves – Applications – NDT – pulse echo system through transmission and reflection mode - thermal insulation of buildings.

Introduction to Mechanics and applications

Moment of inertia (M.I) - Radius of gyration - M.I of circular disc, solid cylinder, diatomic molecule - K.E of a rotating body — centre of mass – conservation of linear momentum – Relation between Torque and angular momentum - Torsional pendulum - The concept of gravity – Law of universal gravitation –weigh and weightlessness – Projectile motion – range – height – time.

Quantum Mechanics

Photons and light waves - Electrons and matter waves - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization - particle in an infinite potential well - Introduction to quantum computing - History of quantum computation and quantum information - Quantum bits - Quantum Physics and Computation Global perspectives - Future directions.

Oscillations, Optics and Lasers

Simple harmonic motion - resonance - waves on a string - standing waves - traveling waves - Energy transfer of a wave - sound waves - Doppler effect - reflection and refraction of light waves - total internal reflection - interference – Michelson interferometer - air wedge experiment. Laser - characteristics - Spontaneous and stimulated emission - population inversion - CO_2 laser, semiconductor laser - applications - holography.

Electromagnetic Waves

Gauss's law – Faraday's law - Ampere's law - The Maxwell's equations (qualitative only) - wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - polarization - Producing electromagnetic waves - Energy and momentum in EM waves.

COURSE OUTCOMES:

CO1: Ability to understand the basic concepts of physics and their relevant applications in acoustics, non-destructive testing and thermal insulation

CO2: Ability to illustrate the fundamental concepts in rigid bodies and gravitation

CO3: Ability to apply the concepts of quantum computations

CO4: Ability to understand the working principle of lasers and its applications.

CO5: Ability to apply the knowledge of oscillations and propagation of electromagnetic waves in solving engineering problems

REFERENCES:

1. D. Halliday, R. Resnick and J. Walker. Principles of Physics. John Wiley & Sons, 10th Edition, 2015.

2. D. Kleppner, R. J. Kolenkow, An Introduction to Mechanics, Tata Mc Graw Hill, 10th Edition, 2005.

3. D. J. Griffiths. Introduction to Electrodynamics. Pearson Education, 3rd Edition 2015.

4. S. Mani Naidu, Engineering Physics, Pearson Publications, 2014.

5. A. Marikani, Engineering Physics, PHI Publications, 2nd Edition, 2014.

6. Larry .D Kirkpatrick, Gregory E. Francis, Physics: A Conceptual World View, 7th Edition, Cengage Learning, 2010.

7. Paul G. Hewitt, John Suchocki, Leslie A. Hewitt, Conceptual Physical Science Pearson, 6th Edition, 2017.

8. Michael Nielsen, Isaac Chuang, Quantum Computation and Quantum Information, Cambridge, 10th Anniversary Edition, 2010.

20CSG01	OBJECT ORIENTED PROGRAMMING USING C++	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

This course provides an insight on the basic principles of Object Oriented Programming using C++ and its applications in real world scenarios.

COURSE CONTENT:

Fundamentals of OOP and C++

Structural versus object-oriented Programming - Elements of object oriented programming-benefits of OOP – Structure of C++ program - Variables - Tokens - Keywords – Identifiers - Type modifiers - Type casting - Input and Output - Data Types and Expressions - Operators - Flow of control - Arrays, Strings and Pointers.

Classes and Objects

Classes and Objects - Class specification: Class Members, Access Specifier, Scope resolution operator- Class Instantiation - Accessing class members- Passing and returning objects - Array of objects – Constructors: Parameterized constructors - Default arguments – Copy Constructor - Constructor overloading, Destructors - new, delete operators - “this” pointer - Friend classes and friend functions.

Overloading and Inheritance

Function overloading - Operator overloading: Overloadable operators - Unary operator overloading - Binary operator overloading, Overloading the Operator Using Friend Function - Inheritance: Base class and derived class relationship - Derived class declaration - Types of inheritance - Member accessibility - Constructors in derived class.

Virtual functions and Generic Programming

Virtual Functions: Need for virtual function - Pointer to derived class objects - Pure virtual functions - Abstract classes – Virtual Destructors, Generic programming with templates: Function templates - class templates

I/O Streams and Exception handling

Streams: Formatted and unformatted data – Manipulators - Files: Opening and Closing a file - File modes - File pointers and their manipulation, Sequential access to a file - Random access to a file - Reading and Writing files, Exception handling: Exception handling constructs - Handling exceptions.

COURSE OUTCOMES:

CO1: Ability to understand the concepts of Object Oriented Programming

CO2: Ability to choose appropriate Object Oriented features for solving various problems

CO3: Ability to develop C++ application for real world scenarios

CO4: Ability to apply the concepts of Exception handling, generic programming and file handling in programmes using C++

REFERENCES:

1. Herbert Schildt, "C++ The Complete Reference", 5th Edition, Tata McGraw Hill, New Delhi,
2. Bjarne Stroustrup, "The C++ Programming Language", 4th Edition, Addison-Wesley, 2013.
3. Deitel and Deitel, "C++ How to Program", 10th Edition, Prentice Hall India Learning Private Limited, 2018.
4. Robert Lafore, "Object Oriented Programming in C++", 4th edition, Pearson India, 2002.
5. Stanley B. Lippman and Josee Lajoie, "C++ Primer", 5th Edition, Pearson Education, New Delhi, 2013.
6. E.Balagurusamy, "Object Oriented Programming with C++", 6th Edition, Tata McGraw Hill, 2013.

20HMG02	PROFESSIONAL ETHICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

This course is focused to understand the importance of values and ethics in the personal life and engineering careers and also to learn the rights and responsibilities of the employees.

COURSE CONTENT:

HUMAN VALUES

Morals, values and Ethics – Integrity – Work ethic –Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self-confidence – Character - Stress management.

ENGINEERING ETHICS

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Uses of Ethical Theories.

ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

SAFETY, RESPONSIBILITIES AND RIGHTS

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

GLOBAL ISSUES

Multinational Corporations – Environmental Ethics – Computer Ethics – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility.

COURSE OUTCOMES:

CO1: Ability to understand the concept of ethical and peaceful professional life by following human values

CO2: Ability to understand ethical principles, theories, responsibilities and various global issues

CO3: Ability to apply ethical principles related to Engineering domain

CO4: Ability to acquire knowledge of various roles of engineer in competitive and challenging environment

REFERENCES:

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", 3rd Edition, McGraw Hill, New York, 2013.
2. M. Govindarajan, S.Natarajan and V.S. Senthil kumar, "Engineering Ethics(including human values)", Eastern Economy Edition, Printice Hall of India Ltd., 2012
3. Charles E. Harris, Michael S.Protchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases", Thomson Learning, 2012.
4. Edmund G Seebauer and Robert L Barry, ―Fundamentals of Ethics for Scientists and Engineers, Oxford University Press, Oxford, 2011
5. Laura P. Hartman and Joe Desjardins, ―Business Ethics: Decision Making for Personal Integrity and Social Responsibility Mc Graw Hill education, India Pvt. Ltd., New Delhi, 2013

20AC001	ENVIRONMENTAL SCIENCE AND ENGINEERING	L	T	P	C
		AC			

COURSE OBJECTIVE:

To understand the basic knowledge about environment and their chemistry, to apply the knowledge in environmental pollution control and management, to create awareness about various technologies to control/ reduce all environmental related problems.

COURSE CONTENT:

Fundamentals of Environmental Science

Introduction- Definition-environment, Environmental science, Environmental engineering- Components of environment - Atmosphere, lithosphere, hydrosphere and biosphere - types of environment – Natural – man – made - Environmental education- objectives, importance and scope - Need for public awareness.

Chemistry of the Environment

Hydrological cycle- concept of DO, BOD and COD - chemical and photochemical reactions in the atmosphere - ozone chemistry - formation and depletion of ozone layer - acid rain mechanism of formation and effects - Photochemical smog and sulfurous smog. Greenhouse effect, global warming- causes, effects and control measures.

Renewable energy and environment

Introduction - Renewable and non - renewable energy sources - Principles of generation of hydro - power, tidal energy, ocean thermal energy conversion, wind power - wind mill - wind farm geothermal energy and solar energy (solar collectors, photovoltaic modules, solar ponds) - Bioenergy: methods to produce energy from biomass - impact of renewable and non - renewable energy sources on the environment.

Environmental Pollution and control

Introduction - Air pollution – sources - major air pollutants – effects and control - Air Pollution control technologies - cyclone separator and electrostatic precipitator –water pollution – sources - major water pollutants - effects and control of water pollution -waste water treatment - Noise pollution –sources- effects and control- Solid waste management – sources, classification, causes and effects -management and control measures of solid wastes - Hazardous waste management - role of an individual in prevention of pollution.

Human population and the Environment

Population growth - variation among nations - Population explosion – Family Welfare Programme -Environment and human health - Human Rights - Value Education - HIV/AIDS - Women and Child Welfare - Role of Information Technology in Environment and human health.

COURSE OUTCOMES:

CO1: Ability to understand the basic knowledge about environment and their chemistry.

CO2: Ability to select suitable renewable resources for domestic and industrial applications to meet the growing energy demand.

CO3: Ability to apply the knowledge in environmental pollution control and management.

REFERENCES:

1. George Tchobanoglous, Howard S. Peavy, Donald R. Rowe., "Environmental Engineering", McGraw Hill Education, 1st Edition, 2013.
2. Henry J.G. and Heinke G.W., "Environmental Science and Engineering", Prentice Hall, 2nd Edition, 2007.
3. Masters G.B., "Introduction to Environmental Engineering and Science", Pearson Education, 3rd Edition, 2008.
4. Tyler Miller G., "Environmental Science", Cengage Learning, 11th Edition, 2015
5. Smriti Srivastava., "Energy Environment & Ecology", S.K.Kataria & Sons, 2nd Edition, 2013.

20MEG02	ENGINEERING WORKSHOP	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE:

This course aims to make the students understand about various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering by providing practical experience

COURSE CONTENT:

I. Civil Engineering Practice Lab

Buildings: Study of plumbing and carpentry components of residential and industrial buildings.

PLUMBING WORKS

a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, and elbows in household fittings.

b) Study of pipe connections requirements for pumps and turbines.

c) Preparation of plumbing line sketches for water supply and sewage works.

Hands-on-exercise:

a) Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.

b) Demonstration of plumbing requirements of high-rise buildings.

WOOD WORK

Study of the joints in roofs, doors, windows and furniture.

Studying common industrial trusses using models.

Hands-on-exercise:

Wood work, joints by sawing, planning and cutting.

II. Mechanical Engineering Practice Lab

Welding & Sheet metal

1. Preparation of arc welding of butt joints, lap joints, tee joints and corner joints.

2. Sign board fabrication by the application of knowledge gained through welding process

3. Forming of simple objects using sheet metal – Trays.

Machining practices

Metal Hammer fabrication using Simple turning, taper turning, drilling taping practice.

Study

Assembling a centrifugal pump

Assembling a blower

Assembling an air conditioner

Demonstration

1. Demonstration on foundry operations.

III. Electrical Engineering Practice Lab

1. Familiarization of wiring tools, lighting accessories of CFL and incandescent lamps, types and selection of Fuse and MCB.
2. Study of various types of wiring systems
    a. Wiring of one lamp controlled by one switch.
    b. Wiring of one lamp controlled by two SPDT Switch and one 3 pin plug socket independently.
    c. Wiring of fluorescent lamp controlled by one switch from panel with MCB.
3. Study of wiring of different household appliances
    a. Iron-Box wiring.
    b. Fan Regulator wiring.
    c. Emergency Lamp wiring.
4. Familiarization with measuring instruments to measure current, voltage and power in AC/DC circuits.

IV. Electronics Engineering Practice Lab

1. Study of Electronic Components and instruments– Resistors, Capacitors, Inductors, Diodes and multimeter.
2. Measurement of AC signal parameters (voltage, period, frequency) using CRO.
3. Measurement of ripple factor of half wave rectifier and full wave rectifier.
4. Study of logic gates –AND, OR, XOR and NOT.
5. Soldering practice using general purpose PCB – Components, Devices and Circuits.

COURSE OUTCOMES:

CO1: Ability to make various joints in carpentry and select suitable tools for plumbing

CO2: Ability to fabricate products by selecting suitable tools for machining, metal joining and sheet metal processes

CO3: Ability to understand the fundamental electrical parameters, protective devices, domestic wiring and accessories

CO4: Ability to understand the basic principles of electronic components and to apply them in the design of simple electronic circuits on PCB

REFERENCES:

1. Bawa H.S., “Workshop Practice”, Tata McGraw – Hill Publishing Company Limited, New Delhi, 2009.
2. Chapman, William. Workshop Technology Part 1, Part 2. Routledge, 2019.
3. Uppal S. L., Electrical Wiring & Estimating, Khanna Publishers---fifth edition, 2003.
4. John H. Watt, Terrell Croft: American Electricians' Handbook: A Reference Book for the Practical Electrical Man - McGraw-Hill, 2002.
5. Thomas L. Floyd and Steve Wetterling, “Laboratory Exercises for Electronic Devices”, Pearson Education Limited, Tenth Edition, 2017.

20PHG02	ENGINEERING PHYSICS LABORATORY	L	T	P	C
		0	0	3	1.5

COURSE OBJECTIVE:

The students will be provided with an insight to handle optical instruments like microscope, spectrometer, laser and fibre optic kit. The course also provides an outline of modern instruments such as Ultrasonic interferometer, band gap instruments and CRO.

LIST OF EXPERIMENTS:

1. Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
2. Determination of thermal conductivity of a bad conductor using Lee's Disc method.
3. Determination of Young's modulus by non - uniform bending method.
4. Determination of Young's modulus by uniform bending method.
5. Determination of rigidity modulus of a wire and moment inertia of a disc – Torsional pendulum.
6. Determination of dispersive power of prism using spectrometer.
7. Determination of wavelength of a spectral lines using spectrometer grating.
8. Determination of thickness of thin sheet / wire – Air wedge.
9. Determination angle of divergence and wavelength using laser.
10. Determination of Particle size using laser.
11. Determination of acceptance angle and numerical aperture of an optical fiber.
12. Determination of energy band gap of a semiconductor by using p-n junction diode.

COURSE OUTCOMES:

CO1: Ability to select appropriate materials for the thermal insulation of structures using Lee's disc experiment.

CO2: Ability to use Interferometer to measure compressibility of the liquid and velocity of ultrasonic waves.

CO3: Ability to analyze the elastic nature of materials and compute elastic moduli of different materials.

CO4: Ability to distinguish silicon and germanium semiconducting materials using forbidden energy gap experiment.

CO5: Ability to apply the principle of interference, diffraction and refraction to calculate the thickness of an insulation of a wire, micro-particle size and wavelength of spectral lines.

REFERENCES:

1. Dr. S. Vijayakumar, Engineering Physics I, John Wiley Publications, 2014.
2. Dr. S. Vijayakumar, Engineering Physics II, John Wiley Publications, 2015.

20CSG02	PROGRAMMING IN C++ LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE:

This course provides a practical experience on the concepts of Object Oriented Programming using C++ programming language.

LIST OF EXPERIMENTS:

1. Programs using Objects and Classes
2. Programs using Constructors and Destructors
3. Programs using friend function & friend class.
4. Programs using Function Overloading
5. Programs to overload unary & binary operators as member function & non-member function
6. Programs using types of inheritance
7. Programs using virtual functions
8. Programs using Function and class templates
9. Programs using Files and Streams
10. Programs using Exception handling

COURSE OUTCOMES:

CO1: Ability to apply the concept related to Classes and Objects in simple programs

CO2: Ability to apply the concepts of polymorphism to achieve enhanced functionalities of functions and operator.

CO3: Ability to deploy inheritance in simple C++ programs

CO4: Ability to design simple applications that support File Processing

CO5: Ability to develop programs that are capable of handling Exceptions

REFERENCES:

1. Herbert Schildt, "C++ The Complete Reference", 5th Edition, Tata McGraw Hill, New Delhi,
2. Bjarne Stroustrup, "The C++ Programming Language", 4th Edition, Addison-Wesley, 2013.
3. Deitel and Deitel, "C++ How to Program", 10th Edition, Prentice Hall India Learning Private Limited, 2018.
4. Robert Lafore, "Object Oriented Programming in C++", 4th edition, Pearson India, 2002.
5. Stanley B. Lippman and Josee Lajoie, "C++ Primer", 5th Edition, Pearson Education, New Delhi, 2013.
6. E.Balagurusamy, "Object Oriented Programming with C++", 6th Edition, Tata McGraw Hill, 2013.

THIRD SEMESTER SYLLABUS

20MHG06	PROBABILITY AND STATISTICS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- To understand the basics of random variables with emphasis on the standard discrete and continuous distributions.
- To understand the basic probability concepts with respect to two dimensional random variables along with the relationship between the random variables and the significance of the Central Limit theorem.
- To learn the basics of hypothetical testing for small and large samples.
- To understand the concepts of design of experiments.
- To be able to apply the knowledge gained so far with respect to statistical quality controls.

COURSE CONTENT:

Probability and Statistical Distributions (9+3)

Probability – The axioms of probability – Conditional probability – Baye's theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

Two dimensional Random Variables (9+3)

Joint probability distribution – Marginal probability distribution – Conditional probability distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

Sampling Theory (9+3)

Sampling distributions – Estimation of parameters – Statistical hypothesis – Large sample tests based on normal distribution for single mean and difference of means – Tests based on t, Chi-square and F distributions for mean, variance and proportion – Contingency table (test for independent) – Goodness of fit.

Design of Experiments **(9+3)**

Analysis of Variance – One way classification – Two way classifications – Completely randomized design – Randomized block design – Latin square design – 2^2 factorial designs.

Statistical Quality Control **(9+3)**

Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits – Acceptance sampling.

Total:60 Periods

COURSE OUTCOMES:

Upon completion of the course, the students will be able to

CO1: Apply the concepts of one and two dimensional random variables and probability distributions to solve problems in engineering field.

CO2: Analyze the problems in real life by applying the concepts of testing of hypothesis for small and large samples.

CO3: Familiarize the concepts of designing and testing the experiments using ANOVA.

CO4: Apply the methods of statistical process control in engineering field.

TEXT BOOKS:

1. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2007.

REFERENCES:

1. Papoulis, A. and Unnikrishnapillai, S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, 4th Edition, New Delhi, 2010.
2. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8th Edition, 2007.
3. Spiegel. M.R., Schiller. J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.

20ECG02	DIGITAL PRINCIPLES AND SYSTEM DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

The course will enable the students to learn the basics of binary systems and implementations of logic functions, Karnaugh map minimization, the implementation of combinational and sequential circuits, RAM organization and the types of ROM.

COURSE CONTENT:

Number Systems

Review of binary, decimal, octal and hexadecimal number systems – Inter-conversion between number Systems-Number representations- complement's additions, subtraction - Computer codes: BCD, Gray code - Error detection and correction codes - parity codes-Hamming codes.

Simplification of Boolean expression

Positive and Negative Logic-Implementations of Logic Functions using gates, NAND–NOR implementations. Boolean postulates and laws – Principle of Duality - De-Morgan's Theorem - Truth tables and Boolean expression -Minimization of Boolean expressions – Sum of Products (SOP) Product of Sums (POS) – Karnaugh map Minimization.

Combinational Circuits

Adder, Subtractor, Encoder, Decoder, Multiplexer and Demultiplexer - Implementation of Combinational circuits, Magnitude Comparator.

Sequential Circuits

Flip-flops - Triggering, - Master slave configuration- Shift registers - Asynchronous Counters - Ring counter

Programmable logic devices

Classification and characteristics of memories – RAM organization – Types of ROM, CPLD

COURSE OUTCOMES:

At the end of the course, the students will have the

CO1: Ability to understand the basics of number systems, logic gates and programmable logic devices.
CO2: Ability to apply the concept of Boolean expressions and programmable logic devices for implementing logical functions.
CO3: Ability to design digital systems with the help of combinational logic circuits.
CO4: Ability to design digital systems with sequential logical circuits.

REFERENCES

1. Charles H.Roth, Larry L Kinney, "Fundamental of Logic Design", 7th Edition – CL Engineering, 2019.
2. Morris Mano M, "Digital Design", Prentice-Hall of India, New Delhi, Sixth Edition 2018.
3. John F. Wakerly, "Digital Design Principles and Practices", Fifth Edition, Pearson Education, 2018.
4. Floyd T L, "Digital Fundamentals", Pearson Education, New Delhi, Eleventh Edition, 2015.
5. Donald P. Leach, Albert Paul Malvino, Goutam Saha, "Digital Principles and Applications", 8th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2014.

20CS001	COMPUTER ORGANIZATION AND ARCHITECTURE	L	T	P	C
		3	0	0	3

*Common with B.Tech. IT

COURSE OBJECTIVE:

The course will enable the student to learn the basic structure, operations, addressing modes of the digital computer. It also gives an insight of the concepts like pipelining, memory organization and parallel processing in a digital computer.

COURSE CONTENT:

Architecture: An Overview

Functional units of a Digital Computer – Translation from a High level language to Hardware Language – Technology – Performance – Power wall – Uniprocessor to multiprocessor – Instructions: Operations and Operands – Instruction Set: RISC and CISC - Representing Instructions – Logical Operations – ARM Addressing for 32-bit Immediate and more complex addressing modes.

Computer Arithmetic

Addition and Subtraction – Arithmetic for Multimedia - Multiplication – Multiplication Algorithm and Hardware – Signed Multiplication - Faster Multiplication in ARM - Division – Division Algorithm and Hardware - Signed Division – Faster Division in ARM - Floating Point Representation – Floating Point Operations: Addition - Multiplication – Floating point instructions in ARM.

Processor Design

An abstract view of implementation - Logic design Conventions - Building a datapath – Simple implementation scheme – Pipelining – Pipelined Datapath and Control - Hazards – Data Hazards – Control Hazards – Exceptions.

Memory and I/O Interfacing

Memory Technologies – Basics of Caches – Measuring and Improving Cache Performance – Virtual Memory – Transaction- Look aside Buffer (TLB) - Memory Hierarchy - Input/output system, programmed I/O, DMA and interrupts, I/O processors.

Parallel Processing

Parallelism - Instruction-level-parallelism – Parallel processing challenges - Hardware multithreading – SISD, MIMD, SIMD, SPMD and Vector - Multicore processors – Shared memory Multiprocessors – Graphical Processing Units – Multiprocessor Network Topologies.

COURSE OUTCOMES:

CO1: Ability to describe the functioning of computer hardware and instruction set.

CO2: Ability to perform fixed point and floating point arithmetic operations.

CO3: Ability to formulate solutions using data path, pipelining and parallelism concepts.

CO4: Ability to compare the performances of caches and I/O devices.

REFERENCES:

1. David A. Patterson and John L. Hennessey, "Computer Organization and Design: The Hardware / Software Interface", Morgan Kaufman / Elsevier, ARM Edition, 2017.
2. V. Carl Hamacher, Zvonko G Vranesic and Safwat G Zaky, "Computer Organization", McGraw-Hill Inc, 6th Edition, 2012
3. William Stallings, "Computer Organization and Architecture – Designing for Performance", PHI Learning, 9th Edition, 2012.
4. Morris Mano M, "Computer System Architecture", Pearson Education, 1st Edition, 2011.
5. Andrew S. Tanenbaum,"Structured Computer Organization", Pearson Education, 6th Edition, 2013.

20CS002	DATA STRUCTURE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

This course will enable the students to learn the basic concepts of data structures which includes sequential storage (lists, queues, and stacks), hierarchical storage (trees), association /adjacency storage (graphs) and to design the program using suitable algorithmic techniques.

COURSE CONTENT:

Linear Data structures: (List)

Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation — singly linked lists- circularly linked lists- doubly-linked lists – applications of lists –Polynomial Manipulation – All operation (Insertion, Deletion, Merge, Traversal).

Linear Data structures: (Stacks-Queues)

Stack ADT – Evaluating arithmetic expressions- other applications- Queue ADT – circular queue implementation – Double ended Queues – Priority queue - applications of queues.

Non-Linear Data structures: (Trees)

Tree ADT – Tree traversals - Binary Tree ADT – expression trees – applications of trees – Binary search tree ADT –Threaded Binary Trees- AVL Trees – B-Tree - B+ Tree - Heap – Applications of heap.

Non-Linear Data structures: (Graph)

Representation of Graphs – Breadth-first search – Depth-first search – Topological sort – Minimum Spanning Trees – Kruskal and Prim algorithm – Shortest path algorithm – Dijkstra‟s algorithm – Bellman-Ford algorithm – Floyd - Warshall algorithm.

Sorting, Searching and Hashing Techniques.

Sorting algorithms: Insertion sort - Selection sort - Shell sort - Bubble sort - Quick sort - Merge sort - Radix sort – Searching: Linear search –Binary Search - Hashing: Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

COURSE OUTCOMES:

At the end of the course, the students will have the

CO1: Ability to state the appropriate data structures for the given computational problem.

CO2: Ability to understand the necessary mathematical abstraction to solve problems.

CO3: Ability to choose suitable data structures and algorithms, the ADT/libraries, and use it to design algorithms for a specific problem.

CO4: Ability to develop as a competent programmer capable of designing and analyzing Implementation of algorithms and data structures for different kinds of problems..

REFERENCES:

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, the Hardcover edition, Pearson Education, Third Edition, 2006.
2. Mark de Berg, Otfried Cheong, Marc van Kreveld, Mark Overmars,” Computational Geometry” Springer-Verlag, Third Edition, 2008.
3. Knuth, D.A., “The Art of Computer Programming”, Addison-Wesley, Third revised Edition, 2011.
4. Bjarne Stroustrup, “The C++ Programming Language”, Addison-Wesley ISBN 978-0321563842., Fourth Edition, May 2013.
5. A.K. Sharma, “Data Structures using C”, Pearson Education, Fifth edition, 2013.

20IT002	JAVA PROGRAMMING	L	T	P	C
		3	0	0	3

*Common with B.Tech. IT

COURSE OBJECTIVE:

The course will enable the students to learn about the syntax and semantics of Java programming language to write programs using concepts such as variables, conditional and iterative execution methods, Java standard API library, Applets, Event Handling, AWT and helps to understand the underlying principles of inheritance, packages and interfaces.

COURSE CONTENT:

Introduction to Java, Classes and Objects

History and Evolution of Java – Overview – Data Types - Variables - Arrays – Operators - Control Statements – Classes – Fundamentals – Declaring Objects - Assigning Object Reference Variables - Methods – Constructors - this keyword - Garbage collection - finalize method - Stack Class.

Reusability, Packages, Interfaces and Exception Handling

Overloading Methods - Objects as Parameters - Argument Passing - Returning Objects – Recursion - Access Control – Static – Nested and Inner Classes - Command-Line Arguments – Variable Length Arguments. Inheritance – Basics – Super keyword - Multilevel Hierarchy - Method Overriding - Dynamic Method Dispatch - Abstract Classes - final with Inheritance. Packages - Access Protection - Importing Packages – Interfaces. Exception Handling – Multiple catch Clauses- Nested try Statements - Java‘s Built-in Exceptions –User defined Exception – Chained exceptions.

