

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)**

COMPUTER SCIENCE AND ENGINEERING
(Effective for the batches admitted in 2020 - 21)

Vision

To achieve excellence in the field of Computer Science and Engineering with professional competency.

Mission

- Provide quality education to achieve excellence.
- Upgrade infrastructure and technologies to meet the learner's needs.
- Establish linkages with Government and Industry to enhance technical skills, entrepreneurship and innovations.
- Support research to serve the needs of the society.

Institutional Objectives

- To create a conducive and competitive environment for students through curricular and extra-curricular activities.
- Promote the culture of research among the faculty.
- To promote synergetic alliances with premier Institutions, Industry, CSIR laboratories and various Government organizations for Collaborative Research Projects.
- To promote economic and social enrichment of the society through Skill Development Programmes, Entrepreneurship and extension activities.
- To introduce demand driven new UG & PG academic programmes.
- To ensure a high degree of quality in terms of providing infrastructure, research ambience, faculty and staff development.

Core Values

- **Thirst for Quality Education:** The stake holders of the institute particularly management, employees and students of the institution have a consistent thirst for quality improvement of the processes and services in the institution.
- **Life Long Learning:** In the fast changing technological world, acquiring a special skill at one point of time will not be enough for ever long survival. Hence to flourish in the work place and to bring in innovations in the ways of doing, employee, student as well as alumni must be continuous learners and tech savvy.
- **Diversity and Participation:** AITS promotes the involvement of faculty, staff, and students from all social, economic, ethnic, cultural and religious backgrounds to get the synergy of combining the diversified agents. The focus is on involving students to exhibit their talent in various curricular and co-curricular activities and strengthening alumni link to share their experiences to the students.
- **Academic Integrity and Accountability:** Management induces accountability in the employees for the career of the students and the academic leadership establishes a mentoring mechanism for realization of responsibilities of students towards their parents and in turn to the society

Competencies and Performance Indicators (UG - CSE)

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.

Competency	Indicators	
1.1 Demonstrate competence in mathematical modeling	1.1.1	Apply the knowledge of discrete structures, linear algebra, statistics and numerical techniques to solve problems
	1.1.2	Apply the concepts of probability, statistics and queuing theory in modeling of computer based system, data and network protocols.
	1.2.1	Apply laws of natural science to an engineering problem
	1.3.1	Apply engineering fundamentals
1.2 Demonstrate competence in basic sciences		
1.3 Demonstrate competence in engineering fundamentals		
1.4 Demonstrate competence in specialized engineering knowledge to the program	1.4.1	Apply theory and principles of computer science engineering to solve an engineering problem

PO 2: Problem analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Competency	Indicators	
2.1 Demonstrate an ability to identify and formulate complex engineering problem	2.1.1	Evaluate problem statements and identifies objectives
	2.1.2	Identifies processes/modules/algorithms of a computer based system and parameters to solve a problem
	2.1.3	Identifies mathematical algorithmic knowledge that applies to a given problem
2.2 Demonstrate an ability to formulate a solution plan and methodology for an engineering problem	2.2.1	Reframe the computer based system into interconnected subsystems
	2.2.2	Identifies functionalities and computing resources.
	2.2.3	Identify existing solution/methods to solve the problem, including forming justified approximations and assumptions
	2.2.4	Compare and contrast alternative solution/methods to select the best methods
	2.2.5	Compare and contrast alternative solution processes to select the best process.
2.3 Demonstrate an ability to formulate and interpret a model	2.3.1	Able to apply computer engineering principles to formulate modules of a system with required applicability and performance.
	2.3.2	Identify design constraints for required performance criteria.
	2.4.1	Applies engineering mathematics to implement the solution
2.4 Demonstrate an ability to execute a solution process and analyze results	2.4.2	Analyze and interpret the results using contemporary tools.
	2.4.3	Identify the limitations of the solution and sources/causes.
	2.4.4	Arrive at conclusions with respect to the objectives.

PO 3: Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.

Competency	Indicators	
3.1 Demonstrate an ability to define a complex / open- ended problem in engineering terms	3.1.1	Able to define a precise problem statement with objectives and scope.
	3.1.2	Able to identify and document system requirements from stake holders.
	3.1.3	Ability to review state of the art literature to synthesize system requirements.
	3.1.4	Ability to choose appropriate quality attributes as defined by ISO/IEC/IEEE standard.
	3.1.5	Explore and synthesize system requirements from larger social and professional concerns.
	3.1.6	Ability to develop software requirement specifications (SRS).
3.2 Demonstrate an ability to generate a diverse set of alternative design solutions	3.2.1	Ability to explore design alternatives.