Multithreading, I/O, Applet and String Handling

Java Thread Model - Creating a Thread - Priorities – Synchronization – Inter thread Communication – Suspending - Resuming, and Stopping Threads – Multithreading - Deadlocks. Enumerations - Wrappers – Auto boxing – Annotations. I/O Basics - Reading and Writing Console I/O - PrintWriter Class - Reading and Writing Files - Applet – Architecture – Skeleton – Display methods - Repainting – Applet tag – Passing parameters - transient and volatile modifiers. String Handling – String Class – methods – String Buffer Class – Methods – String Builder.

Generics, Collections and Event Handling

Generics – Example – Parameters - General Form- Bounded Types - Wildcard Arguments - Generic Method and Interfaces – Raw Types and Legacy Code - Generic Class Hierarchies. Collection

Classes – Array List – Linked List – Hash Set and Maps. Event Handling – Mechanisms -Delegation Event Model - Event Classes - Sources of Events - Event Listener Interfaces – Mouse and Keyboard events - Adapter Classes - Inner Classes.

AWT

AWT Classes - Window Fundamentals - Frame Windows - Frame Window in an Applet – Graphics – Color – Fonts - FontMetrics. AWT Controls - Layout Managers - Menu Bars and Menus -Dialog Boxes - FileDialog - Handling Events by Extending AWT Components.

COURSE OUTCOMES:

CO1: Ability to apply the concepts of classes and objects to solve specific problems.

CO2: Ability to write programs using thread, packages and exception handling.

CO3: Ability to write web-based programs using applets.

CO4: Ability to construct the GUI based applications with AWT controls.

REFERENCES:

1. Herbert Schildt, "Java: The Complete Reference", McGraw Hill Professional, 11th Edition, 2018.
2. Cay S. Hortmann, "Core Java Volume – I Fundamentals", Pearson Education, 11th Edition, 2018.
3. Deitel and Deitel, "Java How to Program",Pearson Education India, 10th Edition 2016.
4. Joshua Bloch, "Effective Java", Pearson Education India, 3rd Edition, 2018.
5. Ken Arnold, David Holmes, James Gosling and Prakash Goteti, "The Java Programming Language", Pearson Education India, 2nd Edition, 2009.

20HSG03	HERITAGE OF TAMIL	L	T	P	C
		1	0	0	1

UNIT I (LANGUAGE AND LITERATURE)

Language Families in India – Dravidian Languages – Tamil as aClassical Language – Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature – Management Principles in Thirukural – Tamil Epics and Impact of Buddhism & Jainism in Tamil. Bakthi Literature Azhwars and Nayanmars – Forms of minor Poetry – Development of Modernciliterature in Tamil – Contribution of Bharathiyar and Bharathidhasan.

UNIT II (HERITAGE – ROCK ART PAINTINGS TO MODERN ART – SCULPTURE)

Hero stone to modern sculpture – Bronze icons – Tribes and their handicrafts – Art of temple carmaking – – Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments – Mridhangam, Parai, Veenai, Yazh and Nadhaswaram – Role of Temples in Social and Economic Life of Tamils.

UNIT III (FOLK AND MARTIAL ARTS)

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance – Sports and Games of Tamils.

UNIT IV (THINAI CONCEPT OF TAMILS)

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature – Aram Concept of Tamils – Education and Literacy during Sangam Age – Ancient Cities and Ports of Sangam Age – Export and Import during Sangam Age – Overseas Conquest of Cholas.

UNIT V (CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE)

Contribution of Tamils to Indian Freedom Struggle – The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement – Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

பாடம் : தமிழர்மரபு

பாடக் குறியீடு : 20HSG03

அலகு I (மொழி மற்றும் இலக்கியம்)

இந்தியாவில் உள்ள மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி -– தமிழின் செம்மொழித் தகுதிகள் - சங்க இலக்கியத்தின் மதச்சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம்– திருக்குறளில் மேலாண்மைக் கோட்பாடுகள் – தமிழ் காப்பியங்கள் மற்றும் தமிழில் பௌத்தம் & சமணத்தின் தாக்கம் - பக்தி இலக்கியம் - ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – தமிழில் நவீன இலக்கியம், வளர்ச்சி - பாரதியார் மற்றும் பாரதிதாசன் பங்களிப்பு.

அலகு II (பாரம்பரியம் – பாறை ஓவியங்கள் மற்றும் நவீன கலைகள் – சிற்பம்)

நடுகல் முதல் நவீன சிற்பம் - வெண்கல சின்னங்கள் - பழங்குடியினர் மற்றும் அவர்களின் கைவினைப்பொருட்கள் , பொம்மைகள் -தேர்செய்யும் கலை, சுடுமண் சிற்பங்கள் – நாட்டுப்புற தெய்வங்கள், கன்னியாகுமரியில் திருவள்ளுவர் சிலை - இசைக்கருவிகள் - மிருதங்கம், பாறை, வீணை, யாழ் மற்றும் நாதஸ்வரம் - தமிழர்களின் சமூக மற்றும் பொருளாதார வாழ்வில் கோயில்களின் பங்கு

அலகு III(நாட்டுப்புறக் கலைகள் மற்றும் வீரவிளையாட்டுகள்)

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியன் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம்,வளரி, புலியாட்டம் - தமிழர்களின் விளையாட்டுகள்.

அலகு IV(தமிழர்களின் திணைக்கோட்பாடுகள்)

தமிழர்களின் தாவரங்கள் மற்றும் விலங்கினங்கள் -தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றியஅறக்கருத்து – சங்க காலத்தில் கல்வி மற்றும் எழுத்தறிவு – சங்ககால நகரங்கள் மற்றும் துறைமுகங்கள் - சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V(இந்திய தேசிய இயக்கம் மற்றும் இந்தியப்பண்பாட்டிற்கு தமிழர்களின் பங்களிப்பு)

இந்திய சுதந்திரப் போராட்டத்தில் தமிழர்களின் பங்களிப்பு - இந்தியாவின் சில பகுதிகளில் தமிழர்களின் கலாச்சார தாக்கம் - சுயமரியாதை இயக்கம் - சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள் & கையெழுத்துப் பிரதிகள் – தமிழ் நூல்களின் அச்சு வரலாறு.

20CS003	DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE:

This course will enable the students to gain knowledge about good programming design methods using Top- Down design and to get exposure in implementing the different data structures like sorting, searching and recursive algorithms using C / C++.

COURSE CONTENT:

1. Implementation of Linked List Operations.
2. Implementation of Stack using arrays and Linked list.
3. Implementation of Queue using arrays and Linked list.
4. Implementation of Sorting algorithms.
5. Implementation of Linear search and Binary Search.
6. Implementation of Tree traversal Techniques.
7. Implementation of Depth for Search.
8. Implementation of Breadth first Search.
9. Implementation of Minimum Spanning Trees.
10. Implementation of Shortest Path Algorithms.

COURSE OUTCOMES:

At the end of the course, the students will have the

CO1: Ability to classify the good programming design techniques to solve computational problems.

CO2: Ability to apply appropriate data structures for implementing solutions to real world problems.

CO3: Ability to develop algorithms such as breadth first search, shortest path algorithms for a given problem statement.

CO4: Ability to conduct and investigate appropriate algorithmic techniques to solve computational scenarios.

REFERENCES:

1. Cormen, T.H., Leiserson, C.D., Rivest, R.L. & Stein, C, “Introduction to Algorithms”, MIT Press, Third Edition, 2009.
2. Mark de Berg, Otfried Cheong, Marc van Kreveld, Mark Overmars, ”Computational Geometry” Springer-Verlag, Third Edition, 2008.
3. Knuth, D.A., “The Art of Computer Programming”, Addison-Wesley, Third revised Edition, 2011.
4. Bjarne Stroustrup, “The C++ Programming Language”, Addison-Wesley ISBN 978-0321563842., Fourth Edition, May 2013.
5. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, the Hardcover edition, Pearson Education, Fourth Edition, 2013.

20IT004	JAVA PROGRAMMING LABORATORY	L	T	P	C
		0	0	3	1.5

*Common with B.Tech. IT

COURSE OBJECTIVE:

The course will enable the students to learn the design, implementation, testing, debugging, and documenting of programs using basic data types, I/O statements, conditional and control structures, objects, classes, arrays, strings and functions. It also discuss the principles of inheritance, interface, multithreading, exception handling and packages.

COURSE CONTENT:

List of Experiments

1. Simple java programs using operators, arrays and control statements
2. Develop a stack data structure using class and object
3. Program to demonstrate inheritance & polymorphism
4. Develop an application using interfaces
5. Develop an application using packages
6. Program to illustrate exception handling in java and creation of user defined exception
7. Program to illustrate multithreads and Inter thread Communication
8. Program to implement Deadlock
9. Program to copy the contents of one file into another file.
10. Develop and configure a simple banner applet
11. Program to demonstrate the features of generics types
12. Program to demonstrate the use of ArrayList, LinkedList, HashSet and Map classes.
13. Program to capture the various keyboard and mouse events.
14. Develop a scientific calculator using event-driven programming paradigm of Java
15. Develop a simple text editor with basic file and edit functionalities

COURSE OUTCOMES:

CO1: Ability to write, debug and document well-structured java applications.

CO2: Ability to implement inheritance and polymorphism to solve programming problems.

CO3: Ability to implement the interfaces, exception handling, file operations and multithreading to solve problems.

CO4: Ability to create applets and event driven programming applications

REFERENCES:

1. Herbert Schildt, "Java - The Complete Reference", McGraw Hill Professional, 11th Edition, 2018.
2. Cay S.Hortmann, "Core Java Volume – I Fundamentals", Pearson Education, 11th Edition, 2018.
3. Deitel and Deitel, "Java How to Program", Pearson Education India, 10th Edition 2016.
4. Joshua Bloch, "Effective Java", Pearson Education India, 3rd Edition, 2018.
5. Ken Arnold, David Holmes, James Gosling and Prakash Goteti, "The Java Programming Language", Pearson Education India, 2nd Edition, 2009.

FOURTH SEMESTER SYLLABUS

20MHG04	DISCRETE MATHEMATICS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- To introduce Mathematical Logic, Inference Theory and proof methods.
- To provide fundamental principles of combinatorial counting techniques.
- To introduce graph models, their representation, connectivity and traversability.
- To explain the fundamental algebraic structures, groups and their algebraic properties.
- To provide exposure to the development of the algebraic structures, lattices and Boolean algebra and to demonstrate the utility of Boolean laws.

COURSE CONTENT:

Mathematical Logic **(9+3)**

Propositional logic – Propositional equivalences - Predicates and quantifiers – Nested quantifiers – Rules of inference - Introduction to proofs – Proof methods and strategy.

Combinatorics **(9+3)**

Mathematical induction – Strong induction and well ordering – The basics of counting – The pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications

Graphs **(9+3)**

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths – Trees –Spanning Trees – Minimal Spanning Trees – Dijkstra's Algorithm.

Algebraic Structures **(9+3)**

Algebraic systems – Semi groups and monoids - Groups – Subgroups – Homomorphism's – Normal subgroup and cosets – Lagrange's theorem – Rings and Fields (Definitions and examples).

Lattices and Boolean Algebra **(9+3)**

Partial ordering – Posets – Lattices as posets – Properties of lattices - Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices – Boolean algebra – Minimization of Boolean Expression.

Total: 60 Periods

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Apply appropriate proofing techniques for solving problems involved in real life.

CO2: Analyze the real-life problems by applying graphical, combinatorics and counting techniques.

CO3: Understand the concepts of groups, subgroups, rings and fields.

CO4: Apply the concepts of POSET and Lattice to simplify complex Boolean expressions.

TEXT BOOKS:

1. Rosen, K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2011.
2. Tremblay, J.P. and Manohar.R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.

REFERENCES:

1. Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 4th Edition, Pearson Education Asia, Delhi, 2007.
2. Lipschutz, S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.
3. Koshy, T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.

20IT007	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

*Common with B.Tech. IT

COURSE OBJECTIVE:

The course will enable the students to learn the fundamentals of data models, ER diagrams and to get familiarized with the concepts of transaction processing, concurrency control techniques, recovery procedures, file indexing techniques and advanced databases.

COURSE CONTENT:

Introduction to DBMS

Overview of DBMS- Data Models- Database Languages- Database Administrator- Database Users- Three Schema architecture of DBMS: Basic concepts- Mapping Constraints- Keys. Relational Algebra – Relational Calculus: Domain relational Calculus –Tuple Relational Calculus.

Database Design and SQL

Entity-Relationship Diagram-Design Issues- Weak Entity Sets- and Extended E-R features - Structure of relational Databases- Views- Modifications of the Database- Concept of DDL- DML- TCL - DCL: Basic Structure- Set Operations- Aggregate Functions- Null Values- Domain Constraints- Referential Integrity Constraints- Assertions- Views- Nested Sub Queries- Stored Procedures and Triggers. Functional Dependency- Different Anomalies in designing a Database.- Normalization using Functional Dependencies- Decomposition- Boyce-Codd Normal Form- 3NF- Normalization using Multi-Valued Dependencies- 4NF- 5NF.

Query Processing and Transactions

Database Query Processing - Transactions- Concurrency Control – Recovery System- State Serializability- Lock Based Protocols- Two Phase Locking.

Storage Management and Indexing

Physical Storage Systems: Storage Interfaces – Magnetic Disks – Flash Memory -RAID – Disk block access. Data Storage Structures: Database Storage Architecture - File Organization- Organization of Records in Files – Data Dictionary Storage - Indexing.

Advances in Database

Database System Architectures – Parallel and Distributed Transaction Processing – Complex Data types: Semi structured Data – Spatial Data – Textual Data Big Data – Data Analytics – Blockchain Databases.

COURSE OUTCOMES:

CO1: Ability to describe the components of a database system and give examples of their use.

CO2: Ability to understand the various transaction processing, transaction models, storage management techniques and indexing techniques.

CO3: Ability to understand the advanced databases that are specific to various domains.

CO4: Ability to prepare a relational schema for a conceptual model developed using E-R model.

REFERENCES:

1. Abraham Silberschatz- Henry F. Korth, S. Sudharshan, "Database System Concepts", Tata McGraw Hill, 7th Edition, 2019.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Pearson Education, 7th Edition, 2015.
3. C.J. Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Pearson Education, 8th Edition, 2006.
4. Raghu Ramakrishnan, "Database Management Systems", McGraw-Hill College Publications, 4th Edition, 2015.
5. G.K.Gupta, "Database Management Systems", Tata McGraw Hill, 1st Edition, 2018.
6. Atul Kahate, "Introduction to Database Management Systems", Pearson Education, 1st Edition, 2004.
7. Ivan Bayross, "SQL, PL/SQL the Programming Language of Oracle", BPB Publications, 2010.

20IT008	OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

*Common with B.Tech. IT

COURSE OBJECTIVE:

The course will enable the students to learn the basic components of an operating system, and the interactions among various components in the operating system. The course will cover the policies for scheduling, deadlocks, memory management, synchronization, system calls, and file systems.

COURSE CONTENT:

Operating System Overview

Introduction - Computer System Overview - Basic Elements - Instruction Execution – Interrupts - Memory Hierarchy - Cache Memory - Direct Memory Access - Multiprocessor and Multicore Organization. Operating system overview : objectives and functions - Evolution of Operating System.- Computer System Structure – Operating System Structures : System Components – Operating System Services - System Calls - System Programs – System Structure - OS Generation and System Boot.

Process Management

Process concept – Process Scheduling – Operations on Processes – Inter Process Communication – CPU scheduling – Scheduling criteria – Scheduling algorithms – multi processor scheduling – real time scheduling – Threads overview – multithreading models – threading issues – windows, solaris, linux, android process and thread management – process synchronization – the critical section problem – synchronization hardware – mutex locks – semaphores – classic problems of synchronization – critical regions – monitors- deadlock – system model – deadlock characterization – methods for handling deadlocks – deadlock prevention – deadlock avoidance – deadlock detection – recovery from deadlock.

Storage Management

Main memory : Memory management requirement – Memory Partitioning - Contiguous memory allocation – paging – segmentation – segmentation with paging – 32 and 64 bit architecture examples-Virtual memory: Hardware and Control structures – Operating System software – demand

paging – page replacement algorithms – thrashing – Memory management for UNIX, Solaris, Linux, Windows, Android.

File System

Mass storage system : overview of mass storage structure – disk structure – disk scheduling and management – swap space management – file system interface – file concept – access methods – directory structure – directory organization – file system mounting – file sharing and protection – file system implementation - file system structure – directory implementation – allocation methods – free space management – efficiency and performance –Recovery.

I/O Systems, Protection and Security

I/O systems: I/O hardware – application I/O interface – Kernel I/O subsystem – streams – performance- Protection: Goals – Domain of Protection – Access Matrix – Implementation of Access Matrix – Revocation of Access Rights – Capability based systems – Language based Protection-Security: The security problem – User authentication – Program threats- System threats – Securing system and facilities.

COURSE OUTCOMES:

CO1: Ability to describe the difference between processes and threads.

CO2: Ability to describe the concept of virtual memory and main memory.

CO3: Ability to explain the mechanisms in an OS to control access to resources.

CO4: Ability to compare and contrast the scheduling algorithms and file organizations.

REFERENCES:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, John Wiley and Sons Inc., 8th Edition, 2017.
2. William Stallings, “Operating Systems - Internals and Design Principles”, Pearson Education India 9th Edition, 2018.
3. Andrew S Tanenbaum, “Modern Operating Systems”, PHI, 4th Edition, 2016.
4. Ramaz Elmasri, A.Gil Carrick, David Levine, “Operating Systems - A spiral approach”, Tata McGraw Hill, 2010.
5. Achyut S.Godbole, Atul Kahate, “Operating Systems”, McGraw Hill Education, 3rd Edition 2010.

20CS004	SOFTWARE ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

The course will enable the students with the understanding of software engineering processes such as requirement modeling, design, testing etc. and experiential learning opportunities to apply that knowledge to solve real-world problems.

COURSE CONTENT:

Software Process and Agile Development

Introduction to Software Engineering – Process Model: Perspective process models- Specialized process models- The unified process - Personal and Team Process Models- Agile Process- Extreme Programming- Other Agile Process Models.

Requirements Modeling

Requirements Engineering - Eliciting Requirements - Developing Use Cases - Building the Requirements Model – Validating Requirements – Requirement Analysis – Scenario based Modeling – Data Modeling Concepts – Class based Modeling – Requirements Modeling Strategies – Flow Oriented Modeling – Patterns for Requirements Modeling.

Design Concepts

The Design Process - Design Concepts - The Design Model - Architectural Styles - Architectural Design - Component-Level Design: Designing Class-Based Components- Designing Traditional Components- Component based Development - User Interface Design: The Golden Rules - User Interface Analysis and Design- Interface Analysis - Interface Design Steps - Design Evaluation – Design Patterns.

Testing

Software Testing Fundamentals - Internal and External Views of Testing - White-Box Testing - Basis Path Testing - Control Structure Testing - Black-Box Testing - Software Testing Strategies**:** Strategic Issues - Test Strategies for Conventional Software - Validation Testing - System Testing - The Art of Debugging.

Project Management

Software Project Estimation - Decomposition Techniques - Empirical Estimation Models- The Make/Buy Decision - Project Scheduling – Scheduling - Earned Value Analysis - Risk Management: Risk Identification - Risk Projection - Risk Refinement - Risk Mitigation, Monitoring, and Management - The RMMM Plan.

COURSE OUTCOMES:

CO1: Ability to understand the various software process models.

CO2: Ability to apply the requirement specifications and appropriate software design methodology for a given scenario.

CO3: Ability to compare and contrast various testing measures.

CO4: Ability to estimate the cost for the scheduled project.

REFERENCES:

1. Roger S Pressman, Bruce R Maxim, "Software Engineering - A Practitioner's Approach", McGraw-Hill Education, 8th Edition, 2019.
2. Ian Sommerville, "Software Engineering", Pearson Education Asia, 10th Edition, 2017.
3. Rajib Mall, "Fundamentals of Software Engineering", PHI Learning, 4th Edition, 2014
4. Pankaj Jalote, "Software Engineering: A Precise Approach", Wiley India, 2010.
5. Shari Lawrence Pfleeger, "Software Engineering Theory and Practice", Pearson Education, 4th Edition, New Delhi, 2009.

20CS005	ANALYSIS OF ALGORITHMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

This course will enable the students to learn different algorithm design techniques, analysis of time and space efficiency of algorithms, sorting, searching, elements of dynamic programming, Greedy algorithms and computational complexity (including lower bounds and NP-completeness)

COURSE CONTENT:

Algorithm Analysis

Role of algorithms in computing - Fundamentals of the Analysis of Algorithm Efficiency-Analysis Framework - Asymptotic Notations and its properties - Mathematical analysis for Recursive and Non-recursive algorithms - Empirical analysis of algorithm-Brute force approaches (sorting and searching)

Divide and Conquer

Divide and Conquer Strategy - Merge sort - Quick sort - Binary search - Multiplication of Large Integers and Strassen's Matrix Multiplication - Closest-Pair and Convex-Hull Problems

Dynamic Programming

Concept of Dynamic programming – Principle of optimality- Optimal binary search trees-Knapsack problem and Memory functions- Warshall's and Floyd's algorithm.

Greedy Method and Backtracking

Introduction to Greedy Method- Prims Algorithms - Kruskal's Algorithm - Dijkstra's Algorithm - Huffman Trees and Codes- Backtracking: n - Queens Problem, Hamiltonian Circuit Problem, Subset Sum Problem

Branch and Bound Technique and Limitations of Algorithm

Branch and Bound algorithm concept **-** Assignment Problem - Knapsack Problem - Travelling Salesman Problem - P, NP, NP-Complete Problems-Approximation Algorithms for *NP*-Hard Problems: Traveling Salesman Problem, Knapsack Problem

COURSE OUTCOMES:

At the end of the course, the students will have the

CO1: Ability to define rigorous correctness proofs for algorithms.

CO2: Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs.

CO3: Ability to apply appropriate algorithm design techniques for solving problems.

CO4: Ability to analyze the time and space complexity of algorithms.

REFERENCES:

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2017.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Computer Algorithms/ C++", Second Edition, Universities Press, 2007.
3. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.
4. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
5. Harsh Bhasin, "Algorithms Design and Analysis", Oxford university press, 2016.
6. S. Sridhar, "Design and Analysis of Algorithms", Oxford university press, 2014.

20AC002	CONSTITUTION OF INDIA	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

To enable the students to understand the Historical Background of Indian constitution as well as to interpret the Fundamental Duties and its legal status. It further enables them to understand the Scope of the Right to Life and Personal Liberty.

COURSE CONTENT

Historical perspective of the Constitution of India

Meaning of the constitution law and constitutionalism - Historical perspective of the Constitution of India - Salient features and characteristics of the Constitution of India

Fundamental rights and legal status

Scheme of the fundamental rights - The scheme of the Fundamental Duties and its legal status - The Directive Principles of State Policy – Its importance and implementation

The constitution powers

Federal structure and distribution of legislative and financial powers between the Union and the States - Parliamentary Form of Government in India – The constitution powers and status of the President of India - Amendment of the Constitutional Powers and Procedure

Constitutional amendments

The historical perspectives of the constitutional amendments in India - Emergency Provisions: National Emergency, President Rule, Financial Emergency - Local Self Government – Constitutional Scheme in India

Right to Life and Personal Liberty

Scheme of the Fundamental Right to Equality - Scheme of the Fundamental Right to certain Freedom under Article 19 - Scope of the Right to Life and Personal Liberty under Article 21

COURSE OUTCOMES:

At the end of the course, the student will have the

CO1: Ability to understand and abide by the rules of the Indian constitution.

CO2: Ability to comprehend the constitutional rights & fundamental rights.

CO3: Ability to understand the form of Government in India.

CO4: Ability to comprehend the Parliamentary System and the Constitutional Scheme in India.

REFERENCES:

1. Basu D D, Introduction to the Constitution of India, Lexis Nexis, 2015.
2. Busi S N, Ambedkar B R framing of Indian Constitution, First Edition, 2015.
3. Granville Austin, Working Democratic Constitution: The Indian Experience, Oxford Publication. 2003.
4. Jain M P, Indian Constitution Law, Seventh Edition, Lexis Nexis, 2014.
5. The Constitution of India (Bare Act), Government Publication, 1950.

20HSG04	TAMILS AND TECHNOLOGY	L	T	P	C
		1	0	0	1

UNIT I (WEAVING AND CERAMIC TECHNOLOGY)

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II (DESIGN AND CONSTRUCTION TECHNOLOGY)

Designing and Structural construction House & Designs in household materials during Sangam Age – Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram – Sculptures and Temples of Mamallapuram – Great Temples of Cholas and other worship places – Temples of Nayaka Period – Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal – Chetti Nadu Houses, Indo – Saracenic architecture at Madras during British Period.

UNIT III (MANUFACTURING TECHNOLOGY)

Art of Ship Building – Metallurgical studies – Iron industry – Iron smelting, steel -Copper and goldCoins as source of history – Minting of Coins – Beads making-industries Stone beads -Glass beads – Terracotta beads -Shell beads/ bone beats – Archeological evidences – Gem stone types described in Silappathikaram.

UNIT IV (AGRICULTURE AND IRRIGATION TECHNOLOGY)

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry – Wells designed for cattle use – Agriculture and Agro Processing – Knowledge of Sea – Fisheries – Pearl – Conche diving – Ancient Knowledge of Ocean – Knowledge Specific Society.

UNIT V (SCIENTIFIC TAMIL & TAMIL COMPUTING)

Development of Scientific Tamil – Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

அலகு I (நெசவு மற்றும் பானைத் தொழில்நுட்பம்)

சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு மற்றும் சிவப்பு பாத்திரங்கள் (BRW) - மட்பாண்டங்கள் மீது கீரல் குறியீடு

அலகு II (வடிவமைப்பு மற்றும் கட்டுமான தொழில்நுட்பம்)

சங்க காலத்தில் வீட்டு உபயோகப் பொருட்களில் வடிவமைத்தல் மற்றும் கட்டமைப்பு,கட்டுமானங்கள் - கட்டிட பொருட்கள் மற்றும் சங்க காலத்து நடுகற்கள் - சிலப்பதிகாரத்தில் கட்டப்பட்ட கட்டங்களின் விவரங்கள் - மாமல்லபுரத்தில் உள்ள சிற்பங்கள் மற்றும் கோவில்கள் - சோழர்களின் பெரிய கோவில்கள் மற்றும் பிற வழிபாட்டு தலங்கள் - நாயக்கர் கால கோவில்கள் - வகை ஆய்வு (மதுரை மீனாட்சி கோயில்)- திருமலை நாயக்கர் மஹால் - செட்டி நாடு வீடுகள், ஆங்கிலேயர் காலத்தில் சென்னையில் உள்ள இந்தோ - சரசெனிக் கட்டிடக்கலை.

அலகு III (உற்பத்தி தொழில்நுட்பம்)

கப்பல் கட்டும் கலை - உலோகவியல் ஆய்வுகள் - இரும்புத் தொழில் - இரும்பு உருக்குதல், எஃகு - வரலாற்றின் ஆதாரமாக தாமிரம் மற்றும் தங்க நாணயங்கள் - அச்சிடுதல் - மணிகள் செய்யும் தொழில்கள், கல் மணிகள் - கண்ணாடி மணிகள் - டெரகோட்டா மணிகள் - சங்கு மணிகள் / எலும்புத்துண்டுகள் - தொல்பொருள் சான்றுகள் - சிலப்பதிகாரத்தில் விவரிக்கப்பட்டுள்ள மணிகள் .

அலகு IV (வேளாண்மை மற்றும் நீர்ப்பாசன தொழில்நுட்பம்)

அணை, தொட்டி, குளங்கள், மதகு, சோழர் கால குமிழி தூம்பு முக்கியத்துவம், கால்நடை பராமரிப்பு - கால்நடைகள் பயன்படுத்த வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மை சார்ந்த தொழில்நுட்பம் - கடல் சார் அறிவு - மீன்வளம் - முத்து - சங்கு அறுத்தல் - கடல் பற்றிய பண்டைய அறிவு - கடல் குறிப்பிட்ட அறிவு சார் உலகம்.

அலகு V (அறிவியல் தமிழ் & கணினி தமிழ்)

அறிவியல் தமிழ் மற்றும் கணினி தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென்பொருள் உருவாக்கம் – தமிழ் மெய்நிகர் அகாடமி – தமிழ் மின்நூலகம் – இணைய தமிழ் அகராதிகள் – சொற்குவை திட்டம்.

20IT009	DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C
		0	0	3	1.5

COURSE CONTENT:

1. Creation of a database and write SQL queries to retrieve information from the database.
2. Perform Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.
3. Creation of a database using views, synonyms, sequences and indexes
4. Creation of a database using Commit, Rollback and Save point.
5. Creation of a database to set various constraints.
6. Creating relationship between the databases.
7. Write PL/SQL block to by accepting input from the user and handling exceptions.
8. Creation of Procedures.
9. Creation of functions.
10. Mini project (Application Development using Oracle/ MySQL)
    a) Inventory Control System.
    b) Material Requirement Processing.
    c) Hospital Management System.
    d) Railway Reservation System.
    e) Personal Information System.
    f) Web Based User Identification System.
    g) Timetable Management System.
    h) Hotel Management System

20IT010	OPERATING SYSTEMS LABORATORY	L	T	P	C
		0	0	3	1.5

List of Experiments:

1. Basics of UNIX commands
2. Write programs using system calls of UNIX operating system.
3. Write C programs to simulate UNIX commands.
4. Shell Programming.
5. Implementation of various CPU Scheduling Algorithms.
6. Implementation of Semaphores.
7. Implementation of Shared memory and IPC.
8. Implementation of Bankers Algorithm for Deadlock Avoidance.
9. Implementation of Deadlock Detection Algorithm.
10. Program to Implement Threading and Synchronization Applications.
11. Implementation of various Memory Allocation Methods for fixed partition.
12. Implementation of Paging Technique of Memory Management.
13. Implementation of the various Page Replacement Algorithms.
14. Implementation of the various File Organization Techniques.
15. Implementation of the various File Allocation Strategies.

COURSE OUTCOMES:

CO1: Ability to compare the performance of various CPU Scheduling Algorithms

CO2: Ability to implement semaphores, deadlock detection and avoidance algorithms.

CO3: Ability to analyze the performance of the various Page Replacement Algorithms.

CO4: Ability to Implement File Organization and File Allocation Strategies.

REFERENCES:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, John Wiley and Sons Inc., 8th Edition, 2014.
2. William Stallings, “Operating Systems - Internals and Design Principles”, Pearson Education India 9th Edition, 2018.
3. Andrew S Tanenbaum, “Modern Operating Systems”, PHI, 4th Edition, 2015.
4. Ramaz Elmasri, A.Gil Carrick, David Levine, “Operating Systems - A spiral approach”, Tata McGraw Hill, 2010.

5. Achyut S.Godbole, Atul Kahate, “Operating Systems”, McGraw Hill Education, 3rd Edition 2010.

V SEMESTER
SYLLABUS

20CS006	THEORY OF COMPUTATION	L	T	P	C
		3	1	0	4

COURSE OBJECTIVE:

This course will enable the students to learn the basic concepts of computing models like Finite State Machine, Pushdown Automata and Turing Machine, decidability and decidability conditions of various automata problems.

COURSE CONTENT:

Finite Automata

Alphabets - Strings and Languages - Automata and Grammars - Deterministic Finite Automata (DFA) - Formal Definition - Simplified notation: State transition graph - Transition table - Language of DFA - Nondeterministic Finite Automata (NFA) - NFA with epsilon transition - Language of NFA - Equivalence of NFA and DFA - Minimization of Finite Automata - Distinguishing one string from other.

Regular Expression

Definition - Operators of regular expression and their precedence - Algebraic laws for Regular expressions - Kleene's Theorem - Regular expression to FA - DFA to Regular expression - Arden Theorem - Non Regular Languages - Pumping Lemma for Regular Languages. Application of Pumping Lemma - Closure properties of Regular Languages - Decision properties of Regular Languages - FA with output: Moore and Mealy machine - Equivalence of Moore and Mealy Machine - Applications and Limitation of FA.

Grammars

Grammar Introduction– Types of Grammar - Context Free Grammars and Languages– Derivations and Languages – Ambiguity- Relationship between derivation and derivation trees – Simplification of CFG – Elimination of Useless symbols - Unit productions - Null productions – Greibach Normal form – Chomsky Normal form – Problems related to CNF and GNF

Push Down Automata

Description and definition - Instantaneous Description - Language of PDA - Acceptance by Final state - Acceptance by empty stack - Deterministic PDA - Equivalence of acceptance by empty stack and final state - Conversion of CFG to PDA and PDA to CFG.

Turing Machines & Undecidability

Basic model - definition and representation - Instantaneous Description - Language acceptance by TM - Variants of Turing Machine - TM as Computer of Integer functions - Universal TM - Church's Thesis - Recursive and recursively enumerable languages - Halting problem - Introduction to undecidability - undecidable problems about TMs - Post correspondence problem (PCP) - Modified PCP and undecidable nature of Post correspondence problem

COURSE OUTCOMES:

At the end of the course, the students will have the

CO1: Ability to recall Finite Automata for Regular expressions and languages.

CO2: Ability to understand Context Free Grammar for computational languages.

CO3: Ability to interpret the automata theory for real world problems.

CO4: Ability to illustrate solutions for computational problems utilizing Push Down Automata and Turing Machines.

REFERENCES:

1. Hopcroft J.E., Motwani R. and Ullman J.D, "Introduction to Automata Theory, Languages and Computations", Second Edition, Pearson Education, 2008. (UNIT 1,2,3)
2. John C Martin, "Introduction to Languages and the Theory of Computation", Third Edition, Tata McGraw Hill Publishing Company, New Delhi, 2007. (UNIT 4,5)
3. Mishra K L P and Chandrasekaran N, "Theory of Computer Science – Automata, Languages and Computation", Third Edition, Prentice Hall of India, 2004.
4. Harry R Lewis and Christos H Papadimitriou, "Elements of the Theory of Computation", Second Edition, Prentice Hall of India, Pearson Education, New Delhi, 2003.
5. Peter Linz, "An Introduction to Formal Language and Automata", Third Edition, Narosa Publishers, New Delhi, 2002.
6. Michel Sipser, "Introduction of the Theory of Computation", Thompson Brokecole, 1997.

20CS007	OBJECT ORIENTED ANALYSIS AND DESIGN	L	T	P	C
		3	0	0	3

*Common with B.Tech. IT

COURSE OBJECTIVE

The course will enable the students to learn the fundamentals of object modeling, UML diagrams, software design and requirement specification.

COURSE CONTENT

Introduction

An overview of Object Oriented Systems Development- Unified Approach – Object basics – Object state and properties – Behavior – Methods – Messages – Encapsulation - Information hiding – Class hierarchy – Relationships – Associations – Aggregations- Identity – Dynamic binding – Persistence – Meta classes – Object oriented system development life cycle – Software development process- Building high quality Software -Object Oriented System Development: A Use case driven approach- Reusability.

Object-Oriented Methodologies

Rumbaugh Methodology – Booch Methodology – Jacobson Methodology – Patterns – Frameworks – Unified Approach – Unified Modeling Language – Use case – class diagram – Interactive Diagram – Package Diagram – Collaboration Diagram – State Diagram – Activity Diagram.

Object-Oriented Analysis

Identifying use cases – Object Analysis – Classification – Noun phrase approach-Common class pattern approach- use case driven approach- Classes, responsibilities and Collaborators-Naming classes-Identifying Object relationships, Attributes and Methods.

Object-Oriented Design

Object oriented Design process and Design axioms – Micro level process-purpose of view layer interface-Prototyping the user interface.

Software Quality and Reusability

Software Quality assurance – Testing strategies – Object orientation testing – Test cases – Test Plan – Debugging principles – Usability – Satisfaction – Usability testing – Satisfaction testing.

COURSE OUTCOMES:

CO1: Ability to decompose a problem domain into classes of objects having related state and behavior.

CO2: Ability to draw UML diagrams for applications.

CO3: Ability to apply appropriate design patterns.

CO4: Ability to compare and contrast various testing techniques

REFERENCES:

1. Ali Bahrami, "Object Oriented System Development", Tata McGraw Hill Edition, 2017.
2. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education, 2nd Edition, 2015.
3. Craig Larman, "Applying UML and Patterns: An Introduction to Object Oriented Analysis and Design and Iterative Development", Pearson Education, 3rd Edition, 2017.
4. Martin Fowler, "UML Distilled A Brief Guide to Standard Object Modeling Language", 3rd Edition, Pearson Education, 2015.
5. Russ Miles, Kim Hamilton, "Learning UML 2.0: A Pragmatic Introduction to UML", O'Reilly, 2008.

20CS008	DESIGN OF COMPUTER NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

This course will enable the students to learn the basic concepts in network architecture, routing, Internet Protocol, multicasting, the application layer protocols and to analyze the functioning of end to end data delivery.

COURSE CONTENT:

Introduction

Building a network – Requirements - Layering and protocols - Internet Architecture – Performance metrics – Topology Design.

Link Layer and Media Access Control

Link layer Services - Framing - Error Detection - Flow control - Media access control – LAN and WAN - IEEE LAN Standards, Logical Link Control protocols, HDLC- ALOHA, SLOTTED ALOHA, FDDI and Client Server model - Wireless LANs – 802.11 – Switching and bridging.

Network Layer Level Services

Basic Internetworking (IP, CIDR, ARP, DHCP, ICMP) - Routing (RIP, OSPF, metrics) – Global Internet (Areas, BGP, IPv6), Multicast – addresses – multicast routing (DVMRP, PIM).

Transport Layer Services

Overview of Transport layer - UDP - Reliable byte stream (TCP) - Connection management - Flow control - Retransmission – TCP Congestion control - Congestion avoidance (DEC bit, RED).

Application Layer Services

Traditional applications -Electronic Mail (SMTP, POP3, IMAP, MIME) – HTTP – DNS-SNMP.

COURSE OUTCOMES:

At the end of the course, the students will have the

CO1: Ability to define a variety of networking terminologies.

CO2: Ability to understand the basic layers and its functions in computer networks.

CO3: Ability to interpret the working of various layer network protocols.

CO4: Ability to analyze and implement routing algorithms such as distance vector, link state routing algorithms.

REFERENCES:

1. Larry L. Peterson, Bruce S. Davis, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc, 2012. (UNIT 1-5).
2. Behrouz A. Forouzan, “Data communication and Networking”, Fourth Edition, Tata McGraw–Hill, 2011
3. Nader. F. Mir, “Computer and Communication Networks”, Pearson Prentice Hall Publishers, 2010.

4. James F. Kurose, Keith W. Ross, “Computer Networking - A Top-Down Approach Featuring the Internet”, Fifth Edition, Pearson Education, 2009.
5. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, “Computer Networks: An Open Source Approach”, McGraw Hill Publisher, 2011.

20CS009	ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	1	0	4

COURSE OBJECTIVE:

This course will enable the students to gain knowledge about the logical implications in intelligence and the techniques of knowledge representation and to explore the adaption of artificial intelligence techniques in real-time scenarios.

COURSE CONTENT:

Introduction

Foundations of Artificial Intelligence - History of AI - Intelligent Agent: Agents and Environments - Good Behavior: The Concept of Rationality - The Nature of Environments - The Structure of Agents.

Problem Solving by Searching

Solving Problem by Searching: Problem Solving by Search – Uninformed Search:- Breadth-first search, Uniform-cost search, Depth-first search, Bidirectional Search Informed Search: Greedy best-first search – A* Search – Memory-bounded heuristic search

Reasoning and Planning

Logical Agent: Logic-Proposition Logic – Syntax and Semantics – Theorem Proving – Model Checking- Inference in First Order Logic: Forward Chaining – Backward Chaining – Resolution.

Knowledge Representation

Knowledge Representation Issues – Approaches for Knowledge Representation: Simple Relational Knowledge – Inherited Knowledge

Learning

Learning from Examples: Forms of Learning. supervised Learning- Decision Trees – Regression and classification with linear models. Unsupervised Learning:- K means- Reinforcement Learning: Active :Q Learning – Passive: Temporal-difference learning

COURSE OUTCOMES:

At the end of the course, the student will have the

CO1: Ability to define the basic concepts of Artificial Intelligence.
CO2: Ability to understand appropriate search algorithms for any AI problem.
CO3: Ability to apply knowledge representation techniques in Artificial Intelligence.
CO4: Ability to analyze the various techniques in real world applications.

REFERENCES:

1. Stuart J. Russell, Peter Norvig, “Artificial Intelligence - A Modern Approach”, Third Edition, Pearson Publishers, 2015.
2. Elaine Rich, Kevin Knight, Shivashankar B. Nair, “Artificial Intelligence”, Third Edition, Tata McGraw-Hill Education, 2008.
3. Dr. S N Sivanandam, Dr. M Paulraj,” Introduction to Artificial Neural Networks”,Vikas Publishing House, India-2014.
4. Steven Bird, Ewan Klein and Edward Loper, “Natural Language Processing with Python”, O’Reilly, 2009, https://www.nltk.org/book/.
5. Nils J. Nilsson, “Artificial Intelligence: A New Synthesis”, Morgan Kaufmaan Publishers Inc; Second Edition, 2003.
6. David L. Poole and Alan K. Mackworth, ―Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.

Online Resources:

1. NPTEL, “Artificial Intelligence”, http://nptel.ac.in/courses/106105079/2.
2. Udacity, “Introduction to Artificial Intelligence”, https://in.udacity.com/course/intro-toartificial-intelligence--cs271.
3. https://www.coursera.org/learn/introduction-to-ai#syllabus

20CS010	NETWORKS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE:

This course will enable the students to implement various network topologies, to implement internetworking using simulation tools and to compare the performance of LAN protocols.

COURSE CONTENT:

1. Design and configuration of network topologies using simulation tools.
2. Simulation of ARP/RARP protocol.
3. Implementation of applications that use TCP as network layer protocol.
4. Implementation of applications that use UDP in network layer protocol.
5. Performance comparison of LAN protocols.
6. Simulation of Congestion control algorithm using network simulation tools.
7. Implementation of Remote Procedure Call.

COURSE OUTCOMES:

At the end of the course, the student will have the

CO1: Ability to define the control parameters to enable the communication between client and the server.

CO2: Ability to describe the different types of protocols employed in the layers of networking architecture.

CO3: Ability to simulate network routing algorithms to enhance Internet communication.

CO4: Ability to demonstrate the usage of various network protocols using simulation tools.

References:

1. Elliotte Rusty Harold, "Java Network Programming", 4th Edition, O'Reilly.
2. Teerawat Issariyakul, Ekram Hossain, "Introduction to Network Simulator", Springer, Second Edition.
3. Nader. F. Mir, "Computer and Communication Networks", Pearson Prentice Hall Publishers, 2010.
4. James F. Kurose, Keith W. Ross, "Computer Networking - A Top-Down Approach Featuring the Internet", Fifth Edition, Pearson Education, 2009.
5. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", McGraw Hill Publisher, 2011.

20CS011	CASE TOOLS LABORATORY	L	T	P	C
		0	0	3	1.5

*Common with B.Tech. IT

COURSE OBJECTIVE:

The course will enable the students to learn the basics of object-oriented analysis and design, UML design diagrams and various testing techniques.

COURSE CONTENT:

List of Experiments

1. To develop a mini-project by following the exercises listed below.
2. Formulate a problem statement.
3. Identify Use Cases and develop the Use Case model.
4. Identify the conceptual classes and develop a domain model with UML Class diagram.
5. Using the identified scenarios, find the interaction between objects and represent those using UML Sequence diagrams.
6. Draw relevant state charts, activity diagrams, component and deployment diagrams.
7. Identify the User Interface, Domain objects, and Technical services. Draw the partial layered, Logical architecture diagram with UML package diagram notation.
8. Develop and test the Technical services layer.
9. Develop and test the Domain objects layer.
10. Develop and test the User interface layer.

Suggested domains for Mini-Project

- Passport automation system
- Book bank
- Exam Registration
- Stock maintenance system.
- Online course reservation system
- E-ticketing
- Software personnel management system
- Credit card processing
- E-book management system
- Recruitment system
- Foreign trading system

- Conference Management System
- BPO Management System
- Library Management System
- Student Information System

COURSE OUTCOMES:

CO1: Ability to write software requirement specification.

CO2: Ability to use the UML analysis and design diagrams.

CO3: Ability to apply appropriate design patterns.

CO4: Ability to create code from design.

REFERENCES:

1. Ali Bahrami, "Object Oriented System Development", Tata McGraw Hill Edition, 2017.
2. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education, 2nd Edition, 2015.
3. Craig Larman, "Applying UML and Patterns: An Introduction to Object Oriented Analysis and Design and Iterative Development", Pearson Education, 3rd Edition, 2017.
4. Martin Fowler, "UML Distilled A Brief Guide to Standard Object Modeling Language", 3rd Edition, Pearson Education, 2015.
5. Russ Miles, Kim Hamilton, "Learning UML 2.0: A Pragmatic Introduction to UML", O'Reilly, 2008.

VI SEMESTER
SYLLABUS

20CS012	PRINCIPLES OF COMPILER DESIGN	L	T	P	C
		3	1	0	4

COURSE OBJECTIVE:

This course will enable the students to learn the basic concepts of compiler, various parsing techniques, and different levels of translation and to gain knowledge on code optimization and machine code generation.

COURSE CONTENT:

Introduction

Language processors - The Structure of a Compiler-Need and Role of Lexical Analyzer, Lexical Errors, Input Buffering Expressing Tokens by Regular Expressions, Converting regular expression to DFA, Minimization of DFA, Language for Specifying Lexical Analyzers, LEX-Design of Lexical Analyzer for a sample Language.

Parsing Techniques

Need and Role of the Parser-Context Free Grammars, Top Down Parsing -General Strategies, Recursive Descent Parser - Predictive Parser-LL(1) Parser, Bottom up Parsing – ShiftReduce Parser-LR Parser - LR (0)Item, Construction of SLR Parsing Table. Introduction to Canonical LR(1) and LALR Parser – operator Precedence Parsing - Error Handling and Recovery in Syntax Analyzer, YACC-Design of a syntax Analyzer for a Sample Language.

Intermediate Code Generation

Syntax Directed Definitions – Evaluation order for SDD - Intermediate Code Generation – Three address code Types and Declarations - Type Systems -Specification of a simple type checker, Equivalence of Type Expressions, Type Conversions.

Run Time Storage Allocation and Code Generation

Source Language Issues-Storage Organization- Storage Allocation-Parameter Passing, Symbol Tables - Dynamic Storage Allocation- Code Generation -Issues in Design of a Code Generator.

Code Optimization

Basic blocks and Flow Graphs Optimization of Basic Blocks - DAG, Optimization of Basic Blocks -Principal Sources of Optimization - Data Flow Analysis.

COURSE OUTCOMES:

At the end of the course, the students will have the

CO1: Ability to recall the concepts of lexical, syntactic and semantic structures in programming languages.

CO2: Ability to understand Intermediate code during compilation process.

CO3: Ability to apply suitable parsing techniques to generate syntax trees.

CO4: Ability to analyse various code generation and optimization techniques.

REFERENCES:

1. Alfred V Aho, Monica S.Larn Ravi Sethi and Jeffrey D Ullman, "Compilers - Principles, Techniques and Tools", 2nd Edition, Pearson Education, 2007.
2. Randy Allen, Ken Kennedy, “Optimizing Compilers for Modern Architectures: A Dependence-based Approach”, Morgan Kaufmann Publishers, 2002.
3. Steven S. Muchnick, “Advanced Compiler Design and Implementation, “Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.
4. Keith D Cooper and Linda Torczon, “Engineering a Compiler”, Morgan Kaufmann Publishers Elsevier Science, 2004.
5. Charles N. Fischer, Richard. J. LeBlanc, “Crafting a Compiler with C”, Pearson Education, 2008.

20CS013	FULL STACK PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

This course will enable the students to learn the basics of HTML5 CSS3 and JavaScript essential for website development and also to gain knowledge on PHP, Java Servlet and XML essential for the development of dynamic websites.

COURSE CONTENT:

Introduction to World Wide Web and HTML5

Web Basics – Multitier Application Architecture – Client-Side Scripting versus Server-Side Scripting – W3C – **HTML5:** Introduction – Editing HTML5 – W3C Validation service – Headings – Linking – Images – Special Characters – Horizontal Rules – List - Tables – Forms – Form Input Types – meta elements – Page structure elements

Cascaded Style Sheets

Introduction – Inline styles – Embedded styles – linking external styles – Conflicting styles – Absolute and Relative Positional Elements – Backgrounds – Box Model – Text flow – Media Types – Media queries – Text shadows – Rounded corners – linear gradient – radial gradient – Image borders – Animation; Selectors – Transitions and Transformations

Client-Side Programming: JavaScript

Displaying a line of Text – User input with prompt dialogs – Arithmetic – Control Statements – if, if- else, while – for – switch – do…while – break and Continue – logical operators – Function Definitions – Scope Rules – Global functions – Declaring and Allocating Arrays - Example Arrays – Introduction to JavaScript Objects – Math Object – String Object – Date Object – document Object – Modelling a Document: DOM Nodes and Trees – Traversing and Modifying DOM Tree - load Event – Event mousemove and the event Object – Form processing with Events – Event Bubbling

Server-Side Programming: Java Servlets

Revisiting Java – Servlet Life cycle – Parameter Data – Sessions – Cookies – URL Rewriting - XML Basics – Structuring Data – XML Namespaces – W3C XML Schema Documents.

Server-Side Programming: PHP

Introduction – Converting between data types – Operators – Arrays – String Comparison – Regular Expression – Form Processing and Business Logic – Reading from a database – Using Cookies – Ajax web Application – Ajax example using XMLHttpRequest Object.

COURSE OUTCOMES:

At the end of the course , the student will have the

CO1: Ability to remember the structure of web programming languages.

CO2: Ability to understand the working principles of Client side and server side scripting languages.

CO3: Ability to develop static and interactive web pages with latest W3C standards.

CO4: Ability to design dynamic web page / web application with database access and session management.

REFERENCES:

1. Deitel and Deitel and Nieto, “Internet and World Wide Web - How to Program”, Prentice Hall, 5th Edition, 2012.
2. Jeffrey C. Jackson, Web Technologies A Computer Science Perspective, 1st edition, Pearson Education, 2011
3. Chris Bates, Web Programming: Building Internet Applications, 3rd Edition, Wiley India Pvt. Limited, 2007
4. Robert W. Sebesta, Programming the World Wide Web, 7th Edition, Pearson, 2013
5. Eric Freeman, Elisabeth Robson, Head First HTML5 Programming, Building Web Apps with JavaScript, 1st Edition, O'Reilly Media, Incorporated, 2011
6. Jason Hunter, William Crawford, Java Servlet Programming, 2nd Edition, O'Reilly Media, 2010

20CS014	COMPILER DESIGN LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE:

This course will enable the students to learn the basic techniques of compiler construction and also to design and implement language processors using C and Lex tools.

LIST OF EXPERIMENTS:

1. Design a lexical analyser for given language which ignore spaces, tabs and new lines. Syntax specification states that identifiers can be arbitrarily long. Simulate the program using C.
2. Write a program to recognize strings under 'a', 'a*b+', 'abb'.
3. Implement the lexical analyzer using JLex/YACC/Flex
   a. Write a LEX program to convert the substring abc to ABC from the given input string.
   b. Write a LEX program to find out total number of vowels, and consonants from the given input string.
4. Write a program for implementing the functionalities of Predictive parser.
5. Design a bottom up parser for the given language.
6. Convert the BNF rules into YACC form and write code to generate abstract syntax tree
7. Write a program to generate machine code from abstract syntax tree generated by the parser.
8. Generate three address code for a simple program using LEX and YACC.
9. Implement code optimization techniques (constant folding, strength reduction and algebraic transformation).
10. Implement back-end of the compiler for which the three address code is given as input and the 8086 assembly language code is produced as output.

COURSE OUTCOMES:

At the end of the course, the student will have the

CO1: Ability to debug programs using lex and YACC compiler.

CO2: Ability to construct parse tree using top-down and bottom-up parsing techniques.

CO3: Ability to generate and optimize assembly language codes.

CO4: Ability to implement lexical analyzer using LEX and YACC

REFERENCES:

1. Alfred V Aho, Monica S.Larn Ravi Sethi and Jeffrey D Ullman, "Compilers - Principles, Techniques and Tools", 2nd Edition, Pearson Education, 2007.
2. Randy Allen, Ken Kennedy, “Optimizing Compilers for Modern Architectures: A Dependence-based Approach”, Morgan Kaufmann Publishers, 2002.
3. Steven S. Muchnick, “Advanced Compiler Design and Implementation, “Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.
4. Keith D Cooper and Linda Torczon, “Engineering a Compiler”, Morgan Kaufmann Publishers Elsevier Science, 2004.
5. Charles N. Fischer, Richard. J. LeBlanc, “Crafting a Compiler with C”, Pearson Education, 2008.

20CS015	FULL STACK PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE:

This course will enable the students to learn Front end and back end programming and to develop dynamic and interactive websites / web applications using internet technologies

LIST OF EXPERIMENTS:

1. Creation of static and functional websites using HTML5 and CSS3 that could pass W3C validation. Include maps and images.
2. Creation of webpage / website that employs advanced aesthetic effects supported by CSS3.
3. Creation of Interactive web page / website using JavaScript and employing DOM manipulation and Event Handling features of JavaScript
4. Creation of dynamic website like Online result portal using Java Servlet as server-side scripting language. Implementation should also include database access.
5. Creation of dynamic webpage that provides count of number of unique visitors to the website. Use the concept of cookies and use Java Servlet as server-side scripting language.
6. Creation of dynamic web page that provides user session management. Use PHP as server-side scripting language.
7. Create a single page web application using AJAX.

COURSE OUTCOMES:

At the end of the course, the students will have the

CO1: Ability to learn the structure of web application development.
CO1: Ability to implement a static website with latest W3C standards
CO2: Ability to implement an interactive website with client-side programming
CO3: Ability to implement a dynamic web page / web application with database access and session management.

REFERENCES:

1. Deitel and Deitel and Nieto, “Internet and World Wide Web - How to Program”, Prentice Hall, 5th Edition, 2012.
2. Jeffrey C. Jackson, Web Technologies A Computer Science Perspective, 1st edition, Pearson Education, 2011.
3. Chris Bates, Web Programming: Building Internet Applications, 3rd Edition, Wiley India Pvt. Limited, 2007.
4. Robert W. Sebesta, Programming the World Wide Web, 7th Edition, Pearson, 2013.
5. Eric Freeman, Elisabeth Robson, Head First HTML5 Programming, Building Web Apps with JavaScript, 1st Edition, O'Reilly Media, Incorporated, 2011.
6. Jason Hunter, William Crawford, Java Servlet Programming, 2nd Edition, O'Reilly Media, 2010.

20CS901	DESIGN PROJECT	L	T	P	C
		0	0	8	4

COURSE OBJECTIVE:

This course will enable the students to apply the knowledge and practical skills to solve real life engineering problems.

COURSE CONTENT:

1. Create a website for Online Book Store
2. Design Mobile Application for Health Monitoring
3. Create a setup for a Honey pot and monitor the Honeypot on network (KF Sensor)
4. Create a system to Improve Consumer Retailer Connectivity using Data analytics
5. Develop a system to Predict Student Grade using Machine Learning algorithms

COURSE OUTCOMES:

At the end of the course, the students will have the

CO1: Ability to describe the principles of product design and development in solving engineering problems.

CO 2: Ability to produce design Specification through experimental works which complies with the design project requirement.

CO3: Ability to analyze and demonstrate design specifications through experimental works and Communicate effectively with the community.

CO4: Ability to demonstrate the ability to collaborate among team members.

REFERENCES:

1. Harolld Kerzner, “Project Management- A systems approach to planning, Scheduling and Controlling”,10th edition, Wiley

2. Luc Chaput, “Project Design Strategic Information- A Process Approach” Presses de I’Universitie du Quebec, 2011

3. Sally Fincher, Marian Petre and Martyn Clark, “Computer Science Project Work-Principles and Pragmatics”, Springer, 2013

4. Anastasia Pagnoni, “Project Engineering-Computer Oriented Planning and Operational Decision Making, Springer-Verlag, 1st edition, 1990

5. Sandor Vajna, “Integrated Design Engineering-Interdisciplinary and Holistic Product Development”,Otto -von-Guericke-Universitat Magdeburg, Germany,2020

6. Martin Fischer, Howard Ashcraft, Dean Reed, Atul Khanzode, “Integrating Project Delivery”,Wiley, 2017

VII SEMESTER SYLLABUS

20CS016	CLOUD COMPUTING TECHNIQUES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

This course will enable the students to learn the concept of cloud computing and its various issues, emergence of cloud as the next generation computing paradigm and to set up a private cloud.

COURSE CONTENTS:

Introduction

Introduction - Historical Development – The Cloud Reference Model – Cloud Characteristics – Cloud Deployment Models: Public, Private, Community, HybridClouds - Cloud Delivery Models: IaaS, PaaS, SaaS – Open Source Private Cloud Software: Eucalyptus, Open Nebula, Open Stack.

Virtualization

Data Center Technology - Virtualization - Characteristics of Virtualized Environments – Taxonomy of Virtualization Techniques – Virtualization and Cloud Computing – Pros and Cons of Virtualization - Implementation Levels of Virtualization - Tools and Mechanisms: Xen, VMWare, Microsoft Hyper-V.

Cloud Computing Mechanism

Cloud Infrastructure Mechanism: Cloud Storage, Cloud Usage Monitor, Resource Replication – Specialized Cloud Mechanism: Load Balancer, SLA Monitor, Pay-per-use Monitor, Audit Monitor Failover System, Hypervisor, Resource Cluster, Multi Device Broker, State Management Database.

Security in the Cloud

Basic Terms and Concepts – Threat Agents – Cloud Security Threats – Cloud Security Mechanism: Encryption, Hashing, Digital Signature, Public Key Infrastructure, Identity and Access Management, Single Sign-on, Cloud Based Security Groups, Hardened Virtual Server Images

Cloud Computing Architecture

Fundamental Cloud Architectures-Workload Distribution Architecture- Resource Pooling Architecture -Dynamic Scalability Architecture- Elastic Resource Capacity Architecture-Service Load Balancing Architecture-Advanced Cloud Architectures Hypervisor Clustering Architecture-Load Balanced Virtual Server Instances Architecture-Non-Disruptive Service Relocation Architecture-Zero Downtime Architecture-Cloud Balancing Architecture-Case Study.

COURSE OUTCOMES:

At the end of the course, the students will have the

CO1: Ability to define the concepts, key technologies, strengths and limitations of cloud computing.
CO2: Ability to identify the architecture, infrastructure and delivery models of cloud computing.
CO3: Ability to apply appropriate technologies and approaches for computing workloads.

CO4: Ability to analyze security, privacy and interoperability issues in Cloud Computing.

REFERENCES:

1. Thomas Erl, ZaighamMahood, Ricardo Puttini, ―Cloud Computing, Concept, Technology andArchitecture‖, Prentice Hall, 2013.
2. Toby Velte, Anthony Velte, Robert C. Elsenpeter, ―Cloud Computing, A Practical Approach‖, Tata McGraw-Hill Edition, 2010.
3. RajkumarBuyya, Christian Vecchiola, S. ThamaraiSelvi, ―Mastering Cloud Computing, Tata McGraw-Hill, 2013.
4. ArshdeepBahga, Vijay Madisetti, ―Cloud Computing: A Hands-On Approach, Universities Press, 2014.
5. Tom White, ―Hadoop: The Definitive Guide, O'Reilly Media, 4th Edition, 2015.
6. John Rittinghouse and James Ransome,‖ Cloud Computing, Implementation, Management and Strategy‖, CRC Press, 2010

PROFESSIONAL ELECTIVES – I
NETWORKING

20CSP11	MOBILE NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

To understand how routing is done in telephone networks using different internet routing protocols in optical and mobile networks. To explore the issues in ad hoc networks the protocols used for the working of ad hoc networks.

COURSE CONTENT:

Introduction

Introduction – Wireless Transmission - Medium Access Control: Motivation for Specialized MAC- SDMA- FDMA- TDMA- CDMA- Comparison of Access mechanisms; Tele communications systems: GSM, GPRS and their architectures.

Wireless LAN

Infrastructure and Ad-Hoc Network – IEEE 802.11: System and protocol architecture – MAC management – 802.11b – 802.11a; Bluetooth: Architecture – Radio layer – Baseband layer – Link manager protocol – L2CAP – Security – SDP – Profiles – IEEE 802.15 – IrDA – ZigBee.

Mobile Network Layer

Mobile IP: Goals – Assumptions and Requirement – Entities – IP packet Delivery- Agent Advertisement and Discovery – Registration – Tunneling and Encapsulation – Optimization –IPv6 – DHCP – DSDV – DSR .

Mobile Transport Layer

Traditional TCP- Indirect TCP- Snooping TCP- Mobile TCP- Fast retransmit/ Fast Recovery- Transmission/ Timeout Freezing.

WAP and Mobile Languages

WAP (1.x) Architecture – WAP 2.0 –WML; Mobile Ad-hoc and Sensor Networks: Introduction – MANET - Sensor Networks – Applications.

COURSE OUTCOMES:

CO1: Ability to Understand challenges in routing in different kinds of networks.
CO2: Ability to explore the features of the protocols used in networks.
CO3: Ability to analyze the issues of different protocols for different kinds of networks.

REFERENCES:

1. Jochen H. Schiller, “Mobile Communications”, second edition, Pearson Education, New Delhi, 2007.
2. William Stallings, “Wireless Communications and Networks”, PHI/Pearson Education, 2002.
3. Dharma Prakash Agarval, Qing , An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, Singapore, 2005.

4. Jon W. Mark, Weihua Zhuang, “Wireless Communications and Networking”, Prentice Hall, New Delhi, 2007.
5. Frank Adelstein, Sandeep K S Gupta, Golden G Richard, Loren Schwiebert, “Fundamentals of Mobile and Pervasive Computing,”tata Mc-Graw Hill Education Pvt. Ltd., New Delhi, 2005.

20CSP12	STORAGE AREA NETWORK	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

This course is focused to understand logical and physical components of a storage infrastructure and to learn the components of managing and monitoring the data center.

COURSE CONTENTS:

Storage System

Introduction to Information Storage: Evolution of Storage Architecture - Data Center Infrastructure - Virtualization and Cloud Computing. **Data Center Environment**: Application - Host (Compute) - Connectivity - Storage. Data Protection: **RAID:** RAID Implementation Methods - RAID Techniques - RAID Levels - RAID Impact on Disk Performance.

Storage Networking Technologies

Fibre Channel Storage Area Networks: Components of FC SAN - FC connectivity - Fibre Channel Architecture – Zoning - FC SAN Topologies - Virtualization in SAN**. IP SAN and FCoE:** iSCSI – FCIP - FCoE. **Network Attached Storage**: Components of NAS - NAS I/O Operation - NAS File-Sharing Protocols - File-Level Virtualization

Backup, Archive and Replication

Backup and Archive: Backup Methods - Backup Topologies - Backup Targets - Data Deduplication for Backup - Backup in Virtualized Environments - Data Archive. **Local Replication**: Replication Terminology - Uses of Local Replicas - Local Replication Technologies - Local Replication in a Virtualized Environment. **Remote Replication**: Remote Replication Technologies - Three-Site Replication - Remote Replication and Migration in a Virtualized Environment.

Cloud Computing and Virtualization

Cloud Enabling Technologies - Characteristics of Cloud Computing - Benefits of Cloud Computing - Cloud Service Model - Cloud Deployment Models - Cloud Computing Infrastructure - Virtualization Appliances: Black Box Virtualization - In-Band Virtualization Appliances - Out of -Band Virtualization Appliances - High Availability for Virtualization Appliances - Appliances for Mass Consumption.

Securing and Managing Storage Infrastructure

Securing and Storage Infrastructure: Information Security Framework - Storage Security Domains - Security Implementations in Storage Networking - Securing Storage Infrastructure in Virtualized and Cloud Environments. **Managing the Storage Infrastructure**: Monitoring the Storage Infrastructure - Storage Infrastructure Management activities - Storage Infrastructure Management Challenges - Information Lifecycle management.

COURSE OUTCOMES:

CO1: Ability to learn the fundamentals of storage architecture and infrastructure.

CO2: Ability to understand the components and implementation of NAS

CO3: Ability to apply virtualization concept to implement different storage management requirements in cloud computing.

REFERENCES:

1. G. Somasundaram, Alok Shrivastava, “Information Storage and Management”, Second Edition, EMC Education Services, Wiley ISBN: 9781118094839, 2012.
2. Clark Tom, “Storage Virtualization”, Addison Wesley Publishing Company ISBN : 9780321262516 (Unit IV)
3. Robert Spalding, "Storage Network - The Complete Reference", Tata McGraw Hill, Osborne, First Edition, 2003.
4. Gerald J. Kowalski, Mark T. Maybury, “Information Storage and Retrieval Systems”, Kluwer Academic Publishers, 2002
5. Marc Farley, “Building Storage Networks”, Tata McGraw Hill, Osborne, 2001.
6. Meeta Gupta, “Storage Area Networks Fundamentals” Pearson Education Limited, 2002.

20CSP13	WIRELESS SENSOR NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

To learn about the issues in the design of wireless ad hoc networks .To expose the students to different aspects in sensor networks and to understand various security issues in ad hoc and sensor networks

COURSE CONTENT:

MAC & Routing in Ad Hoc Networks

Introduction – Issues and challenges in ad hoc networks – MAC Layer Protocols for wireless ad hoc networks – Contention-Based MAC protocols – MAC Protocols Using Directional Antennas – Multiple Channel MAC Protocols – Power-Aware MAC Protocols – Routing in Ad hoc Networks.

Transport & QOS in Ad Hoc Networks

TCP‟s challenges and Design Issues in Ad Hoc Networks – Transport protocols for ad hoc networks – Issues and Challenges in providing QoS – MAC Layer QoS solutions – Network Layer QoS solutions – QoS Model.

MAC & Routing in Wireless Sensor Networks

Introduction – Applications – Challenges – Sensor network architecture – MAC Protocols for wireless sensor networks– Contention-Based protocols – Schedule-Based protocols –Zigbee – Topology Control – Routing Protocols

Transport & QOS in Wireless Sensor Networks

Data-Centric and Contention-Based Networking – Transport Layer and QoS in Wireless Sensor Networks – Congestion Control – In-network processing – Operating systems for wireless sensor networks – Examples.

Security in Ad Hoc And Sensor Networks

Security Attacks – Key Distribution and Management – Intrusion Detection – Software based Anti-tamper techniques – Water marking techniques – Defense against routing attacks - Secure Ad hoc routing protocols – Broadcast authentication .

COURSE OUTCOMES:

CO1: Ability to identify different issues in wireless ad hoc and sensor networks
CO2: Ability to understand protocols developed for ad hoc and sensor networks
CO3: Ability to analyze different issues in wireless ad hoc and sensor networks

REFERENCES:

1. Subir Kumar Sarkar, T G Basavaraju, C Puttamadappa, “Ad-Hoc Mobile Wireless Networks”, Auerbach Publications, 2007.
2. Holger Karl, Andreas Willig, “Protocols and Architectures for Wireless Sensor Networks”, Wiley India Private Limited, 2011.

3. Erdal Çayirci ,Chunming Rong, “Security in Wireless Ad Hoc and Sensor Networks”, John Wiley and Sons, 2009.
4. C. Siva Ram Murthy and B.S. Manoj, “Ad Hoc Wireless Networks – Architectures and Protocols”, Pearson Education, 2004.
5. Carlos De Morais Cordeiro, Dharma Prakash Agrawal, “Ad Hoc and Sensor Networks: Theory and Applications”, World Scientific Publishing, Second Edition, 2011.
6. Waltenegus Dargie, Christian Poellabauer, “Fundamentals of Wireless Sensor Networks Theory and Practice”, Wiley India Private Limited, 2014.

20CSP14	MOBILE COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

This course is focused to provide understanding about the basic concepts of mobile computing. To learn the basics of mobile telecommunication system and to gain knowledge about different mobile platforms and applications.

COURSE CONTENT:

Introduction

What is Mobile Computing – Mobile Computing vs. Wireless Networking – Applications of Mobile Computing – Characteristics of Mobile computing – Structure of Mobile Computing applications – Multiplexing: SDM – FDM – TDM – CDM – Spread spectrum: DSSS – FHSS – Medium Access Control Protocols: SDMA- TDMA- FDMA- CDMA

Telecommunications Systems

GSM: Mobile Services & System Architecture – Radio Interface – Protocols, Localization and Calling, Handover, Security – GPRS – DECT: System and Protocol Architectures – TETRA – Services & Architecture – UMTS: Network Architecture – Software Defined Radio (SDR)

Wireless LAN

Infrared vs radio transmission – Infrastructure and ad hoc network – IEEE 802.11: System Architecture, Protocol Architecture, Physical layer, MAC layer, 802.11b, 802.11a – HIPERLAN: HIPERLAN 1 – WATM – BRAN – HIPERLAN2 – Bluetooth: User scenarios –Architecture – Radio layer – Baseband layer – Link manager protocol – L2CAP – Security – IEEE 802.15

Mobile Network Layer

Mobile IP – DHCP – Mobile Ad Hoc networks: Routing – DSDV – DSR – Alternative metrics – Overview of Ad hoc routing Protocols – AODV, ZRP, Multicast Routing Protocols for MANET

Mobile Transport and Application Layer

Mobile Transport Layer: Traditional TCP – Classical Improvements of TCP: Indirect TCP – Snooping TCP – Mobile TCP – Fast Retransmit/fast recovery – Time-out freezing – Selective retransmission – Transaction-oriented TCP – Mobile Application Layer: Wireless Application Protocol (WAP) Architecture – WDP – WTLS – WTP –WSP – WAE – WML – WML Script – Wireless Telephony Application – Push architecture – Push/Pull services

COURSE OUTCOMES:

CO1: Ability to understand the basic concepts of Mobile Communication.

CO2: Ability to understand how services are offered by various Mobile Telecommunication Systems and Wireless LANs.

CO3: Ability to understand how the various protocols present in the network, transport and application layer of Mobile networking devices function

REFERENCES:

1. Jochen Schiller, “Mobile Communications”, PHI, Second Edition, 2003.(ALL UNITS)
2. Prasant Kumar Pattnaik and Rajib Mall, “Fundamentals of Mobile Computing”, PHI Learning Pvt.Ltd, 2nd Edition, 2016. (UNIT I, UNIT II)
3. Roopa Yavagal and Asoke K. Talukder, “Mobile Computing: Technology, Applications and Service Creation”, McGraw-Hill Education, 2006
4. Raj Kamal, Mobile Computing, Oxford University Press, 2007
5. William Stallings, “Wireless Communications & Networks”, Second Edition, Pearson, 2009
6. Kumkum Garg, “Mobile Computing Theory and Practice”, Pearson, 2010

20CSP15	SOFTWARE DEFINED NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

To learn the fundamentals of software defined networks. To understand the separation of the data plane and the control plane. To study about the SDN Programming and various applications of SDN

COURSE CONTENT:

Introduction

History of Software Defined Networking (SDN) – Modern Data Center – Traditional Switch Architecture – Why SDN – Evolution of SDN – How SDN Works – Centralized and Distributed Control and Date Planes

Open Flow & SDN Controllers

Open Flow Specification – Drawbacks of Open SDN, SDN via APIs, SDN via Hypervisor-Based Overlays – SDN via Opening up the Device – SDN Controllers – General Concepts

Data Centers

Multitenant and Virtualized Multitenant Data Center – SDN Solutions for the Data Center Network – VLANs – EVPN – VxLAN – NVGRE

SDN Programming

Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs – Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications

SDN

Juniper SDN Framework – IETF SDN Framework – Open Daylight Controller – Floodlight Controller – Bandwidth Calendaring – Data Center Orchestration

COURSE OUTCOMES:

CO1: Ability to analyze the evolution of software defined networks
CO2: Ability to express the various components of SDN and their uses
CO3: Ability to explain the use of SDN in the current networking scenario
CO4: Ability to design and develop various applications of SDN

REFERENCES:

1. Paul Goransson and Chuck Black, Software Defined Networks: A Comprehensive Approach, First Edition, Morgan Kaufmann, 2014.
2. Thomas D. Nadeau, Ken Gray, SDN: Software Defined Networks, OReilly Media, 2013.
3. Siamak Azodolmolky, Software Defined Networking with Open Flow, Packet Publishing, 2013.

4. Vivek Tiwari, SDN and Open Flow for Beginnersll, Amazon Digital Services, Inc., 2013.
5. Fei Hu, Editor, Network Innovation through Open Flow and SDN: Principles and Design, CRC Press, 2014.

20CSP16	SOCIAL NETWORK ANALYSIS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

To understand the concept of semantic web and related applications. To learn knowledge representation using ontology. To understand human behavior in social web and related communities. To learn visualization of social networks.

COURSE CONTENT:

Introduction

Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks - Applications of Social Network Analysis.

Modelling, Aggregating and Knowledge Representation

Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modeling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data - Advanced representations.

Extraction and Mining Communities in Web Social Networks

Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social networks - Multi-Relational characterization of dynamic social network communities.

Predicting Human Behavior and Privacy Issues

Understanding and predicting human behavior for social communities - User data management - Inference and Distribution - Enabling new human experiences - Reality mining - Context - Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.

Visualization and Applications of Social Networks

Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and

Node-Link Diagrams - Hybrid representations - Applications - Cover networks - Community welfare - Collaboration networks - Co-Citation networks.

COURSE OUTCOMES:

CO1: Ability to develop semantic web related applications.
CO2: Ability to represent knowledge using ontology.
CO3: Ability to predict human behavior in social web and related communities.
CO4: Ability to visualize social networks.

REFERENCES:

1. Peter Mika, ―Social Networks and the Semantic Web, First Edition, Springer 2007.
2. Borko Furht, ―Handbook of Social Network Technologies and Applications‖, 1st Edition, Springer, 2010.
3. Guandong Xu, Yanchun Zhang and Lin Li, ―Web Mining and Social Networking – Techniques and applications‖, First Edition, Springer, 2011.
4. Dion Goh and Schubert Foo, ―Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively‖, IGI Global Snippet, 2008.
5. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, ―Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling, IGI Global Snippet, 2009.
6. John G. Breslin, Alexander Passant and Stefan Decker, ―The Social Semantic Web, Springer, 2009.

20CSP17	DISTRIBUTED SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

To understand the foundations of distributed systems and issues related to clock Synchronization and the need for global state in distributed systems. To learn distributed mutual exclusion and deadlock detection algorithms. To understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems.

UNIT I INTRODUCTION

Introduction: Definition –Relation to computer system components –Motivation –Relation to parallel systems — Message-passing systems versus shared memory systems –Primitives for distributed communication –Synchronous versus asynchronous executions –Design issues and challenges. A model of distributed computations: A distributed program –A model of distributed executions –Models of communication networks –Global state — Cuts –Past and future cones of an event –Models of process communications. Logical Time: A framework for a system of logical clocks –Scalar time –Vector time — Physical clock synchronization: NTP.

UNIT II MESSAGE ORDERING & SNAPSHOTS

Message ordering and group communication: Message ordering paradigms –Asynchronous execution with synchronous communication –Synchronous program order on an asynchronous system –Group communication — Causal order (CO) — Total order. Global state and snapshot recording algorithms: Introduction –System model and definitions –Snapshot algorithms for FIFO channels

UNIT III DISTRIBUTED MUTEX & DEADLOCK

Distributed mutual exclusion algorithms: Introduction — Preliminaries — Lamport?s algorithm — Ricart-Agrawala algorithm — Maekawa?s algorithm — Suzuki–Kasami?s broadcast algorithm. Deadlock detection in distributed systems: Introduction — System model — Preliminaries — Models of deadlocks — Knapp?s classification — Algorithms for the single resource model, the AND model and the OR model.

UNIT IV RECOVERY & CONSENSUS

Checkpointing and rollback recovery: Introduction — Background and definitions — Issues in failure recovery — Checkpoint-based recovery — Log-based rollback recovery — Coordinated checkpointing algorithm — Algorithm for asynchronous checkpointing and recovery. Consensus and agreement algorithms: Problem definition — Overview of results — Agreement in a failure —free system — Agreement in synchronous systems with failures.

UNIT V P2P & DISTRIBUTED SHARED MEMORY

Peer-to-peer computing and overlay graphs: Introduction — Data indexing and overlays — Chord — Content addressable networks — Tapestry. Distributed shared memory: Abstraction and advantages — Memory consistency models –Shared memory Mutual Exclusion.

OUTCOMES:

At the end of this course, the students will be able to:

CO1: Ability to understand the various synchronization issues and global state for distributed systems.

CO2: Ability to understand the Mutual Exclusion and Deadlock detection algorithms in distributed systems

CO3: Ability to describe the agreement protocols and fault tolerance mechanisms in distributed systems.

CO4: Ability to describe the features of peer-to-peer and distributed shared memory systems

REFERENCES:

1. Kshemkalyani, Ajay D., and Mukesh Singhal. Distributed computing: principles, algorithms, and systems. Cambridge University Press, 2011.

2. George Coulouris, Jean Dollimore and Tim Kindberg, “Distributed Systems Concepts and Design”, Fifth Edition, Pearson Education, 2012

3. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007.

4. Mukesh Singhal and Niranjan G. Shivaratri. Advanced concepts in operating systems. McGraw-Hill, Inc., 1994.

5. Tanenbaum A.S., Van Steen M., “Distributed Systems: Principles and Paradigms”, Pearson Education, 2007.S

PROFESSIONAL ELECTIVES – II
INFORMATION SECURITY

20CSP21	CRYPTOGRAPHY AND NETWORK SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

This course is focused to understand the basics of Cryptography and Network Security. It provides an understanding about how Confidentiality, Integrity and Availability of data are maintained. To understand how various protocols for network security function to protect against the threats in the networks.

COURSE CONTENT:

Computer and Network Security Concepts

Computer Security Concepts – OSI Security Architecture – Security Attacks – Security Mechanisms – Fundamental security design principles – Attack surfaces and attack trees –A model for network security – Standards – Introduction to Number theory: Euclidean algorithm –Modular Arithmetic – Prime numbers – Fermat's and Euler's Theorems –Testing for Primality –The Chinese Remainder Theorem

Symmetric Ciphers

Classical Encryption Techniques: Symmetric cipher model – Substitution Techniques – Transposition techniques – Rotor machines – Steganography – Block ciphers and the DES: Traditional Block cipher structure – The Data Encryption Standard, A DES example, Strength of DES, Block Cipher Design principles – Advanced Encryption Standard: AES Structure – AES Transformation functions – AES key expansion – Block cipher operation: Cipher block chaining mode – Cipher feedback mode – Output feedback mode – Stream Ciphers – RC4

Asymmetric Ciphers

Principles of Public key cryptosystems – The RSA algorithm – Diffie Hellman key exchange – Elgamal cryptographic system – Elliptic curve arithmetic – Elliptic curve cryptography.

Cryptographic Data Integrity Algorithms

Cryptographic Hash functions: Applications – Two Simple hash functions – Requirements and Security – SHA – Message Authentication Codes: Message authentication Requirements – Message authentication functions – Requirements for MAC – MAC based on hash functions – MAC based on Block ciphers – Digital signatures – RSA Digital signature algorithm – Key management and Distribution: Distribution of public keys – X.509 certificates – PKI – User authentication: Remote user-authentication principles – Kerberos

Network and Internet Security

Network Access Control – Extensible Authentication Protocol – IEEE 802.1X Port based Network Access Control – Transport Layer Security: HTTPS, Secure Shell – Email security: Internet mail architecture – Email threats and security – S/MIME – PGP – IP security: Overview, IP Security Policy, ESP, Internet Key Exchange

COURSE OUTCOMES:

CO1: Ability to understand the basic concepts involved in cryptography and symmetric ciphers
CO2: Ability to analyze the working of public key encryptions and hash functions
CO3: Ability to understand the cryptographic operations of digital signatures and public key distribution
CO4: Ability to understand the various security protocols of Internet services and its applications

REFERENCES:

1. William Stallings, "Cryptography and Network Security: Principles and Practice", PHI 7th Edition, 2017.
2. Behrouz A Forouzan and Debdeep Mukhopadhyay, "Cryptography and Network Security", Tata Mcgraw Hill, 2011
3. C K Shyamala, N Harini, Dr. T R Padmanabhan, "Cryptography and Security", Wiley, 2011
4. Douglas Robert Stinson and Maura Paterson, "Cryptography and Network Security", CRC Press, 2018
5. Atul Kahate, "Cryptography and Network Security", McGraw Hill Education Pvt. Ltd., 3rd Edition, 2013
6. Charlie Kaufman, Radia Perlman, and Mike Speciner, "Network Security: Private Communication in a Public World", Prentice Hall, 2nd Edition, 2002

20CSP22	CYBER FORENSICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

This course mainly focuses on security issues of network layer and transport layer. It further deals with the functions of computer forensics tools, forensics data validation and data hiding.

COURSE CONTENT:

Network Layer Security &Transport Layer Security

IPSec Protocol - IP Authentication Header - IP ESP - Key Management Protocol for IPsec - Transport layer Security, SSL protocol, Cryptographic Computations – TLS Protocol.

E-Mail Security & Firewalls

PGP - S/MIME - Internet Firewalls for Trusted System, Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs - SET for E-Commerce Transactions.

Introduction to Computer Forensics

Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime - Introduction to Identity Theft & Identity Fraud - Types of CF techniques - Incident and incident response methodology - Forensic duplication and investigation - Preparation for IR, Creating response tool kit and IR team - Forensics Technology and Systems - Understanding Computer Investigation – Data Acquisition.

Evidence Collection and Forensics Tools

Processing Crime and Incident Scenes – Working with Windows and DOS Systems. Current Computer Forensics Tools, Software/ Hardware Tools.

Analysis and Validation

Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics.

COURSE OUTCOMES:

CO1: Be able to evaluate the security issues related to network layer and transport layer.
CO2: Be able to apply the computer forensics software and hardware tools.
CO3: Be able to analyze and validate the forensics data.

REFERENCES:

1. Man Young Rhee, “Internet Security: Cryptographic Principles”, “Algorithms and Protocols”, Wiley Publications, 2003.
2. Nelson, Phillips, Enfinger, Steuart, “Computer Forensics and Investigations”, Cengage Learning, India Edition, 2009.
3. John R.Vacca, “Computer Forensics”, Cengage Learning, 2005
4. Richard E.Smith, “Internet Cryptography”, 3rd Edition Pearson Education, 2008.

5. Marjie T.Britz, “Computer Forensics and Cyber Crime”: An Introduction”, 3rd Edition, Prentice Hall, 2013.
6. Joakim Kävrestad, “Fundamentals of Digital Forensics: Theory, Methods, and Real-Life Applications”, Springer, July 2018.

20CSP23	Network and Web Security	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To learn the core fundamentals of system and web security concepts
- To have through understanding in the security concepts related to networks
- To design security applications in the field of Information technology
- To be exposed to the concepts of Network Security
- To perform a detailed study of Web Application security and related Issues.

COURSE CONTENT:

Introduction to System Security

History Building a secure organization- A Cryptography primer- detecting system Intrusion- Preventing system Intrusion- Fault tolerance and Resilience in cloud computing environments- Security web applications, services and servers.

Web Application Security

Evolution of Web Applications – Code Defense Mechanisms – Web Application Technologies – Mapping the Application – Bypassing the Client side controls – Attacking Authentication, Session Management and Access Controls

Web Security

Cracks in Foundation – Threats – Protection Strategies – Basic Idea – Security Implementation Cycle and Policy – Approaches to Secure Web Services- – Protecting Servers – Firewalls for Improving Web Security – Client Side Security

Hacking and Securing Modern Web Applications

Introduction to Hacking Web Applications – Cross-site Scripting(XSS) – Request Forgery – XXE – Injection – DoS – Securing Web Applications and Architecture – Vulnerability Discovery and Management – Defending XSS Attacks - Defending Against XXE, Injection and DoS – Securing Third-Party Dependencies

Network Security

Secret Sharing Schemes-Kerberos- Pretty Good Privacy (PGP)-Secure Socket Layer (SSL) - System Security: Intruders – HIDS- NIDS Malicious software – viruses – Firewalls.

COURSE OUTCOMES:

CO1: Ability to understand the core fundamentals of Web Security
CO2: Ability to apply the security concepts related to networks in wireless scenario
CO3: Ability to analyze the possible security attacks in complex real time systems and their effective countermeasures

CO4: Ability to analyze the security issues in the network and resolve it.

REFERENCES:

1. John R.Vacca, Computer and Information Security Handbook, Second Edition, Elsevier 2013.
2. Andrew Hoffman, Web Application Security Exploitation and Countermeasures for Modern Web Applications, O'Reilly Media, 2020.
3. Amrit Tiwana, Web Security, Digital Press, 1999.
4. Dafydd Stuttard, Marcus Pinto, The Web Application Hacker's Handbook Discovering and Exploiting Security Flaws, Second Edition, Wiley, 2011.
5. William Stallings, "Cryptography and Network Security: Principles and Practices", Third Edition, Pearson Education, 2006.

20CSP24	Ethical Coding and Risk Management	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

To provide a deep understanding of security issues and concerns and to gain experience in advanced hacking techniques and their countermeasures.

COURSE CONTENT:

Introduction

Understanding the importance of security - Concept of ethical hacking and essential Terminologies-Threat, Attack, Vulnerabilities, Target of Evaluation, Exploit - Phases involved in hacking - Foot printing - Scanning - System Hacking - Session Hijacking.

Buffer Overflows

Significance of Buffer Overflow Vulnerability, Why Programs/Applications are vulnerable. Reasons for Buffer Overflow Attacks - Methods of ensuring that buffer overflows are trapped.

Sniffers

Active and passive sniffing - ARP poisoning and countermeasures - Man in the middle attacks - Spoofing and sniffing attacks - Sniffing countermeasures.

SQL Injection

Attacking SQL Servers, Sniffing, Brute Forcing and finding Application Configuration Files, Input validation attacks - Preventive Measures - Web Application Threats - Web Application Hacking - Cross Site Scripting / XSS Flaws / Countermeasures Correct Web Application Set-up.

Web Application Security

Core Defense Mechanisms - Handling User Access - Authentication -Session Management - Access Control.

COURSE OUTCOMES:

CO1: Ability to critically evaluate the potential countermeasures in advanced hacking techniques.

CO2: Ability to analyze and evaluate techniques used to break an insecure web application

CO3: Ability to identify relevant countermeasures.

REFERENCES:

1. Patrick Engebretson, “The Basics of Hacking and Penetration Testing”, Elsevier, 2013.
2. Rajat Khare, “Network Security and Ethical Hacking”, Luniver Press, 2006.
3. Ankit Fadia, Manu Zacharia, “Network Intrusion Alert: An Ethical Hacking Guide to Intrusion Detection”, Thomson Course Technology PTR, 2007.
4. Thomas Mathew “Ethical Hacking”, OSB Publisher, 2003.
5. Joel Scambray and George Kurtz, “Hacking Exposed: Network Security Secrets & Solutions, Stuart McClure”, McGraw-Hill, 2005.

20CSP25	Python Programming	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

To know the basics of algorithmic problem solving, read and write simple Python programs. To develop Python programs with Python data structures namely lists, tuples, and dictionaries.

COURSE CONTENT:

Introduction

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).

Python Basics

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments.

Control Structures and Strings

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions : return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays.

Lists and Tuples

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing – list comprehension.

File Handling and Exceptions

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages.

COURSE OUTCOMES:

CO1: Ability to develop algorithmic solutions to simple computational problems

CO2: Ability to structure simple python programs for solving problems.

CO3: Ability to create applications written using simple Python programs.

REFERENCES:

1. Anita Goel and Ajay Mittal "Computer Fundamentals and Programming in C", Pearson Education, 2013(Unit 1)
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/ O'Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/) (Units 2,3,4 and 5)
3. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
4. Charles Dierbach, "Introduction to Computer Science using Python: A Computational

Problem-Solving Focus, Wiley India Edition, 2013.
5. John V Guttag, “Introduction to Computation and Programming Using Python’’, Revised and expanded Edition, MIT Press, 2013
6. Kenneth A. Lambert, “Fundamentals of Python: First Programs”, CENGAGE Learning, 2012.

20CSP26	Problem Solving using Python Programming	L	T	P	C
		2	0	2	3

COURSE OBJECTIVE:

This course is designed to provide insights into the various functionalities and features of Python programming.

COURSE CONTENT:

Python Basics **12**

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments.

Control Structures and Strings **12**

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays.

Lists and Tuples **12**

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing – list comprehension.

File Handling and Exceptions **12**

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages.

Object Oriented Programming **12**

Classes/Objects, Inheritance, Encapsulation, Abstraction, Polymorphism.

Total Periods: 60

COURSE OUTCOMES:

CO1: Ability to develop simple Python programs for solving computational problems.
CO2: Ability to apply control structures and loops to structure Python programs.
CO3: Ability to manage file operations and handle exceptions in Python.
CO4: Ability to design object-oriented programs using classes and inheritance.
CO5: Ability to create applications utilizing Python data structures effectively.

CO-PO Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO 1	3		3	3									3	
CO 2	3	3		3	3								3	
CO 3	3	3	2	2									3	
CO 4	3		3	3	3								2	3
CO 5	3	2	3		3								3	3

REFERENCES:

1. Eric Matthes, “Python Crash Course: A Hands-On, Project-Based Introduction to Programming”, No Starch Press, 3rd Edition, 2024.
2. Mark Lutz, “Learning Python”, O'Reilly Media, 5th Edition, 2023.
3. John Zelle, “Python Programming: An Introduction to Computer Science”, Franklin, Beedle & Associates, 3rd Edition, 2023
4. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist’’, 2nd edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/).
5. John V Guttag, “Introduction to Computation and Programming Using Python’’, Revised and expanded Edition, MIT Press , 2013
6. Kenneth A. Lambert, “Fundamentals of Python: First Programs”, CENGAGE Learning, 2012.

Lab Experiments

1. Program using operation on Data types
2. Program using Functions and Tuple Assignment
3. Scientific Problem-Solving using Decision Making and Looping.
4. Program using Recursion and Function Composition
5. Program using Fruitful Functions with Return Values
6. Program using String Operations and Immutability
7. Program using List Operations, List Methods, Dictionaries and List Comprehension
8. Program using File Handling and Exception Handling
9. Program using Object-Oriented Programming concepts.
10. Program using Command Line Arguments, Modules, and Packages

PROFESSIONAL ELECTIVES – III
HUMAN COMPUTER INTERACTION

20CSP31	AUGMENTED REALITY AND VIRTUAL REALITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

This course focus to learn about rapidly evolving field of Virtual and Augmented Reality. To understand the principles of AR and VR and prepare the students for participating in the production of integrative immersive applications and cross disciplinary academic research projects.

COURSE CONTENT:

INTRODUCTION

Introduction to VR - Historical perspective - Birds-eye view. Sensation and perception - Geometry of Virtual Worlds - Geometric Modeling - Transforming models. Matrix algebra 2D and 3D rotations. Homogeneous transforms - The chain of viewing transforms - Eye transforms - Canonical view transform - Viewport transform. Light and Optics - Tracking Systems - Visual Rendering.

VISUAL PHYSIOLOGY AND PERCEPTION

Visual Physiology - Visual Perception - Parts of the human eye - Photoreceptors and densities - Scotopic and Photopic vision - Display resolution requiments - Eye movements - Neural Vision Structures - Sufficient display resolution - other Implications of physiology on VR. Sufficient resolution for VR- Light intensity - Eye movements - Neuroscience of vision. Depth perception - Motion perception- Frame rates and displays.

TRACKING

Overview - Orientation tracking - Tilt drift correction - Yaw drift correction - Tracking with a camera - Perspective n-point problem - Filtering - Lighthouse approach - Velocities - Acceleration - Vestibular system - Virtual world physics -Simulation - Collision detection - Avatar motion.

MODELING AND RENDERING

Geometric modeling - Kinematics modeling - Physical modeling - Behavior modeling -Model Management. Visual Rendering - Overview - Shading models - Rasterization - Pixel shading -VR Specific Problems - Distortion Shading - Post-rendering image warp.

AUDIO AND INTERFACES

Audio: Physics and physiology - Auditory perception - Auditory localization - Combining other senses. Interfaces: Locomotion – Manipulation - System control - Social interaction – Uses of AR and VR.

COURSE OUTCOMES:

CO1: Ability to acquire knowledge of VR and AR techniques to build virtual environments.
CO2: Ability to apply VR techniques to create 3D virtual reality environments.
CO3: Ability to improve human computer interaction using Augmented reality tools.

REFERENCES:

1. Steven M. LaValle, Virtual Reality, Second Edition, Cambridge University Press,2019 **(UNIT-1,2,3)**
2. Augmented Reality: Principles and Practice (Usability) by Dieter Schmalstieg and Tobias Hollerer, Pearson Education (US), Addison-Wesley Educational Publishers Inc, New Jersey, United States, 2016. ISBN: 9780321883575**(UNIT 4,5)**
3. C. Burdea and Philippe Coiffet, Virtual Reality Technology, Second Edition, Gregory, John Wiley and Sons, Inc.,2008
4. Future Cyborgs: Human-Machine Interface for Virtual Reality Applications by Robert R Powell. 2012.
5. Jason Jerald. 2015. The VR Book: Human-Centred Design for Virtual Reality. Association for Computing Machinery and Morgan and Claypool, New York, NY, USA.
6. The Fourth Transformation: How Augmented Reality and Artificial Intelligence Will Change Everything, Robert Scoble and Shel Israel, Patrick Brewster Press; 1 edition, 2016.

20CSP32	DESIGN ORIENTED HCI	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

To learn the human-centered system that people find useful and usable. To understand the design, prototype, and evaluation of user interfaces. To gain the knowledge about how human perceives and interacts with computers.

COURSE CONTENT:

Interactive System Design and Conceptual Model Based Design

Introduction- Interaction Design- Goals of Interaction Design- Heuristics and Usability principles.

Conceptual Model Based Design and Evaluation

Understanding the problem space- Conceptual Models- Interaction Paradigms- Conceptual models to Physical design- Cognition- Conceptual Framework for Cognition.

Interaction Design, Establishing Requirements and Construction

Basic activities of Interaction design- Characteristics of Interaction Design Process- Practical Issues- Lifecycle Models- Requirements- Data Gathering- Data Interpretation and Analysis- Task Description and Task Analysis.

Prototyping Construction and Evaluation Framework

Prototyping and Construction- Conceptual Design- Physical Design- What, Why and When to evaluate- Evaluation paradigm- DECIDE: A framework to guide evaluation.

Testing

User testing- Doing user testing- Experiments- Predictive Models

COURSE OUTCOMES:

CO1: Ability to design and develop processes and life cycle of Human Computer Interaction.

CO2: Ability to analyze product usability evaluations and testing methods.

CO3: Ability to categorize, design and develop Human Computer Interaction in proper architectural structures.

REFERENCES:

1. Preece J., Rogers Y.,Sharp H.,Baniyon D., Holland S. and Carey T. Human Computer Interaction,Addison-Wesley, 1994.
2. Dix A., Finlay J.,Abowd G. D. and Beale R. Human Computer Interaction, 3rd edition, Pearson Education, 2005.
3. B.Shneiderman; Designing the User Interface,Addison Wesley 2000 (Indian Reprint).
4. Yvonne Rogers, Helen Sharp, Jennifer Preece; Interaction Design 3 rd Edition Wiley 2011
5. Frank Bentley,Edward Barrett Building Mobile Experiences MIP Press Cambridge 2012
6. Jacob Nieilsen; Useability Engineering; Morgan Kaufmann, Academic Press, London, 1993.

20CSP33	USER INTERFACE DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

This course aims to introduce the principles and critical importance of user interface design. This course also outlines standard approaches, key theories and frameworks that underlie the design of most interfaces

COURSE CONTENT:

INTRODUCTION

The Importance of the User Interface – Characteristics of Graphical and Web User Interfaces: Interaction styles, Graphical User Interface, Web User Interface, Principlesof UI Design – Obstacles in the development path - Usability

HUMAN COMPUTER INTERACTION

Understanding how people interact with computers - Human Characteristics and Considerations in Design – Human Interaction Speed –Business Definition and Requirement Analysis – Determining Basic Business Functions – Design Standards – System Training and Documentation needs

WINDOWS

Characteristics - Components - Window Presentation Styles– Types of window – Choose Proper interaction devices – Choose proper Screen Based Controls – Operable Controls – Text Entry/Read-only controls – Selection controls – Combination entry - Menus: Structure, Functions and Content of menus

MULTIMEDIA

Text and Messages - Content and Text For Web Pages – Providing Effective Feedback– Guidance & Assistance–Internationalization– Accessibility– Icons– Image– Multimedia and Graphics

WINDOWS LAYOUT AND TEST

Choosing proper colors - Organizing and Laying out Screens – Usability testing - Prototypes – Kinds of Tests – Developing and Conducting a test – Analyze, Modify and Retest – Evaluate the working System

COURSE OUTCOMES:

CO1: Ability to understand the importance of user interface design and able to describe the structure of user interface and design process

CO2: Ability to Explore a representative range of design guidelines and able to select a usable and compelling user-interface given a set of requirements and available technologies.

CO3: Ability to apply design principles, guidelines and heuristics to create a user-interaction strategy that solves a real-world problem

CO4: Ability to assess the user-interface by employing a series of evaluation methods available in usability engineering

REFERENCES:

1. Wilbert.O.Galitz, "The Essential Guide To User Interface Design", John Wiley & Sons, Third edition, 2007 (Unit 1 to Unit 5)
2. Ben Shneiderman, Maxine Cohen, Catherine Plaisant, "Designing the user interface Strategies for Effective Human-Computer Interaction", Sixth Edition, Pearson Education, 2017
3. Alan Cooper, "The Essential Of User Interface Design", Wiley - Dream Tech Ltd., 2002
4. Alan J. Dix, Janet E. Finlay, Gregory D. Abowd, Russell Beale, Janet E. Finley., "HumanComputer Interaction", Third Edition, Prentice Hall, 2008.
5. Rogers, Preece, 'Interaction Design', Wiley India Edition, 2007
6. Will Grant, "101 UX Principles: A Definitive Design Guide", First Edition, Packt Publishers, 2018.
7. Soren Lauesen, "User Interface Design: A Software Engineering Perspective", Pearson/Addison-Wesley, 2005

20CSP34	HUMAN COMPUTER INTERACTION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

To learn the foundations of Human Computer Interaction. To become familiar with the design technologies for individuals and persons with disabilities to be aware of mobile HCI and to learn the guidelines for user interface.

COURSE CONTENT:

Foundations of HCI

The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. – Case Studies.

Design & Software Process

Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process: Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.

Models and Theories

HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements – Communication and collaboration models-Hypertext, Multimedia and WWW.

Mobile HCI

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools. – Case Studies.

Web Interface Design

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow – Case Studies.

COURSE OUTCOMES:

CO1: Ability to Design effective dialog for HCI and for individuals, persons with disabilities.
CO2: Ability to assess the importance of user feedback
CO3: Ability to explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.

REFERENCES:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, “Human Computer Interaction”, 3rd Edition, Pearson Education, 2004.
2. Brian Fling, “Mobile Design and Development, First Edition”, O‘Reilly Media Inc., 2009.

3. Bill Scott and Theresa Neil, “Designing Web Interfaces”, First Edition, O‘Reilly, 2009.
4. Dix A., Finlay J., Abowd G.D and Beale R. “Human Computer Interaction”, 3rd Edition, Person Education, 2005.
5. Preece J., Rogers Y., Sharp H., Banion D., Holland S and Carey T., “Human Computer Interaction”, Addison – Wesley, 1994.
6. B.Shneiderman ,”Designing the User Interface”, Addison – Wesley, 2000.

20CSP35	IMAGE PROCESSING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

This course is focused to learn Digital Image fundamentals. Be exposed to simple Image Processing techniques. Be familiar with Image compression and Segmentation techniques. To learn to represent Image in form of features.

COURSE CONTENT:

DIGIITAL IMAGE FUNDAMENTALS

Introduction: Digital image processing steps - Components of an Image processing system - Image sensing and Acquisition - Image sampling and quantization - Basic relationships between pixels

IMAGE TRANSFORM

Need for image transform - 2-D Discrete Fourier transform – Properties - The Cosine Transform - Hadamard transform - Discrete cosine transform - Karhunen-Loeve (KL) transform

IMAGE ENHANCEMENT IN THE SPATIAL DOMAIN

Basic intensity transformation functions - Histogram Equalization - Histogram Matching - Fundamentals of spatial filtering - Smoothing spatial filters - Sharpening spatial filters - Use of first and second derivatives for enhancement.

IMAGE SEGMENTATION

Point, Line and edge detection– Thresholding – Region based Segmentation: Region growing – Region splitting and merging – Segmentation using Morphological Watersheds: Basic concepts – Dam Construction - Watershed Segmentation Algorithm – Morphological Image Processing: Erosion and Dilation

IMAGE COMPRESSION

Fundamentals: Coding redundancy - Spatial and temporal redundancy - Image compression models – Some basic Compression Methods: Huffman coding - Run length coding

COURSE OUTCOMES:

CO1: Ability to understand the concept of Digital Image fundamentals.

CO2: Ability to apply different types of Image transformation techniques.

CO3: Ability to apply segmentation techniques to identify the region of interest and extract features of images

CO4: Ability to analyze different image compression techniques.

REFERENCES:

1. Rafael C Gonzalez and Richard E Woods, “Digital Image Processing”, Pearson Education, New Delhi, 2017.Unit (1,3,4,5)

2. Anil K Jain, “Fundamentals of Digital Image Processing”, PHI Learning, New Delhi, 2014. (Unit 2)
3. William K Pratt, “Digital Image Processing”, Wiley India, New Delhi, 2011.
4. Alasdair McAndrew, “Introduction to Digital Image Processing with MATLAB”, Cengage Learning, New Delhi, 2011.
5. BhabatoshChanda and DwijeshDuttaMajumder, “Digital Image Processing and Analysis”, PHI Learning, New Delhi, 2011.

20CSP36	INTERNET OF THINGS	L	T	P	C
		3	0	0	3

Course Objectives

- Understand various basic concepts related to Internet of Things.
- Understand the elements involved in Internet of Things.
- Explore the various real-time applications which can be automated using Internet of Things.

Course Content

Fundamentals of IoT

Introduction - Definition and Characteristics of IoT - Physical design - IoT Protocols Logical design - IoT communication models, IoT Communication APIs - Enabling technologies - Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates - Domain specific IoTs - IoT Architectural view - IoT and M2M- difference between IoT and M2M - IoT systems management – Needs - NETCONF, YANG - IoT design methodology.

Elements of IoT

Sensors and actuators - Communication modules – Zigbee - LoRa - RFID - Wi-Fi - Power sources-IoT platforms – Introduction to Arduino and Raspberry Pi - Cloud Computing in IoT - Cloud Connectivity - Big Data Analytics-Data Visualization.

Challenges in IoT and Case Studies

Security Concerns and Challenges - Real time applications of IoT – Home automation – Automatic lighting – Home intrusion detection – Cities – Smart parking – Environment – Weather monitoring system – Agriculture – Smart irrigation.

References

1. Arshdeep Bahga, Vijay Madisetti, “Internet of Things-A hands-on approach", Universities Press, 2015.
2. Olivier Hersent, David Boswarthick, Omar Elloumi, “The Internet of Things: Key applications and Protocols”, Wiley Publications 2nd edition, 2013.
3. Raj Kamal, “Internet of Things – Architecture and Design Principles”, Mc Graw Hill Education Pvt. Ltd., 2017.
4. “Internet of Things and Data Analytics”, HwaiyuGeng, P.E, Wiley Publications, 2017.
5. Marco Schwartz, “Internet of Things with the Arduino Yun”, Packt Publishing, 2014.

PROFESSIONAL ELECTIVES – IV
SOFTWARE PROJECT ENGINEERING

20CSP41	SOFTWARE PROJECT MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

This course aims to outline the fundamental principles and techniques in software project management and also provides knowledge about how to complete specific project in time with the available budget

COURSE CONTENT:

Project Evaluation and Project Planning

Importance of Software Project Management – Activities - Methodologies – Categorization of Software Projects – Setting objectives – Management Control – Project portfolio Management – Cost-benefit evaluation techniques – Risk evaluation – Strategic program Management – Stepwise Project Planning.

Project Life Cycle and Effort Estimation

Choice of Process models - Incremental delivery – Rapid Application development – Agile methods – Dynamic System Development Method - Extreme Programming – Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points - COCOMO II A Parametric Productivity Model

Activity Planning and Risk Management

Objectives of Activity planning – Project schedules & Activities – Sequencing and scheduling – Network Planning models – Forward Pass & Backward Pass techniques – Critical path Method – Risk identification, Assessment, Planning & Management – PERT technique – Resource Allocation: Creation of critical paths – Cost schedules.

Project Management and Control

Creating the framework – Collecting the data – Visualizing progress – Cost monitoring – Earned Value Analysis – Change control – Managing contracts – Types of Contract – Stages in contract Placement – Contract Management.

Staffing in Software Projects

Organizational behavior – Best methods of staff selection – Motivation – The Oldham-Hackman job characteristic model – Working in teams – Becoming a team - Decision making – Organizational structures – Virtual teams – Communications genres – Communication plans.

COURSE OUTCOMES:

CO1: Ability to analyze the different project contexts and determine an appropriate management strategy that matches the requirements of the Organization

CO2: Ability to plan for the projects that address real-world management challenges and manage projects at each stage of the software Development

CO3: Ability to manage project risks including identifying, analyzing and responding to risks

CO4: Ability to understand effective strategies to manage human resources of a project for successful project completion

REFERENCES:

1. Bob Hughes, Mike Cotterell and Rajib Mall, “Software Project Management”, Fifth Edition, Tata McGraw Hill, New Delhi, 2012 (Unit 1 to 5)
2. Walker Royce, “Software Project Management A Unified Framework”, Pearson Education, Fifth Edition, 2009.
3. Robert T. Futrell, Donald F. Shefer and Linda I. Shefer, “Quality Software Project Management”, Pearson Education, 2003.
4. PankajJalote, “Software Project Management in practice”, 1st Edition, Pearson Education, 2005.
5. S. A. Kelkar, “Software Project Management: A Concise Study”, PHI Learning Pvt.Ltd., 2012
6. Robert K..Wysocki, “Effective Software Project Management”, 3rd Edition, Wiley

20CSP42	AGILE SOFTWARE DEVELOPMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

This course makes student to learn the fundamental principles and practices associated with each of the agile development methods. To apply the principles and practices of agile software development on a project of interest and relevance to the student. Topics include agile software development, development of team roles, Estimation and planning, Managing software and quality assurance.

COURSE CONTENT:

Introduction

Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Comparative review of the existing agile methods- Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams

Agile Process

Lean production - SCRUM, Crystal, Feature Driven Development, Adaptive Software Development, and Extreme Programming-Gathering Requirements: The agile way- Agile Estimation and Planning-Estimation Styles and Process

Agility and Knowledge Management

Agile information systems – agile decision making – institutional knowledge evolution cycle – development, acquisition, refinement, distribution, deployment, leveraging –Managing software knowledge – challenges of migrating to agile methodologies

Agility and Requirements Engineering

Impact of agile processes in RE – overview of RE using agile – managing unstable requirements – requirements elicitation –requirements management in agile environment, agile requirements prioritization – agile requirements modeling and generation

Agility and Quality Assurance

Agile Interaction Design - Agile product development – Agile Metrics – Feature Driven Development (FDD) – Agile approach to Quality Assurance - Test Driven Development - Agile approach to Global Software Development.

COURSE OUTCOMES:

CO1: Ability to know understand iterative software development process

CO2: Ability to understand the agile principles and specific practices

CO3: Ability to know the importance of interacting with business stakeholders in determining the requirements for a software system.

REFERENCES:

1. Dingsoyr, Torgeir, Dyba, Tore, Moe, Nils Brede (Eds.), "Agile Software Development, Current Research and Future Directions", Springer-Verlag Berlin Heidelberg, 2010 (UNIT I,II,III)
2. Torgeir Dingsoyr, Tore Dyba, Nils Brede Moe, "Agile Software Development", Springer Heidelberg Dordrecht London New York,2007 (UNIT I)
3. David J. Anderson; Eli Schragenheim, "Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results", Prentice Hall, 2003 (UNIT IV)
4. Ioannis G. Stamelos, "Agile Software Development Quality Assurance", Information Science Reference. (UNIT V)
5. Hazza& Dubinsky, "Agile Software Engineering, Series: Undergraduate Topics in Computer Science", Springer, VIII edition, 2009
6. Craig Larman, "Agile and Iterative Development: A manager_s Guide", Addison-Wesley, 2004
7. Kevin C. Desouza, "Agile information systems: conceptualization, construction, and management", Butterworth-Heinemann, 2007.

20CSP43	SOFTWARE REQUIREMENTS ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

The objective of this course is to understand fundamental concepts of Software engineering, Requirements engineering and Analysis modelling. To know about the various software design methodologies.

COURSE CONTENT:

Software Engineering Concepts

Introduction- Nature of Software - The changing nature of Software – Software Myths – Characteristics of Software -The Software Process: The Process Framework - Umbrella Activities.

Software Process Model

A Generic Process Model - Defining a Framework Activity- Identifying a Task Set- Prescriptive Process Models- Specialized Process Models- The Unified Process- Product and Process- Agile Development- Agility and the Cost of Change- Agile Unified Process- Agile Teams

Understanding Requirements

Requirements Engineering - Importance of Requirement Analysis – Functional and Non – Functional – User requirements – System requirements – Software Requirements - Establishing the Groundwork- Eliciting Requirements- Developing Use Cases - Building the Analysis Model- Negotiating Requirements

Requirements Modeling

Requirements Analysis- Scenario-Based Modeling- UML Models that Supplement the Use Case- Class-Based Methods: Identifying Analysis Classes- Specifying Attributes- Defining Operations- Associations and Dependencies- Behavior, Patterns, and Web/Mobile Apps- Creating a Behavioral Model- Requirements Modeling for Web and Mobile Apps

Software Requirement Specification and Design

SRS - IEEE Standards - Goals of good software design - Golden Rules- Prototype- Design process – Design Concepts-Design Model– Design Heuristic – Architectural styles, Architectural Design, Architectural Mapping using Data Flow- User Interface

COURSE OUTCOMES:

CO1: Ability to understand the basic concept of software engineering.
CO2: Ability to choose an appropriate process model for software development.
CO3: Ability to understand the various software design methodologies.
CO4: Ability to prepare Software requirement Specification document for a project.

REFERENCES:

1. R. S. Pressman, “Software Engineering: A Practitioner's Approach” McGraw Hill, Eighth Edition, 2015.
2. Ian Sommerville, “Software Engineering”, 10th Edition, Pearson Education Asia, 2016.
3. G J Myers, Corey S, Tom B and Todd M T, “The Art of Software Testing”, Third Edition, Wiley, 2011.
4. K.K. Aggarwal, Yogesh Singh, “Software Engineering”, New Age International Publishers, Third Edition, 2007.
5. Pankaj J, “An Integrated Approach to Software Engineering”, Third Edition, Narosa Publishing House, 2005.
6. Rajib Mall, “Fundamentals of Software Engineering”, Third Edition, PHI Learning Private Limited, 2009.

ONLINE RESOURCES:

1. https://www.geeksforgeeks.org/software-engineering/
2. https://www.coursera.org/specializations/requirements-engineering-secure software#courses

20CSP44	SOFTWARE QUALITY ASSURANCE AND TESTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

To understand the basics of testing, design, test team organization and various types of test in the life cycle of the software product. To learn the software quality assurance, metrics, defect prevention techniques for applications.

COURSE CONTENT:

SOFTWARE TESTING - CONCEPTS, ISSUES, AND TECHNIQUES

Quality Revolution, Verification and Validation, Failure, Error, Fault, and Defect, Objectives of Testing, Testing Activities, Test Case Selection White-Box and Black ,test Planning and design, Test Tools and Automation, . Power of Test. Test Team Organization and Management-Test Groups, Software Quality Assurance Group ,System Test Team Hierarchy, Team Building.

SYSTEM TESTING

System Testing - System Integration Techniques-Incremental, Top Down Bottom Up Sandwich and Big Bang, Software and Hardware Integration, Hardware Design Verification Tests, Hardware and Software Compatibility Matrix Test Plan for System Integration. Built- in Testing. functional testing - Testing a Function in Context. Boundary Value Analysis, Decision Tables. acceptance testing - Selection of Acceptance Criteria, Acceptance Test Plan, Test Execution Test. software reliability - Fault and Failure, Factors Influencing Software, Reliability Models

SYSTEM TEST CATEGORIES

System test categories Taxonomy of System Tests, Interface Tests Functionality Tests. GUI Tests, Security Tests Feature Tests, Robustness Tests, Boundary Value Tests

Power Cycling .Test Generation from FSM models- State-Oriented Model. Finite-State Machine Transition Tour Method, Testing with State Verification. Test Architectures-Local, distributed, Coordinated, Remote. Test cases-Defect Reports, Defect Causal Analysis, Beta testing, measuring Test Effectiveness.

SOFTWARE QUALITY

Software quality - People‘s Quality Expectations, Frameworks and ISO-9126, McCall‘s Quality Factors and Criteria – Relationship. Quality Metrics. Quality Characteristics ISO 9000:2000 Software Quality Standard. Maturity models- Test Process Improvement, Testing Maturity Model.

SOFTWARE QUALITY ASSURANCE

Quality Assurance - Root Cause Analysis, modeling, technologies, standards and methodologies for defect prevention. Fault Tolerance and Failure Containment - Safety Assurance and Damage Control, Hazard analysis using fault-trees and event-trees. Comparing Quality Assurance Techniques and Activities. QA Monitoring and Measurement, Risk Identification for Quantifiable Quality Improvement. Case Study: FSM-Based Testing of Web-Based Applications.

COURSE OUTCOMES:

CO1: Ability to perform functional and nonfunctional tests in the life cycle of the software product.
CO2: Ability to understand system testing and test execution process.
CO3: Ability to identify defect prevention techniques and software quality assurance metrics.
CO4: Ability to apply techniques of quality assurance for typical applications.

REFERENCES:

1. ”Software Testing And Quality Assurance-Theory and Practice”, Kshirasagar Nak Priyadarshi Tripathy, John Wiley & Sons Inc,2008.
2. Ron Patton, “Software Testing”, Second Edition, Sams Publishing, Pearson Education, 2007
3. Srinivasan Desikan and Gopalaswamy Ramesh, “Software Testing – Principles and Practices”, Pearson Education, 2006
4. ”Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement”, Jeff Tian, John Wiley & Sons, Inc., Hoboken, New Jersey. 2005.
5. ”Software Quality Assurance - From Theory to Implementation”, Daniel Galin, Pearson Education Ltd UK, 2004

20CSP45	ROBOTIC PROCESS AUTOMATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

To acquire the practical and theoretical knowledge about RPA and tools.

COURSE CONTENT:

RPA Foundation and Skills

RPA-Flavours of RPA-History of RPA-Benefits of RPA-Downsides of RPA-RPA Compared to BPO BPM and BPA-On-premises vs the cloud-Web technology –programming language and code-OCR-Databases-APIs-AI-Cognitive Automation.

Process Methodologies and Planning

Lean-Six Sigma-How to Implement Six Sigma-Six Sigma Roles and Levels-Lean Six Sigma-Finding the Right Balance -Applying Lean and Six Sigma to RPA-The Preliminaries -Use a Consulting Firm? -RPA Consulting: Some Case Studies -What to Automate? -ROI for RPA -RPA Use Cases -The Plan.

BOT Development

Preliminaries-Installation of UiPath -Getting Started-Activities-Flowcharts and Sequences-Log Message-Variables-Loops and Conditionals-For Each Loop-Do While Loop and While Loop-IF/THEN/ELSE Conditionals-Switch-Debug-Common UiPath Functions-The UiPath Orchestrator-Best Practices for Bot Development.

Deployment Monitoring and Data Preparation

Testing-Going into Production-Monitoring-Security -Scaling. Types of Data-Big Data -The Issues with Big Data -The Data Process -Types of Algorithms-The Perils of the Moonshot-Bias.

Open Source RPA

What Is Open Source Software? -The Business Model of Open Source? -The Pros and Cons of Open Source Software -OpenRPA -UI.Vision -Robot Framework-Robocorp -Orchestra –TagUI.

COURSE OUTCOMES:

CO1: Ability to understand the basics of RPA, benefits, functionalities and use cases.

CO2: Ability to deploy BOT and other RPA tools.

CO3: Ability to differentiate between RPA and traditional automation.

CO4: Ability to automate web applications using RPA.

REFERENCES:

1. "The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems",ISBN-13 (pbk): 978-1-4842-5728-9 ISBN-13 (electronic): 978-1-4842-5729-6,https://doi.org/10.1007/978-1-4842-5729-6**.[UNIT 1-5]**
2. "Robotic Process Automation: Guide to Building Software Robots, Automate Repetitive Tasks & Become an RPA Consultant"By Richard Murdoch.
3. "Robotic Process and Cognitive Automation: The Next Phase"By Mary C. Lacity and Leslie P. Willcocks.
4. "Robotic Process Automation with Blue Prism Quick Start Guide: Create Software Robots and Automate Business Processes" By Lim Mei Ying.
5. "The Care and Feeding of Bots: An Owner's Manual for Robotic Process Automation " By Christopher Surdak JD.
6. "Robotic Process Automation Rpa A Complete Guide - 2020 Edition" by [Blokdyk, Gerardus] By Gerardus Blokdyk.

PROFESSIONAL ELECTIVES – V
RECENT COMPUTING ADVANCEMENTS I

20CSP51	SALESFORCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

This course provides basic concepts of Salesforce and the force.com platform. It also cover how data is structured and accessed using Visualforce and Apex and creation of custom user interfaces and database actions on the force.com platform.

COURSE CONTENT:

Introduction to Cloud Computing

Introducing the concept of Cloud Computing - Overview of each of three building blocks in cloud applications SAAS, PAAS, IAAS –Types of Cloud.

Basic Concepts on Salesforce

Introduction of cloud vendors (Salesforce): Salesforce and the Platform – PaaS and Multitenant Architecture- Salesforce Licensing – Setting up development environment: Navigating the UI- Setting Sandbox - Development Environment.

Structuring Data

Structure of Data: Objects - Fields - Sales Process - Security settings – Validation: Standard and Custom – Creating and Retrieving Data in UI – Querying Data SOQL, SOSL - Reports.

Introduction to Visualforce and Apex

Introducing MVC- HTML – HTML to visualforce – visualforce component – standard controller – Introduction to apex: Apex, statements, variables, Flow control, classes, coding conventions – Governor Limits.

Apex Classes and Triggers

Apex classes and Triggers: Classes, Triggers, Trigger Chains – Visualforce with Apex - Test coverage and Deploying: Test coverage, Salesforce automation - Deploying customization, lightning in Salesforce.

COURSE OUTCOMES

CO1: Ability to understand the concepts of Salesforce development.

CO2: Ability to remember the structure of apex.

CO3: Ability to apply apex to develop salesforce Applications.

CO3: Ability to understand the automation of the services, testing and deploying salesforce.

REFERENCES:

1. Michael Wicherski, “Beginning Salesforce Developer”, Apress, 2017.
2. Jeff Douglas & Wes Nolte, “Salesforce Handbook”, 2010.
3. Michael Wicherski Matt Kaufman, “Learning Apex Programming”, Ingram short title, 2015.
4. Keir Bowden, “Visualforce Development Cookbook” , Packt Publishing Limited,2016
5. Mohith Shrivastava, “Learning Salesforce Lightning Application Development: Build and test Lightning Components for Salesforce Lightning Experience using Salesforce DX”, Packt Publishing Limited, 2017
6. Nayan B. Ruparelia, “Cloud Computing”, The MIT Press, 2016.

20CSP52	FUNDAMENTALS OF AWS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

To learn the fundamentals of AWS. To understand planning and deploying scalable, highly available, and fault tolerant systems on AWS. To study about complete overview of AWS Services and various AWS Database services and storages.

COURSE CONTENT:

CLOUD COMPUTING AND AWS OVERVIEW

Cloud Computing - Cloud 101-Understanding the basics – Designing Cloud Applications Designing with AWS Global Services - AWS Regions & Availability Zones – AWS Fundamentals - AWS Platform & Services

OVERVIEW OF AWS SERVICES

Compute Services overview- Storage Services Overview - Database Services Overview - Monitoring Services overview - Management Services Overview - Deployment Services – Amazon EC2 – Amazon Elastic Block Store (EBS) – Amazon Elastic File Service (EFS) - Amazon Relational Database Service (RDS) and Amazon DynomoDB - Building highly AWS available and fault tolerance systems - AWS Auto Scaling Fundamentals - AWS Elastic Load Balancing – AWS Networking Services -

AWS STORAGE AND APPLICATIONS

Services using Cloud Watch - AWS Simple Storage Service (S3) - S3 Overview and pricing - S3 Life Cycle Policies & Versioning - Create a S3 Bucket, upload objects and object permissions – Cloud Adoption – Migration – Cloud Storage – Cloud Security Services

DESIGNING FOR AND IMPLEMENTING HIGH AVAILABILITY

Defining availability objectives - Using AWS for disaster recovery - Setting up high availability - Designing for and Implementing Security - Deploying to Production and Going Live – Cloud Watch for Monitoring – AWS Infrastructure

AWS COMPONENTS, COST MODEL, AND APPLICATION

AWS components - Optimizing cloud infrastructure costs - Application development environments - Setting up the AWS infrastructure - Designing for and Implementing Scalability - Designing scalable application architectures - Leveraging AWS infrastructure services for scalability - Setting up auto scaling

COURSE OUTCOMES:

CO1: Ability to analyze the basic fundamentals of AWS
CO2: Ability to express the various services of AWS
CO3: Ability to explain the use of Cloud storage and applications and databases
CO4: Ability to design and develop various security measures and AWS infrastructure

REFERENCES:

1. Aurobindo Sarkar and Amit Shah, Learning AWS: Design, build, and deploy responsive applications using AWS cloud components, First Publication, Packt Publishing Ltd, 2015.
2. Mark Wilkins, Learning Amazon Web Services (AWS) Hands-On Guide to the Fundamentals of AWS Cloud, Pearson Education, 2019.
3. Michael Wittig, Andreas Wittig, Amazon Web Services in Action, Manning, 2015.
4. Lucas Chan & Rowan Udell, AWS Administration Cookbook, 2017.
5. Prabhakaran Kuppusamy, Uchit Vyas, AWS Development Essentials, Packt Publishing Ltd, 2014.

20CSP53	MACHINE LEARNING & DEEP LEARNING TECHNIQUES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

To learn the basic concepts of machine learning. To understand the major classification and clustering techniques. To acquire the knowledge on the concepts of Deep Learning techniques.

COURSE CONTENT:

Introduction

Machine Learning: What & Why? – Types of Machine Learning – Supervised and Unsupervised Learning – Curse of Dimensionality – Over fitting &Under fitting. Platform for Machine Learning – Machine Learning Python Libraries.

Regression & Classification

Linear Regression – Bias & Variance trade off – Training Data & testing data – validation data – Cross validation techniques – Feature selection & Extraction - Regularization – Error & Noise – Logistic Regression – Naïve Bayes – Bayesian Classifier – Support Vector Machine – Performance metrics – Application face recognition with PCA.

Clustering Techniques

Measuring similarity – Evaluating output of clustering methods – Spectral Clustering – Agglomerative clustering – Divisive clustering – K means clustering – CART – Random Forest – Application: image segmentation using K means clustering

Deep Learning

Historical trends in Deep learning – Introduction to Simple DNN – Deep learning software libraries – Deep Feed Forward networks – Activation Function, ReLU – Differentiation algorithms – Regularization methods for Deep Learning – Drop out – Convolutional neural networks – Pooling – Normalization. Application using ImageNet

Recurrent Neural Networks

RNN topologies – Long Short term memory – Bidirectional LSTM & RNN – Auto encoders – Application Case study: Handwritten digits recognition using deep learning LSTM with keras – sentiment analysis.

COURSE OUTCOMES:

CO1: Ability to understand the concept of the linear learning models and classification in machine learning.

CO2: Ability to understand the clustering techniques and their utilization in machine learning.

CO3: Ability to apply various networks models in deep learning.

CO4: Ability to acquire knowledge of severalencoders.

REFERENCES:

1. KevinP.Murphy, Machine Learning:A Probabilistic Perspective‖,MITPress,2012.
2. Ian Good fellow, Yoshua Bengio,Aaron Courville,―DeepLearning‖,MITPress,2016.
3. Ethem Alpaydin, ―Introduction to Machine Learning‖, Prentice Hall of India, 2005
4. Tom Mitchell, "Machine Learning", McGraw-Hill, 1997.
5. Sebastian Raschka, Vahid Mirjilili,‖Python Machine Learning and deep learning‖, 2nd edition, kindle book, 2018.

20CSP54	ENTREPRENEURSHIP DEVELOPMENT	L	T	P	C
		3	0	0	3

Course Objectives

- To develop necessary knowledge and skills for entrepreneurship
- Develop and strengthen entrepreneurial quality
- Understand the process and procedure involved in setting up enterprises

Entrepreneurship concept, Characteristics of Successful Entrepreneur, Knowledge and Skills of Entrepreneur, Central and State Government Industrial Policies and Regulations.

Prefeasibility Study, Criteria for Selection of Product, Capital Budgeting, Feasibility Report Preparation and Evaluation Criteria

Finance and Human Resource Mobilization, Operations Planning, Market and Channel Selection, Growth Strategies, Product Launching, Incubation, Venture capital

References

1. S.S.Khanka, "Entrepreneurial Development"; S. Chand & Co. Ltd., 2011.
2. Hisrich R D and Peters M P, "Entrepreneurship"; Tata McGraw-Hill, 5th Edition, 2012.
3. Mathew Manimala, "Entrepreneurship Theory at the Crossroads", Paradigms & Praxis, Biztrantra , 2nd Edition , 2009
4. Prasanna Chandra, "Projects – Planning, Analysis, Selection, Implementation and Reviews", Tata McGraw-Hill, 2015.
5. Rabindra N. Kanungo; "Entrepreneurship and Innovation"; Sage Publications, 2014.

20CSP55	SOFT COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

The course focuses on the various soft computing frame works and familiarize with the design of neural networks, fuzzy logic and fuzzy systems and also to learn the mathematical background for optimized genetic programming.

COURSE CONTENT:

Introduction

Introduction to Soft computing - Basic tools of Soft Computing - Soft Computing vs Hard Computing -Artificial Neural Networks -Classification of ANNs-McCulloch and Pitts Neuron Model.

Artificial Neural Networks

Back propagation Neural Networks – Kohonen Neural Network -Learning Vector Quantization - Hamming Neural Network – Hopfield Neural Network- Bi-directional Associative Memory - Adaptive Resonance Theory Neural Networks

Fuzzy Systems

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets – Classical Relations and Fuzzy Relations -Membership Functions -Defuzzification – Fuzzy Arithmetic and Fuzzy Measures - Fuzzy Rule Base and Approximate Reasoning – Introduction to Fuzzy Decision Making.

Genetic Algorithms

Basic Concepts- Working Principles -Encoding- Fitness Function – Reproduction -Inheritance Operators – Cross Over – Inversion and Deletion -Mutation Operator – Bit-wise Operators - Convergence of Genetic Algorithm.

Optimization Techniques

Multi objective Evolutionary Algorithms (MOEA) - Particle swarm optimization (PSO)- Ant Colony Optimization - Biogeography Based Optimization (BBO).

COURSE OUTCOMES:

CO1: Ability to analyze various soft computing techniques for real time problems.
CO2: Ability to apply fuzzy rules and reasoning to develop decision making and expert system.
CO3: Ability to apply optimization techniques for improving solution model.

REFERENCES:

1. S.Rajasekaran and G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis & Applications", Prentice-Hall of India Pvt. Ltd., 2006.

2. George J. Klir, Ute St. Clair, Bo Yuan, “Fuzzy Set Theory: Foundations and Applications” Prentice Hall, 1997.
3. David E. Goldberg, “Genetic Algorithm in Search Optimization and Machine Learning” Pearson Education India, 2013.
4. James A. Freeman, David M. Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques, Pearson Education India, 1991.
5. Simon Haykin, “Neural Networks Comprehensive Foundation” Second Edition, Pearson Education, 2005.

20CSP56	DATA MINING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

This course is focused to introduce the basic concepts and techniques of Data Mining. To understand the significance of data pre-processing. To explore the standard algorithms for finding hidden and interesting patterns in data.

COURSE CONTENT:

Introduction

Introduction: Why Data Mining – What is Data mining – What kinds of data can be mined – What kind of patterns can be mined – Which technologies are used – Which kind of applications are targeted – Major issues in data mining – Getting to know your data: – Data Objects and attribute types, Basic Statistical description of data – Data Visualization – Measuring Data similarity and dissimilarity measures

Data Preprocessing

Data Preprocessing: Overview – Data Cleaning: missing values – noisy data – data cleaning as a process – Data Integration – Data Reduction: Strategies – Wavelet Transforms – PCA, Attribute Subset Selection – Histograms – Clustering – Sampling – Data cube Aggregation – Data Transformation and Discretization: Overview – Data transformation by normalization – Discretization by Binning – Discretization by Histogram analysis – Discretization by cluster, decision tree and correlation analyses

Frequent Pattern Analysis

Basic concepts: Market basket analysis – Frequent itemsets, Closed itemsets and association rules – Frequent Itemset Mining Methods: Apriori algorithm– Generating association rules from frequent itemsets – Improving the efficiency of apriori – Pattern Mining: A road map – Pattern Mining in Multilevel, Multi Dimensional Space – Constraint Based Frequent Pattern Mining

Classification

Basic concepts – Decision Tree Induction - Bayesian Classification methods – Rule Based Classification – Bayesian belief networks – Classification by Back Propagation – Support Vector Machines — Classification using frequent patterns – Lazy Learners – Other Classification methods: GA – Rough set approach – Fuzzy set approach

Clustering

Cluster analysis – Partitioning Methods – Hierarchical Methods – Density Based Methods – Grid Based Methods – Evaluation of clustering – Clustering high dimensional data – Clustering with constraints, Outlier and outlier analysis: outlier detection methods

COURSE OUTCOMES:

CO1: Ability to understand the significance of Data mining.

CO2: Ability to analyze how suitable pre-processing techniques are applied in datasets

CO3: Ability to analyze how patterns can be extracted by applying association rule mining techniques

CO4: Ability to analyze the working principles of various algorithms used in classification and clustering data mining techniques

REFERENCES:

1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012
2. Alex Berson and Stephen J.Smith, "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, 35th Reprint 2016.
3. K.P. Soman, Shyam Diwakar and V. Ajay, "Insight into Data Mining Theory and Practice", Eastern Economy Edition, Prentice Hall of India, 2006.
4. Ian H.Witten and Eibe Frank, "Data Mining: Practical Machine Learning Tools and Techniques", Elsevier, Second Edition.
5. Charu C. Aggarwal, "Data Mining: The Textbook", Springer International Publishing, 2015
6. Ian H. Witten, Eibe Frank, Mark A. Hall and Christopher J. Pal, "Data Mining: Practical Machine Learning Tools and Techniques", Morgan Kaufmann Publisher, 4th Edition, 2016

20CSP57	BLOCKCHAIN TECHNOLOGY AND APPLICATIONS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

This course covers the emerging abstract models for Blockchain Technology. It helps to understand the function of Blockchain as a method of securing distributed logs. This course provides deep insight about functionality of Blockchain. The topics includes cryptographic functions, bitcoin, cryptocurrency, blockchain frameworks and bitcoin applications

COURSE CONTENT:

Introduction to Blockchain

Introduction – basic ideas behind blockchain- Basic Cryptographic primitives used in Blockchain – Secure, Collison-resistant, hash functions, Properties of a hash function, digital signature, public key cryptosystems, zero-knowledge proof systems Basic Distributed System concepts

Bitcoin and Cryptocurrency

A basic crypto currency, Creation of coins- Bitcoin Blockchain and scripts, Use cases of Bitcoin Blockchain scripting language in micropayment- crypto-currency as application of blockchain technology- Distributed consensus in open environments-Consensus in a Bitcoin network

Bitcoin Network and Payments

The Bitcoin network Wallets- Bitcoin payments Innovation in Bitcoin- Bitcoin Clients and APIs- Types of Bitcoin Core clients- Setting up a Bitcoin node- Bitcoin limitations

Hyper Ledger Fabric & Etherum

Architecture of Hyperledger fabric v1.1-Introduction to hyperledger fabric v1.1, chain code- Ethereum: Ethereum network, EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity, Smart contracts, Truffle Design and issue Crypto currency, Mining, DApps

BLOCKCHAIN APPLICATIONS

Applications of blockchain in Internet of Things-Medical Record Management System- Uses of Blockchain in E-Governance, Land Registration Blockchain Security–Finance

COURSE OUTCOMES:

CO1: Ability to understand the cryptographic building blocks and their security
CO2: Ability to understand emerging abstract models for Blockchain Technology.
CO3: Ability to understand how the individual components of the Bitcoin protocol works

REFERENCES:

1. Bashir, Imran, "Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks" Second edition, 2017 (UNIT I,II,III,IV)
2. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017
3. S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, 'Blockchain Technology: Cryptocurrency and Applications', Oxford University Press, 2019
4. Joseph Bonneau et al, SoK: "Research perspectives and challenges for Bitcoin and cryptocurrency", IEEE Symposium on security and Privacy, 2015.
5. Jacob Stenum Czepluch, "The Use of Block Chain Technology in Different Application Domains", The IT University of Copenhagen,2015 (UNIT V)
6. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016
7. https://onlinecourses.nptel.ac.in, "Introduction to Blockchain Technology and its Applications"

PROFESSIONAL ELECTIVES – VI
RECENT COMPUTING ADVANCEMENTS II

20CSP61	INTELLECTUAL PROPERTY RIGHTS	L	T	P	C
		3	0	0	3

Course Objectives

- To acquire knowledge about the intellectual property rights.
- To learn the procedure for registering Patents, Copy Rights, Trademarks and Geographical Indication
- To protect one's intellectual property rights

Course Content

Introduction to IPR, International cooperation on IPR, Major Treaties, International convention relating to Intellectual Property – Establishment of WIPO – Mission and Activities – History – General Agreement on Trade and Tariff (GATT).

Nature &Importance of Patents, Copy Rights, Trade Marks, Geographical Indication. Procedure to file Application for grant of Patents, Copy rights, Trade Marks and Geographic Indication.

Emerging trends in IPR, IPR litigation, Case Studies on Patents, Copyright and related rights, Trade Marks, geographic indications

References

1. Bare Acts (Up-to-date)
2. Subbaram N. R., and Viswanathan S., "Handbook of Indian Patent Law and Practice", Printers and Publishers Pvt. Ltd., 2008.
3. Susan K. Sell, "Private Power, Public Law: The globalization of Intellectual Property Rights", Cambridge studies in International relations, Cambridge University Press, 2013.
4. Wadehra, B.L., "Law relating to Intellectual Property", University law publishing company Pvt Ltd, 4th Edition, 2010.
5. Bhandari, M.K., "Law Relating to Intellectual Property Rights", Central Law Publications, 4th Edition, 2015.

20CSP62	MICROSOFT AZURE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

This course provides basic concepts and services of Microsoft Azure platform. It also covers the Virtual Machine Management, storage, Networking and Databases.

COURSE CONTENT:

Introduction to Azure

Overview of cloud computing – Benefits of cloud - Cloud Offering: SAAS, PAAS, IAAS – Azure services - Introduction to portals - Azure Management Portal - Subscription management and billing.

Azure Websites, Cloud Services, VMS

Creating and configuring websites- Deploying and monitoring websites – PaaS Cloud Services – Azure Virtual Machines – What is Azure Virtual Machines – Creating and configuring Virtual Machines – Configure disks – Virtual Machine Management.

Azure Storage, Virtual Networks

Blob storage – Table storage – Queues – Redundancy – creating and managing storage – Virtual Networks: Creating a Virtual Networks – Network configuration file – Cross premises connection – Point to site network.

Databases

SQL Database – Firewall Setting – Applications connecting to azure SQL – SQL server in azure Virtual Machines – Comparing Azure SQL Database with SQL server in Azure Virtual Machines – Database alternatives.

Azure Directory And Management Tools

Overview – creating directory – Users and Groups - Authentication – Management tools: Visual Studio and Azure SDK - Windows PowerShell – Cross Platform command line Interface – Business Cases - Total Cost of Ownership – Workload cost – Manage cost – SLA

COURSE OUTCOMES:

CO1: Ability to understand the key concepts of cloud computing and Azure Portal.

CO2: Ability to understand the foundational services of azure, virtual machines.

CO3: Ability to understand the services relating to storage and networking.

CO4: Ability to design and configure websites using azure.

REFERENCES:

1. Michael Collier, Robin Shahan, “Microsoft Azure Essential” , Microsoft Press, 2015
2. Kennan Bismar, “Azure: Microsoft Azure Tutorial for Beginners”, Zaccheus, 2018.
3. Mohamed Wali, “Learn Microsoft Azure: Build, manage, and scale cloud applications using the Azure ecosystem”, Ingram short title, 2018.
4. Jim Cheshire, “Microsoft Azure Fundamentals”, Microsoft Press; 1st edition, 2019
5. Erl Thomas, Puttini Ricardo, Mahmood Zaigham, "Cloud Computing: Concepts, Technology & Architecture”, pearson education, 2013.
6. Nayan B. Ruparelia, “Cloud Computing”, The MIT Press, 2016.

20CSP63	BIG DATA ANALYTICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

This course is focused to know the fundamental concepts of Big data and analytics. To explore tools and practices for working with Big data. To be familiar with Big Data framework and its applications.

COURSE CONTENTS:

INTRODUCTION TO BIG DATA

Types of Digital Data – Classification of Digital Data – Characteristics of Data – Evolution of Big Data – Definition of Big Data – Challenges with Big Data – Volume –Velocity – Variety

HADOOP

Hadoop distributed file system: HDFS Concepts – Java Interface - Data flow, Hadoop I/O: Serialization – File based Dta Structures - Setting up Hadoop Cluster: Cluster setup and Installation.

MAPREDUCE

MapReduce (MR) basics - MR algorithm design: Local Aggregation - Pairs and Stripes - Computing Relative Frequencies - Secondary Sorting - Inverted Indexing for Text Retrieval: Web Crawling - Inverted Indexes - Inverted Indexing - Baseline Implementation - Revised Implementation Graph algorithms: Graph Representations - Parallel Breadth-First Search – Page Rank - Issues with Graph Processing

PIG AND HBASE

Pig Latin, User defined functions, Data processing operators, HBasics, Installation, Clients, Examples, HBase Vs RDBMS.

NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION

NoSQL Databases : Schema-less Models: Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores – Tabular Stores – Object Data Stores – Graph Databases.

COURSE OUTCOMES:

CO1: Ability to work with big data tools and its analysis techniques

CO2: Ability to apply appropriate methods and tools to process large amount of data in terms of scalability and performance using HDFS.

CO3: Ability to apply appropriate methods and tools to process large amount of data using MapReduce Programming.

CO4: Ability to perform analytics on NoSQL Database.

REFERENCES:

1. EMC Education Services, “Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data”, John Wiley & Sons, New Delhi, 2015 (Unit I)
2. SeemaAcharya, SubhashiniChellapan, “Big Data and Analytics”, Wiley, USA, 2015.
3. Jimmy Lin and Chris Dyer, "Data Intensive Text Processing using MapReduce", Morgan and Claypool Publishers, USA, First Edition, 2010 (Unit III)
4. Tom White, "Hadoop: The Definitive Guide", O`Reilly Publishers, USA, Third Edition,2012.(Unit II & IV)
5. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/Elsevier Publishers, 2013. (Unit V)
6. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2015.

20CSP64	BASICS OF TENSORFLOW AND KERAS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

To learn the basic concepts of tensors and keras. To understand the major implementation using Tensorflow and Keras. To acquire the knowledge on the concepts of Deep Learning techniques.

COURSE CONTENT:

Introduction

Artificial Intelligence - Machine Learning – Learning Representations from data – The "deep" in deep learning – Neural networks – What makes deep learning different – the modern machine learning landscape- democratization of deep learning.

Tensor Building Blocks

Scalars (0D tensors) – Vectors (1D tensors) – Matrices (2D tensors) – Key attributes – Manipulating tensors in Numpy – Notion of data batches – Real world examples of data tensors – Tensor operations – Geometric interpretation of tensor operations.

Convolutional Neural Networks

Introduction to convnets – convolution operation , max pooling operation – Training a convent from scratch – Data preprocessing – data augmentation – Feature extraction – fine tuning – Visualizing heat maps of class activation . Application: Temperature Forecasting problem.

Introduction to Keras

Introduction - Keras ,Theano , CNTK – Setting up a deep learning workstation –Jupyter Notebook – GPU architecture – Application : Classifying movie reviews

Generative Deep Learning

Generative Recurrent networks – Recurrent layer in keras – Understanding LSTM and GRU layers - Text generation with LSTM – GAN architecture – Generator – Discriminator – DCGAN

COURSE OUTCOMES:

CO1: Ability to understand the concept of the tensor learning models in deep learning.

CO2: Ability to understand the techniques and their utilization in deep learning.

CO3: Ability to apply various networks models in deep learning.

CO4: Ability to acquire knowledge of several encoders.

REFERENCES:

1. François Chollet, "Deep Learning with Python", Manning Publications, 2017.

2. IanGoodfellow, YoshuaBengio, AaronCourville, “DeepLearning”, MITPress, 2016.

3. Antonio Gulli , Amita Kapoor , Sujit Pal, “Deep Learning with TensorFlow 2 and Keras - Second Edition, Packet Publishing, 2018.

4. Carol Quadros, “Machine Learning with python, scikit-learn and Tensorflow”, Packet Publishing, 2018.

5. Sebastian Raschka, VahidMirjilili, “Python Machine Learning and deep learning”, 2nd edition, kindle book, 2018.

20CSP65	MACHINE VISION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

To understand the principles and application of machine vision system in Manufacturing and measurement. To understand Transforms and its applications to detect lines, circles, ellipses and three-dimensional image analysis techniques.

COURSE CONTENT:

Introduction

Machine Vision use of machine vision - Benefits of machine vision Machine vision applications - Components of a machine vision system - Different types of machine vision systems - Machine vision platforms - Image digitization- Digital image properties.

Image Preprocessing and Segmentation

Pixel brightness transformations - Geometric transformation - Image Data Compression - Image Filtering and restoration - Image Segmentation – Local pre-processing - Image restoration. Segmentation: Thresholding- Edge-based segmentation- Region-based segmentation- Matching.

Object Recognition

Object Recognition - Knowledge representation - Statistical pattern recognition - Neural nets - Syntactic pattern recognition- Recognition as graph matching- Optimization techniques in recognition.

3D Vision Geometry and Radiometry

3D vision tasks- Geometry for 3D vision: 3D model-based vision- Basics of projective geometry- Single perspective camera **-** Geometry of two cameras-Fundamental matrix. Radiometry and 3D vision: Surface reflectance- Shape from shading- Mathematical morphology

Texture and Motion Analysis

Statistical texture description - Syntactic texture description methods - Hybrid texture description methods - Different motion analysis methods- Optical flow Application. In-vehicle vision system - locating roadway - road markings - identifying road signs - locating pedestrians.

COURSE OUTCOMES:

CO1: Ability to understand digital image capturing and processing techniques.

CO2: Ability to apply Machine vision techniques to pattern recognition.

CO3: Ability to design strategies for machine vision based applications.

REFERENCES:

1. Sonka M., Hlavac V. and Boyle R., “Image Processing, Analysis, and Machine Vision’, Second Editio…n, Brooks/Cole, Pacific Grove, 1999. **(UNIT 1,2,3,4,5)**
2. Jain A.K., “Fundamentals of Digital Image Processing”, Prentice-Hall, New Jersey, 1989.
3. E. R.Davies,“Computer &MachineVision”,FourthEdition,AcademicPress,2012.

4. R.Szeliski,“ComputerVision:Algorithms and Applications”, Springer2011.
5. SimonJ.D.Prince,“ComputerVision: Models, Learning, and Inference”, Cambridge Universiy Press,2012
6. John G. Prokis, Dimitris G. Manolakis, “Digital Signal Processing (Principles, Algorithms and appls.)”, PHI. Publication

20CSP66	FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

This course aims to improve student's awareness and understanding of the basic concepts involved in Integrated Product Development by providing exposure to the key product development concepts which enhance employability and also make students industry ready

COURSE CONTENT:

Fundamentals of Product Development

Global Trends Analysis and Product decision: Types of various trends - Overview of Products and Services - Types of Product Development - Overview of Product Development methodologies - Product Life Cycle – Planning and Management

Requirements and System Design

Types of Requirements - Requirement Engineering - Traceability Matrix and Analysis - Introduction to System Modeling - System Optimization - System Specification - Sub-System Design

Design and Testing

Industrial Design and User Interface Design - Concept generation Techniques – Concept Screening and Evaluation - Component Design and Verification – High Level/Low Level Design – Types of Prototypes - System Integration – Testing standards and Certification

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Documentation, Sustenance Engineering and EoL Support

Product verification and validation processes and stages - Product Documentation – Sustenance: Maintenance and Repair – Enhancements - Product EoL: Obsolescence Management - Configuration Management - EoL Disposal

Business Dynamics Engineering Services Industry

Engineering Services Industry - Product development in Industry versus Academia - The IPD Essentials: Vertical specific product development processes – Product development Trade-offs - Intellectual Property Rights and Confidentiality - Security and configuration management.

COURSE OUTCOMES:

CO1: Ability to understand the global trends and development methodologies of various types of products and services

CO2: Ability to collect and analyze requirements for the development of new product and will be able to convert them to design specification

CO3: Ability to Analyze and solve problems independently or as a team and will be able to manage a project from start to finish

CO4: Ability to obtain the technical skills needed to effectively play the entry level design engineer role in an engineering organization

REFERENCES:

1. IT-ITeS Sector Skills Council NASSCOM Handbook, “Foundation Skills in Integrated Product Development (FSIPD)” (Unit 1 to Unit 5)
2. Karl T Ulrich and Steven D Eppinger, "Product Design and Development", Tata McGraw Hill, Fifth Edition, New Delhi, 2011
3. John W Newstorm and Keith Davis, "Organizational Behavior", Tata McGraw Hill, Eleventh Edition, New Delhi, 2005. 106
4. Peter F Drucker, “People and Performance”, Butterworth – Heinemann [Elsevier], Oxford, UK, 2004.
5. Vinod Kumar Garg and Venkitakrishnan N K, “Enterprise Resource Planning – Concepts and Practice”, Prentice Hall India, New Delhi, 2003
6. Ullman, David G., “The Mechanical Design Process”, Mc Graw-Hill, 4th edition, 2009
7. Mark S Sanders and Ernest J McCormick, "Human Factors in Engineering and Design", McGraw Hill Education, Seventh Edition, New Delhi, 20

20CSP67	INFORMATION SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

This course provides the basics of Information Security. The course further deals with legal, ethical and professional issues in Information Security. It enables the students to gain exposure in various technological aspects of Information Security.

COURSE CONTENT:

Introduction

History of Information Security, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC

Security Investigation

Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues

Security Analysis

Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk

Logical Design

Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity

Physical Design

Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel

COURSE OUTCOMES:

CO1: Be able to design a secure information system using system development life cycle for preventing various threats and attacks

CO2: Be able to analyze the risk management concepts

CO3: Be able to apply the cryptographic algorithms and evaluate

REFERENCES:

1. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", 4th Edition, Cengage Learning, November 2014.
2. Micki Krause, Harold F. Tipton, "Handbook of Information Security Management", Vol 2-6th Edition, CRC Press LLC, 2008.
3. Stuart Mc Clure, Joel Scrambray, George Kurtz, "Hacking Exposed", Tata McGraw- Hill, 7th Edition, 2012.
4. Matt Bishop, "Computer Security Art and Science", Addison-Wesley Professional, November 2018.

5. William Stallings, “Cryptography and Network Security: Principles and Practice”, Pearson, 7th Edition, 2017.
6. Malcolm Harkins, “Managing Risk and Information Security: Protect to Enable”, APress, December 2012.

OPEN ELECTIVES

OFFERED BY B.E (ELECTRONICS AND COMMUNICATION ENGINEERING) PROGRAMME

20ECE01	ELECTRONIC MEASUREMENTS AND INSTRUMENTATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

This course will enable the students to learn the fundamentals of electrical and electronic instruments, measurement techniques, storage and display devices.

COURSE CONTENT:

Introduction

Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement — Standards and calibration

Electrical and Electronic Instruments

Principle and types of analog and digital voltmeters, ammeters, multimeters – Single and three phase wattmeters and energy meters – Magnetic measurements – Determination of B-H curve and measurements of iron loss.

Comparative Methods of Measurements

D.C & A.C potentiometers, D.C & A.C bridges, transformer ratio bridges, self-balancing bridges. Interference & screening – Multiple earth and earth loops - Electrostatic and electromagnetic interference – Grounding techniques.

Storage and display Devices

Magnetic disk and tape –digital plotters and printers, CRT display, digital CRO, OLED,LED display systems, LCD –USB Data Loggers.

Transducers and Data Acquisition Systems

Classification of transducers – Selection of transducers – Resistive, capacitive & inductive transducers – Piezoelectric, Hall effect, optical and digital transducers – Elements of data acquisition system – A/D, D/A converters – Smart sensors.

COURSE OUTCOMES:

At the end of the course, the students will have the

CO1: Ability to find electrical parameters using appropriate Electronics Instruments.

CO2: Ability to interpret the characteristics and operation of Electrical and Electronic

Instruments.

CO3: Ability to apply storage and display devices.

CO4: Ability to select appropriate sensors in various applications.

REFERENCES:

1. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2004.
2. J. B. Gupta, 'A Course in Electronic and Electrical Measurements', S. K. Kataria & Sons, Delhi, 2003.
3. J Doebelin E.O. and Manik D.N., Measurement Systems – Applications and Design, Special Indian Edition, Tata McGraw Hill Education Pvt. Ltd., 2007.
4. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw Hill, II Edition 2004.
5. D.V.S. Moorthy, 'Transducers and Instrumentation', Prentice Hall of India Pvt Ltd, 2007.

20ECE02	MICROCONTROLLERS AND ITS APPLICATIONS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

This course will enable the students to learn the primary concept of microcontrollers, hardware usage for programming intelligence and get familiarized with the architecture, instruction set and applications of microcontroller.

COURSE CONTENT:

8051 Microcontroller

Architecture of 8051 – Register set - I/O Pins, Ports and Circuits - Instruction set - Addressing modes - Assembly language programs for arithmetic and Logical operations.

Interfacing 8051 Microcontroller

Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - Stepper Motor Interfacing –ADC – DAC.

Application of 8051 Microcontroller

Temperature Controller using ADC – Square and Triangular waveform generation using DAC – Water level controller – Traffic Light Controller.

PIC Microcontroller

CPU Architecture – Register – I/O pins, Ports -Instruction set – addressing modes - Interrupts

Interfacing PIC Microcontroller

PIC: Timers- I2C Interfacing –UART- A/D Converter –Pulse Width Modulation

COURSE OUTCOMES:

At the end of the course, the students will have the

CO1: Ability to interpret the architecture of 8051 and PIC microcontrollers.

CO2: Ability to develop Assembly Language Programs (ALP) for arithmetic and Logical operations using microcontrollers.

CO3: Ability to build 8051 microcontroller-based systems using peripheral interfaces.

CO4: Ability to build PIC microcontroller-based systems using peripheral interfaces.

REFERENCES:

1. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”, Second Edition, Pearson Education, 2011

2. Subrata Ghoshal, “8051 Microcontrollers: Internals, Instructions, Programming &Interfacing”, Second Edition, Pearson education, 2014.
3. John. B. Peatman, “Design with PIC Microcontroller”, Prentice Hall, 2011.
4. Gene .H.Miller, “Micro Computer Engineering”, Pearson Education, 2013.
5. Subrata Ghoshal, “8051 Microcontrollers: Internals, Instructions, Programming &Interfacing”, Second Edition, Pearson education, 2014.

20ECE03	INTRODUCTION TO EMBEDDED SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

This course will enable the students to learn the architecture of embedded systems, design and analysis of embedded computing, basic concepts of real time operating system, programming concepts for embedded systems, system design techniques of embedded hardware and its applications.

COURSE CONTENT:

Architecture of Embedded Systems

Categories of Embedded Systems – Specifications of Embedded systems – Recent trends in Embedded Systems – Detailed Hardware and Software Design – ARM Processor – CPU: programming input and output - supervisor mode, exceptions and traps – Co-processors – Memory system mechanisms – CPU performance – CPU power consumption.

Embedded Computing Platform Design

The CPU Bus-Memory devices and systems – Designing with computing platforms – Host and target machines – consumer electronics architecture – platform-level performance analysis - Components for embedded programs – Models of programs – Assembly, linking and loading – compilation techniques – Program level performance analysis

Processes and Operating Systems

Introduction – Multiple tasks and multiple processes – Multi rate systems – Preemptive real-time operating systems – Priority based scheduling – Inter process communication mechanisms – Semaphores and Shared Data – Message Queues – Mailboxes and Pipes – Interrupt Routines in RTOS Environment – Evaluating operating system performance – power optimization strategies for processes.

Hardware/Software Integration & Programming

Cross-Compilers – Cross-Assemblers – Linker/Locator – Debugger – Emulator – Simulators – Introduction to Integrated Development Environment (IDE) – Getting Embedded Software into Target System: In-Circuit Emulators –Serial Port Programming and Interrupts Programming.

Embedded System Applications

Applications of Embedded systems – Case study of Embedded systems like automatic chocolate vending machine, Adaptive Cruise Control Systems in a Car, Digital camera, Smart card and ATM.

COURSE OUTCOMES:

At the end of the course, the students will have the

CO1: Ability to understand the architecture of embedded systems.

CO2: Ability to understand the concepts of multiple processes and operating systems.

CO3: Ability to choose appropriate tools for developing real time embedded systems.

CO4: Ability to apply suitable hardware and software architectures to implement embedded system applications.

REFERENCES:

1. Marilyn Wolf, "Computers as Components - Principles of Embedded Computing System Design", Third Edition, Morgan Kaufmann Publisher (An imprint from Elsevier), 2012.
2. Jonathan W. Valvano, "Embedded Microcomputer Systems Real Time Interfacing", Third Edition Cengage Learning, 2012.
3. Raj Kamal, "Embedded Systems Architecture Programming and Design", Pearson, 2011.
4. K.V.K.K.Prasad "Embedded /Real-Time Systems: Concepts, Design and Programming" Dream tech, Wiley 2012.
5. Daniel 5.W Lewis, "Fundamentals of Embedded Software" Pearson Education, 2013.

20ECE04	NANO ELECTRONICS AND SENSORS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

This course will enable the students to learn the overview of nano electronics, basic components of electronic systems, memory devices, sensors and actuators.

COURSE CONTENT:

Overview of Nano-Electronics

Nano-scale electronics; Foundation of nano-electronics – low dimension transport, quantum confinement, Coulomb blockade and quantum dot; Ballistic transport and Quantum interferences; Landauer formula, quantization of conductance, example of Quantum point contact.

Two-Terminal Junction Transistors

Basic CMOS process flow; MOS scaling theory; Issues in scaling MOS transistors; Requirements for non-classical MOS transistor; PMOS versus NMOS; Design and construction of MOS capacitor; Integration issues of high-k MOS – interface states, bulk charge, band offset, stability, reliability; MOS transistor and capacitor characteristics.

Gate Transistors

Metal gate transistors – motivation, basics and requirements; quantum transport in nano MOSFET; Ultrathin body silicon on insulator (SOI) – double gate transistors; Vertical transistors – FinFET and surround gate FET; compound semiconductor MOSFET – Hetero-structures MOSFET.

Characteristics of Sensors and Actuators

Basics: types and working principles of sensors and actuators; Characteristic features: Range, Resolution, Sensitivity, Error, Repeatability, Linearity and Accuracy, Impedance, Nonlinearities, Static and Coulomb Friction, Eccentricity, Backlash, Saturation, Dead-band, System Response, First Order System Response, Under-damped Second Order System Response, Frequency Response.

Memory Devices and Sensors

Nano ferroelectrics – Ferroelectric random-access memory –Fe-RAM circuit design – ferroelectric thin film properties and integration – calorimetric -sensors – electrochemical cells – surface and bulk acoustic devices – gas sensitive FETs – resistive semiconductor gas sensors –electronic noses – identification of hazardous solvents and gases – semiconductor sensor array.

COURSE OUTCOMES:

At the end of the course, the students will have the

CO1: Ability to understand the concepts of Nano electronics

CO2: Ability to interpret the characteristics and operation of Gate transistors.

CO3: Ability to interpret the characteristics of sensors and actuators.

CO4: Ability to understand the operation of memory devices and sensors.

REFERENCES:

1. W. Ranier, 'Nano Electronics and Information Technology', Wiley, 2003.
2. K.E. Drexler, 'Nano systems', Wiley, 1992.
3. M.C. Petty, 'Introduction to Molecular Electronics', 1995.
4. Handbook of Nanoscience, Engineering and Technology", Kluwer publishers, 2002.
5. G. Cao, "Nanostructures & Nanomaterials: Synthesis, Properties &Applications", Imperial College Press, 2004.

20ECE05	PRINCIPLES OF VLSI SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

This course will enable the students to learn the principles of MOS transistors, realization of combinational and sequential logic circuits using MOS transistors, arithmetic building blocks and implementation strategies using FPGA.

COURSE CONTENT:

MOS Transistor Principle

NMOS and PMOS transistor operations, MOS DC Equations, Electrical properties of CMOS circuits and device modeling, scaling principles CMOS inverter, Second Order Effects, Stick diagram.

Combinational Logic Circuits

MOSFETs as switches, Basic Logic Gates in CMOS, Examples of Combinational Logic Design, RC Delay Model, Linear Delay Model, Elmore's constant, Pass transistor Logic, Transmission gates, static and dynamic CMOS design.

Sequential Logic Circuits

Static and Dynamic Latches and Registers, Timing issues, Memory architecture and memory control circuits.

Arithmetic Building Blocks

Data path circuits, Architectures for ripple carry adders, carry look ahead adders, High speed adders, Multipliers, speed and area tradeoff

Implementation Strategies

Full custom and Semi-custom design, Standard cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures, Xilinx FPGA.

COURSE OUTCOMES:

At the end of the course, the students will have the

CO1: Ability to interpret the characteristics and operation of MOS transistors.

CO2: Ability to interpret the operation of VLSI architecture using FPGA.

CO3: Ability to build CMOS based arithmetic and logic circuits.

CO4: Ability to build CMOS based sequential circuits.

REFERENCES:

1. Jan Rabaey, Anantha Chandrakasan, B.Nikolic, "Digital Integrated Circuits: A Design Perspective", Second Edition, Prentice Hall of India, 2013.
2. M.J. Smith, "Application Specific Integrated Circuits", Addisson Wesley, 2001.
3. A.Pucknell, Kamran Eshraghian, "BASIC VLSI Design", Third Edition, Prentice Hall of India, 2009.
4. Weste and Harris: CMOS VLSI DESIGN: A Circuits and Systems Perspective (Fourth edition) Pearson Education, 2010.
5. N.Weste, K.Eshraghian, "Principles of CMOS VLSI Design", Second Edition, Addison Wesley 2009.

OFFERED BY B.E (ELECTRICAL AND ELECTRONICS ENGINEERING) PROGRAMME

20EEE01	ENERGY MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

Course Objective:

This course will enable the students to study the concepts behind energy management and auditing, economic analysis and Load management, the energy management on various electrical equipment and metering and to illustrate the concept of lighting systems and cogeneration.

Course Content

INTRODUCTION

Definition for energy management - Need for energy management - energy basics - designing and starting an energy management program - energy accounting -energy monitoring, targeting and reporting - Definition for Energy Audit – Types of energy audit.

ENERGY COST AND LOAD MANAGEMENT

Important concepts in an economic analysis - Economic models-Time value of money - Utility rate structures - cost of electricity - Loss evaluation. Load management: Demand control techniques - Utility monitoring and control system - HVAC and energy management - Economic justification.

ENERGY EFFICIENCY IN ELECTRICAL UTILITIES

Electricity billing – power factor improvement and benefits – transformers – Distribution losses in industrial system – energy efficient motors and factors affecting motor efficiency – star operations of motor – soft starters with energy saver – standards and labelling for motors.

METERING FOR ENERGY MANAGEMENT

Relationships between parameters - Units of measure - Typical cost factors - Utility meters – Smart meters - Demand meters - Paralleling of current transformers – Instrument transformer burdens-Multitasking solid-state meters - Metering location vs. requirements- Metering techniques and practical examples - Power Balancing & Metering: from grid, Solar to gird

LIGHTING SYSTEMS & COGENERATION

Concept of lighting systems - The task and the working space -Light sources - Ballasts - luminaries - Lighting controls-Optimizing lighting energy - Power factor and effect of harmonics on power quality - Cost analysis techniques-Lighting and energy standards Cogeneration: Forms of cogeneration – feasibility of cogeneration- Electrical interconnection.

Course Outcomes:

CO1: Ability to understand the basics of energy management with respect to economic and social maters.

CO2: Ability to apply the concepts of energy management in various electrical energy applications.

CO3: Ability to analyze the energy calculation and statistics for improving the efficiency in industries, commercial and domestic applications.

References

1. Barney L. Capehart, Wayne C. Turner, and William J. Kennedy, Guide to EnergyManagement, Fifth Edition, The Fairmont Press, Inc., 2006
2. IEEE Recommended Practice for Energy Management in Industrial and Commercial Facilities, IEEE, 196.
3. Amit K. Tyagi, Handbook on Energy Audits and Management, TERI, 2003.
4. Book III - Energy efficiency in electrical utilities, Second Edition 2018, By Bureau of Energy Efficiency, Ministry of Power, India.
5. Reay D.A, Industrial Energy Conservation, 1stedition, Pergamon Press, 1977.

20EEE02	MEDICAL INSTRUMENTATION	L	T	P	C
		3	0	0	3

Course Objective:

This course will enable the students to impart knowledge about the basic concepts of bio medical engineering and about sensors, electrodes and their applications in medical fields.

Course Content

FUNDAMENTALS OF BIOMEDICAL ENGINEERING:

Introduction to biomedical Engineering - Development of Bio medical instrumentation – Biometrics – Introduction and Components of man vs Instrument system – physiological system of the body – problems in measuring living system – Sources of biomedical signal – Basic medical instrumentation system – Intelligent Medical Instrumentation system – Regulation of medical devices.

BIO ELECTRIC SIGNALS AND ELECTRODES

Origin of Bio electric signals – ECG – EEG – EMG – Electrodes for ECG - Electrodes for EEG - Electrodes for EMG – Electrical conductivity of Electrode jellies and creams – Micro electrodes – Electrode and Electrolyte interface – polarization.

PHYSIOLOGICAL TRANSDUCERS

Introduction to transducers – classifications of transducers – Performance characteristics of transducer – Displacement transducers – Motion transducers – Position transducers – Pressure transducer – temperature measurement transducer – Photoelectric transducer – Bio sensors – Smart sensors.

RECORDING MODERN IMAGING SYSTEM

ECG recorder – VCG recorder – PCG recorder – Digital Stethoscope – EEG – Electromyography – Central monitors – Heart and blood pressure measurement - Basis of Diagnostic Radiology – X-ray machine - Visualization of X-Rays - Portable and Mobile X-Ray Units – Digital X-ray System.

BIO AMPLIFIER AND PATIENT SAFETY

Need for bio-amplifier - single ended bio-amplifier, differential bio-amplifier – right leg driven ECG amplifier. Band pass filtering, isolation amplifiers – transformer and optical isolation - isolated DC amplifier and AC carrier amplifier. Chopper amplifier. Power line interference - Electric Shock Hazards - Leakage Currents - Safety Codes For Electro medical Equipment - Electrical Safety Analyser - Testing Of Biomedical Equipment

Course Outcomes:

CO1: Ability to remember the basic concepts in bio medical engineering.

CO2: Ability to understand the concept of various sensors, meters and recording devices used in the medical fields.

CO3: Ability to apply this bio-electrical and bio-electronic device to identify the various diseases.

References

1. Leslie Cromwell, “Biomedical Instrumentation and measurement”, Prentice hall of India, New Delhi, 2007.
2. Khandpur R.S, “Handbook of Biomedical Instrumentation”, Tata McGraw-Hill, New Delhi, 2003.
3. John G. Webster, Medical Instrumentation Application and Design, John Wiley and sons, New York, 1998.
4. Standard Handbook of Biomedical Engineering & Design – Myer Kutz, McGrawHill Publisher, 2003.
5. Duane Knudson, Fundamentals of Biomechanics, Springer, 2nd Edition, 2007.

20EEE03	PLC PROGRAMMING	L	T	P	C
		3	0	0	3

Course Objective:

The course will enable the students to understand the operating and selection procedures of a PLC for industrial systems and possess knowledge levels to program a small, automated industrial production line.

Course Content:

INTRODUCTION

Programmable Logic Controller- History of PLC, Difference between PC & PLC, Architecture of PLC, Advantages and Disadvantages, Overall PLC system, PLC cycle Application.

PROGRAMMABLE LOGIC CONTROLLER

PLC as a computer, Programming format, PLC Modules - Input on/off Switching Devices, Input Analog Devices, Output on/off Switching Devices, Output Analog Devices.

PLC PROGRAMMING

Relay Logic, Coils and Indicators, Ladder Diagram, PLC Input Instructions, PLC Programming Examples, Industrial Process Example.

PLC FUNCTIONS

PLC Registers – Input, Output, Holding, Module Addressing, PLC Timer functions, PLC Counter Functions, PLC Arithmetic Functions, and Industrial Application Examples.

SELECTION, MAINTENANCE AND APPLICATION

Factors in Selecting a PLC, Electrical Connections, Troubleshooting malfunctions, Maintenance. Applications – Water Filling Station, Industrial Three-axis Robot Control, PID controller using PLC.

Course Outcomes:

CO1: Ability to understand the electrical relay logic and ladder logic.
CO2: Ability to identify the correct PLC for an industrial system.
CO3: Ability to design ladder logic for small industrial applications.

References:

1. John W Webb, Ronald A Reis, “Programmable logic controllers: Principles and Applications”, Prentice Hall India, 2003.
2. Frank D Petruzella, “Programmable Logic Controllers ", McGraw Hill Inc, 2005.
3. Kelvin T Erikson, “Programmable Logic Controllers”, Dogwood Valley Press, 2005.
4. Garry Duning, “Introduction to Programmable Logic Controller”, Cengage Learning, 3rd Edition, 2006.
5. W. Bolten, “Programmable Logic Controller”, Elsevier Newness Publication, 5th Edition,

2009.

20EEE04	RENEWABLE ENERGY SYSTEMS	L	T	P	C
		3	0	0	3

Course Objective:

This course will enable the students to study about renewable Energy Sources and technologies, learn adequate inputs on a variety of issues in harnessing renewable Energy and to recognize current and possible future role of renewable energy sources.

Course Content

RENEWABLE ENERGY (RE) SOURCES

Environmental consequences of fossil fuel use - Importance of renewable sources of energy - Sustainable Design and development - Types of RE sources - Limitations of RE sources - Present Indian and international energy scenario of conventional and non-conventional sources.

WIND ENERGY

Power in the Wind – Types of Wind Power Plants(WPPs)–Components of WPPs-Working of WPPs - Siting of WPPs - Grid integration issues of WPPs.

SOLAR PV AND THERMAL SYSTEMS

Solar Radiation - Radiation Measurement - Solar Thermal Power Plant - Central Receiver Power Plants - Solar Ponds.- Thermal Energy storage system with PCM - Solar Photovoltaic systems - Types of PV Systems - Types of Solar Cells - Cell, module - array - PV Module - I-V Characteristics - series and parallel connections, maximum power point tracking -Applications. Practical usage: Direct supply, Balance Supply Balance Supply needs temporary storage – Batteries fly wheel system (mechanical) based energy optimization

BIOMASS ENERGY

Introduction - Bio mass resources - Energy from Bio mass: conversion processes - Biomass Cogeneration - Environmental Benefits. Geothermal Energy: Basics - Direct Use - Geothermal Electricity - Mini/micro hydro power: Classification of hydropower schemes - Classification of water turbine - Turbine theory - Essential components of hydroelectric system.

OTHER ENERGY SOURCES

Tidal Energy: Energy from the tides - Barrage and Non Barrage Tidal power systems. Wave Energy: Energy from waves - wave power devices. Ocean Thermal Energy Conversion (OTEC) - Hydrogen Production and Storage - Fuel cell: Principle of working - various types - construction and applications. Energy Storage System - Hybrid Energy Systems.

Course Outcomes:

CO1: Understand the concept of conventional, non-conventional energy sources and solar, wind, biomass, biogas power generation.

CO2: Understand the concept of energy conversion of solar, wind, biomass, biogas, hydrogen cell, fuel cell, Geo thermal, Ocean thermal, Tidal and Wave energy.

CO3: Apply the concept of energy conversion techniques for the betterment of power generation and power system.

References

1. Joshua Earnest, Tore Wizeliu, 'Wind Power Plants and Project Development', PHI Learning Pvt.Ltd, New Delhi, 2011.
2. D.P.Kothari, K.C Singal, Rakesh Ranjan "Renewable Energy Sources and Emerging Technologies", PHI Learning Pvt.Ltd, New Delhi, 2013.
3. A.K.Mukerjee and Nivedita Thakur," Photovoltaic Systems: Analysis and Design", PHI Learning Private Limited, New Delhi, 2011
4. Chetan Singh Solanki, " Solar Photovoltaics : Fundamentals, Technologies and Applications", PHI Learning Private Limited, New Delhi, 2011
5. Shobh Nath Singh, 'Non-conventional Energy resources' Pearson Education, 2015.

20EEE05	VIRTUAL INSTRUMENTATION AND DATA ACQUISTION	L	T	P	C
		3	0	0	3

Course Objective:
This course will enable the students to impart the knowledge about software and programming structure of LabVIEW and to introduce various techniques of interfacing with external instruments of PC.

Course Content
Introduction to Virtual Instrumentation
Introduction - Block diagram and architecture of a virtual instrument - Conventional Instruments versus Virtual Instruments – Data flow techniques, graphical programming in data flow, comparison with conventional programming.

Graphical Programming
Front panel - Block diagram - VIs - Sub-VIs - Simple examples - Looping: For loop, while loop - Shift registers - case and sequence; structures, formula nodes. Arrays - Clusters, charts and graphs - Local and global variables - Property node, string and file I/O.

Data Acquisition
DAQ – Components - Buffers - Triggering - Analog I/O - Digital I/O - Counters and timers - DMA, Software and hardware installation, Calibration, Resolution, Data acquisition interface requirements.

Instrument Control
VI Chassis requirements. Common Instrument Interfaces: Current loop, RS 232C/ RS485, GPIB. Bus Interfaces: USB, PCMCIA, VXI, SCSI, PCI. PXI system controllers - Ethernet control of PXI. Industrial applications- VISA and IVI.

Application of Virtual Instrumentation
Simulation of systems using VI: Development of Control system - Industrial Communication- Image acquisition and processing - Motion control.

Course Outcomes:
CO1: Ability to understand the fundamental programming and dataflow in virtual Instrumentation using various data structures, program structures.
CO2: Ability to understand the fundamental programming and dataflow in virtual Instrumentation using various plotting the graphs and charts for system monitoring, processing and controlling.
CO3: Ability to apply the concept of network interface for data communication using Data Acquisition systems.
CO4: Ability to analyze the tools and to create graphical programming for automation, control applications, real time signal acquisition and analysis

References:

1. Jane W. S. Liu," Real-time Systems", Pearson Education, 2001.
2. Jovitha Jerome, "Virtual Instrumentation using LabVIEW", Prentice Hall of India, New Delhi, 2011.
3. Gary Johnson, "LabVIEW Graphical Programming", McGraw Hill, 1997.
4. Kevin James, "PC Interfacing and Data Acquisition: Techniques for Measurement", Instrumentation and Control, Newnes, 2000.
5. Gupta S and Gupta J P, "PC Interfacing for data acquisition and Process control", Instrument Society of America.

20EEE06	ELECTRIC VEHICLES	L	T	P	C
		3	0	0	3

Course Objective:

This course will enable the students to impart knowledge about the basic concepts and terminologies, energy storage devices used to drive and power the hybrid electric vehicles, different charging technologies and the control units available in the market area.

Course Content

INTRODUCTION

History of EV – basics of EV - Components in EV – Hybrid Electric Vehicles - Fuel Cell Vehicles **-** Recent EVs and HEVs – efficiency comparison – pollution comparison – advantages of EV

VEHICLE MECHANICS and REGENRATIVE BRAKING

General Description of Vehicle Movement - Vehicle Resistance - Dynamic Equation - Tire–Ground Adhesion and Maximum Tractive Effort - Power Train Tractive Effort and Vehicle Speed - Vehicle Power Plant and Transmission Characteristics – EV Vehicle Performance - Tractive Effort in Normal Driving – Energy Consumption – fundamentals of regenerative braking.

ELECTRIC PROPULSION SYSTEMS AND DESIGN OF SERIES AND PARALLEL HEV

DC Motor Drives - Induction Motor Drives – PMBLDC motors – SRM drives – Series HEV: Operation Patterns - Control Strategies - Sizing of the Major Components – Parallel HEV: Control Strategies of Parallel Hybrid Drive Train - Design of Drive Train Parameters - Mild Hybrid Electric Drive Train Design

ENERGY STORAGE SYSTEM

Battery Basics – Li-ion Battery - Cell Discharge Operation - Cell Charge Operation – Construction - Alternative Batteries - Battery Parameters - Technical Characteristics - Practical Capacity - Battery Power - Ragone Plots - Targets and Properties of Batteries - Battery Modelling – Ultra capacitors - Ultrahigh-Speed Flywheels - Hybridization of Energy Storages.

CHARGING STATION AND BMS

EV charging standards - various methods of charging – battery swapping - V2G - G2V- V2B - V2H - integration of EVs in smart grid – Introduction to BMS

Course Outcomes:

CO1: Ability to remember the basic concepts in Electric and hybrid electric vehicles.

CO2: Ability to understand the concept of vehicle dynamics, prime movers, energy storage device and various sensors Electric and hybrid electric vehicles.

CO3: Ability to apply control units concepts in Electric and hybrid electric vehicles to improve the vehicle efficiency.

References

1. Emadi, A. (Ed.), Miller, J., Ehsani, M., “Vehicular Electric Power Systems” Boca Raton, CRC Press, 2003.
2. Husain, I. “Electric and Hybrid Vehicles” Boca Raton, CRC Press, 2010.
3. Larminie, James, and John Lowry, “Electric Vehicle Technology Explained” John Wiley and Sons, 2012.
4. Tariq Muneer and Irene Illescas García, “The automobile, In Electric Vehicles: Prospects and Challenges”, Elsevier, 2017.
5. Sheldon S. Williamson, “Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles”, Springer, 2013.

OFFERED BY B.E (MECHANICAL ENGINEERING) PROGRAMME

20MEE01	AUTOMOTIVE FUNDAMENTALS	L	T	P	C
		3	0	0	3

Course Objectives

To provide knowledge on IC Engines, braking, transmission, suspension, starting systems along with insights into new combustion techniques used for various fuels and alternative sources.

Course Content

VEHICLE STRUCTURE, ENGINE

Types of automobiles, vehicle construction and different layouts, chassis, frame and body, Vehicle aerodynamics, IC engines –components function and materials

ENGINE AUXILIARY SYSTEMS

Electronically controlled gasoline injection system for SI engines and diesel injection system (Unit injector system, Rotary distributor type and common rail direct injection system), Electronic ignition system (Transistorized coil ignition system, capacitive discharge ignition system),

TRANSMISSION SYSTEMS

Clutch: Types diaphragm clutch, single and multi-plate clutch, centrifugal clutch and construction, Gear box: Types - gear selector and shifting mechanism, transfer box, propeller shaft, slip joints, universal joints, Differential and rear axle.

BRAKES AND SUSPENSION SYSTEMS

Braking system: Types of brakes, Mechanical, and Air brakes, Disc & Drum brakes, Engine brakes, anti-lock braking system (ABS).Suspension system: Types of Suspension Systems-front and rear suspension,

ALTERNATIVE ENERGY SOURCES AND EMISSION CONTROL

Use of Natural Gas, Liquefied Petroleum Gas, and Hydrogen in Automobiles. Electric and Hybrid Vehicles, Fuel Cell. Engine emission, Engine emission control system, Emission norms (Euro and BS).

Course Outcomes

At the end of the course the students will have the ability

CO1: To identify the fundamental components of automobile structures, engine auxiliary systems, along with brakes and suspension system

CO2: To classify the clutches, gear boxes, braking and suspension systems based on different types of vehicles.

CO3: To examine the various injection systems, ignition systems and gear shifting mechanism along with alternative energy sources and engine emission characteristics.

References

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4. Julian Happian Smith, “An Introduction to Modern Vehicle Design”, Butterworth- Heinemann, New Delhi, 2002.
5. Gupta R B, “Automobile Engineering", Satya Prakashan, 2015.
6. C.R. Ferguson, A. T. Kirkpatrick, Internal Combustion Engines, 2nd Edition, John Wiley & Sons, 2016.

20MEE02	COMPUTER AIDED DESIGN	L	T	P	C
		3	0	0	3

Course Objective

To provide an overview of how computers are being used in engineering component designs and make the students understand different CAD standards used in Industries

Course Content

FUNDAMENTALS OF COMPUTER GRAPHICS

Product cycle- Design process- sequential and concurrent engineering- Computer aided design – CAD system architecture- Computer graphics – co-ordinate systems- 2D and 3D transformations homogeneous coordinates - Line drawing -Clipping- viewing transformation

GEOMETRIC MODELING

Geometry and topology -representation of curves- Hermite curve- Bezier curve- B-spline curves-rational curves-Techniques for surface modeling – surface patch- Coons and bicubic patches. Solid modeling techniques- CSG

ASSEMBLY OF PARTS

Assembly modelling – interferences of positions and orientation – tolerance analysis- mass property calculations – mechanism simulation and interference checking.

CAD STANDARDS

Standards for computer graphics- Graphical Kernel System (GKS) - standards for exchange images- Open Graphics Library (OpenGL) - Data exchange standards - IGES, STEP, CALS etc. Communication standards.

Course Outcomes

At the end of the course the students will have the ability

CO1: To identify the fundamental components of computer graphics such as product cycle, CAD system and architecture, computer graphics, homogeneous coordinates, geometry, topology along with assembly of parts and CAD standards

CO2: To Classify the types of Coordinate systems, representation of different curves, surface modeling techniques and the various standards used in computer graphics such as GKS, open, IGES, STEP, and CALS.

CO3: To examine the assembly modeling with interferences of position and orientation, tolerance analysis and communication standards

References

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2. Chris McMahon and Jimmie Browne “CAD/CAM Principles", "Practice and Manufacturing management “ Second Edition, Pearson Education, 1999.

3. William M Neumann and Robert F.Sproul “Principles of Computer Graphics”, McGraw Hill Book Co. Singapore, 1989.
4. Donald Hearn and M. Pauline Baker “Computer Graphics”’. Prentice Hall, Inc, 1992.
5. Foley, Wan Dam, Feiner and Hughes - "Computer graphics principles & practice" Pearson Education - 2003.

20MEE03	INTRODUCTION TO POWER PLANT ENGINEERING	L	T	P	C
		3	0	0	3

Course Objective

To providing an overview of power plants and detailing the role of Engineers in their operation and maintenance of renewable power sources,

Course Content

LAYOUT OF POWER PLANTS

Layout of Steam, Hydel, Diesel, Nuclear and Gas Turbine Power Plants - Combined Power Cycles – Comparison and Selection

NUCLEAR AND HYDRO POWER PLANTS

Nuclear Energy – Fission, Fusion Reaction, Types of Reactors, Waste Disposal and safety. Hydroelectric power plants – runoff storage and pumped storage type.

DIESEL AND GAS POWER PLANTS

Types of Diesel Plants, Components, Selection of Engine Type, Applications, environmental hazards- Gas Turbine Power Plant – Fuels - Gas Turbine Material – Regeneration and Intercooling.

SOLAR, TIDAL, WIND POWER PLANTS AND ECONOMIC ISSUES OF POWER PLANTS

Tidal - Solar thermal central receiver system – wind power plants -Cost of Electric Energy – Fixed and operating Costs – Energy Rates – Types of Tariffs.

Course Outcomes

At the end of the course the students will have the ability

CO1: To identify the fundamental components of power plant layouts along with the selection procedure.
CO2: To Classify the types of power plant layouts, reactors based on the type of fuel energy utilized.
CO3: To examine the various components and systems of different power plants such as nuclear, hydro, diesel, gas. Solar, tidal, wind and to determine the economical issues associated with them.

References

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3. Nag P.K, “Power Plant Engineering”, Tata McGraw-Hill, 2014.
4. G. D. Rai, “Introduction to Power Plant Technology”, Khanna Publishers, Third Edition, 2014.
5. T. Morse Frederick, “Power Plant Engineering”, Prentice Hall of India, Third Edition, 2014.
6. Culp A. W., “Principles of Energy Conversion”, McGraw Hill, Second Edition, 2014.

20MEE04	INTRODUCTION TO ROBOTICS	L	T	P	C
		3	0	0	3

Course Objectives

To impart knowledge about automation, various sensors and their applications in robots. Along with Robot Programming methods & Languages used by robots.

Course Content

INTRODUCTION

Automation and robotics –History of robotics - Definition of a Robot - Basic Concepts - Robot configurations - Types of Robot drives - Basic robot motions - Point to point control - Continuous path control.

COMPONENTS AND OPERATIONS

Basic control system concepts - control system analysis - robot actuation and fed back, Manipulators Coordinate transformation - Brief Robot dynamics. Types of Robot and effectors - Grippers - Tools as end effectors - Robot/End - effort interface.

SENSING AND MACHINE VISION

Range sensing - Proximity sensing - Touch sensing - Force and Torque sensing. Introduction to Machine vision - Sensing and digitizing - Image processing and analysis.

ROBOT PROGRAMMING

Methods - languages - Capabilities and limitation - Artificial intelligence - Knowledge representation - Search techniques - AI and Robotics.

INDUSTRIAL APPLICATIONS

Application of robots in machining - Welding - Assembly - Material handling - Loading and unloading - CIM - Hostile and remote environments

Course Outcomes

At the end of the course the students will have the ability

CO1 : To identify the basic control system concepts, manipulator coordinate transformation, robot dynamics, range sensing, Artificial intelligence and industrial applications of robot such as in Welding, Assembly, Material handling, Loading and unloading,

CO2: To classify the types of robots, end effectors, grippers, sensing techniques and robot programming methods,

CO3: To examine the languages, Capabilities, limitations and Search techniques of robots

References

1. S.R. Deb, “Robotics Technology and flexible automation”, Tata McGraw-Hill Education., 2010
2. Mikell P Groover& Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, “Industrial Robotics, Technology programming and Applications”, McGraw Hill, 2012
3. Richard D. Klafter, Thomas .A, ChriElewski, Michael Negin,”Robotics Engineering an Integrated Approach”, PHI Learning, 2011.
4. K.S. Fu., R.C.Gonalez, C.S.G.Lee, “Robotics Control Sensing ", Vision and Intelligence, McGraw Hill International Edition, 2000.
5. Craig J.J., “Introduction to Robotics Mechanics and Control”, Pearson Education, 2008.

20MEE05	3D PRINTING	L	T	P	C
		3	0	0	3

Course Objectives

To understand the various RPT processes adopted to produce parts and to impart knowledge on three dimensional printing, reverse engineering, current technologies and their influence in manufacturing.

Course Content

FUNDAMENTALS OF RPT

Development of RP systems, Rapid Tooling, Rapid Manufacturing- Principle –Fundamental – File format – Other translators – medical applications of RP- Materials for Rapid Prototyping Systems

LIQUID BASED RAPID PROTOTYPING SYSTEMS

Liquid based system – Stereolitho graphy Apparatus (SLA), details of SL process, products, Advantages, Limitations, Applications and Uses.

SOLID BASED RAPID PROTOTYPING SYSTEMS

Solid based system - Fused Deposition Modeling, principle, process, products, advantages, applications and uses - Laminated Object Manufacturing

POWDER BASED RAPID PROTOTYPING SYSTEMS

Selective Laser Sintering – principles of SLS process, principle of sinter bonding process, Laser sintering materials, products, advantages, limitations, applications and uses.

REVERSE ENGINEERING AND NEW TECHNOLOGIES

Reverse Engineering - Introduction, measuring device- contact type and non-contact type, CAD model creation, medical data processing - types of medical imaging, software for making medical models, medical materials, and other applications.

Course Outcomes

At the end of the course the students will have the ability

CO1: To identify the development of RP systems such as liquid, solid and powder based systems, Rapid Tooling, Rapid Manufacturing principle and Fundamentals, File format, translators and medical applications of RP, Materials for Rapid Prototyping Systems along with the concept of reverse engineering.

CO2: To classify the advantages, disadvantages and limitations of liquid, solid and powder based rapid prototyping systems along with the types of measuring devices utilized in reverse engineering.

CO3: To examine the Stereo lithography Apparatus (SLA), Fused Deposition Modeling, Selective Laser Sintering, Laminated Object Manufacturing based on principles, process and products,

CO4: To analyze the concept of reverse engineering, medical data processing and software for making medical models, medical materials, and other applications.

References

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3. Chee Kai Chua, Kah Fai Leong, Chu Sing Lim "Rapid Prototyping: Principles and Applications" World Scientific Publication Pvt Ltd, 2011.
4. Chua C. K, Leong K. F and Lim C. S, "Rapid Prototyping: Principles and Applications", World Scientific, second edition, 2010.
5. Ian Gibson, "Advanced Manufacturing Technology for Medical applications: Reverse Engineering, Software conversion and Rapid Prototyping", Wiley, 2006.