	3.2.2	Ability to produce a variety of potential design solutions suited to meet functional requirements.
	3.2.3	Identify suitable non functional requirements for evaluation of alternate design solutions.
3.3 Demonstrate an ability to select optimal design scheme for further development	3.3.1	Ability to perform systematic evaluation of the degree to which several design concepts meet the criteria.
	3.3.2	Consult with domain experts and stakeholders to select candidate engineering design solution for further development
3.4 Demonstrate an ability to advance an engineering design to defined end state	3.4.1	Ability to refine architecture design into a detailed design within the existing constraints.
	3.4.2	Ability to implement and integrate the modules.
	3.4.3	Ability to verify the functionalities and validate the design.

PO 4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Competency	Indicators	
	4.1.1	Define a problem for purposes of investigation, its scope and importance
4.1 Demonstrate an ability to conduct investigations of technical issues consistent with their level of knowledge and understanding	4.1.2	Ability to choose appropriate procedure/algorithm, data set and test cases.
	4.1.3	Ability to choose appropriate hardware/software tools to conduct the experiment
	4.1.4	Design and develop appropriate procedures/methodologies based on the study objectives
4.2 Demonstrate an ability to design experiments to solve open ended problems	4.2.1	Design and develop appropriate procedures/methodologies based on the study objectives
	4.3.1	Use appropriate procedures, tools and techniques to collect and analyze data
	4.3.2	Critically analyze data for trends and correlations, stating possible errors and limitations
4.3 Demonstrate an ability to analyze data and reach a valid conclusion	4.3.3	Represent data (in tabular and/or graphical forms) so as to facilitate analysis and explanation of the data, and drawing of conclusions
	4.3.4	Synthesize information and knowledge about the problem from the raw data to reach appropriate conclusions

PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

Competency	Indicators	
5.1 Demonstrate an ability to identify / create modern engineering tools, techniques and resources	5.1.1	Identify modern engineering tools, techniques and resources for engineering activities
	5.1.2	Create/adapt/modify/extend tools and techniques to solve engineering problems
5.2 Demonstrate an ability to select and apply discipline specific tools, techniques and resources	5.2.1	Identify the strengths and limitations of tools for (i) acquiring information, (ii) modeling and simulating, (iii) monitoring system performance, and (iv) creating engineering designs.
	5.2.2	Demonstrate proficiency in using discipline specific tools
	5.3.1	Discuss limitations and validate tools, techniques and resources
5.3 Demonstrate an ability to evaluate the suitability and limitations of tools used to solve an engineering problem	5.3.2	Verify the credibility of results from tool use with reference to the accuracy and limitations, and the assumptions inherent in their use

PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

Competency	Indicators	
6.1 Demonstrate an ability to describe engineering roles in a broader context, e.g. pertaining to the environment, health, safety, legal and public welfare	6.1.1	Identify and describe various engineering roles; particularly as pertains to protection of the public and public interest at global, regional and local level
6.2 Demonstrate an understanding of professional	6.2.1	Interpret legislation, regulations, codes, and standards

engineering regulations, legislation and standards

relevant to your discipline and explain its contribution to the protection of the public

PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

Competency	Indicators
7.1 Demonstrate an understanding of the impact of engineering and industrial practices on social, environmental and in economic contexts	7.1.1 Identify risks/impacts in the life-cycle of an engineering product or activity
	7.1.2 Understand the relationship between the technical, socio economic and environmental dimensions of sustainability
7.2 Demonstrate an ability to apply principles of sustainable design and development	7.2.1 Describe management techniques for sustainable development
	7.2.2 Apply principles of preventive engineering and sustainable development to an engineering activity or product relevant to the discipline

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

Competency	Indicators
8.1 Demonstrate an ability to recognize ethical dilemmas	8.1.1 Identify situations of unethical professional conduct and propose ethical alternatives
8.2 Demonstrate an ability to apply the Code of Ethics	8.2.1 Identify tenets of the ASME professional code of ethics
	8.2.2 Examine and apply moral & ethical principles to known case studies

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

Competency	Indicators
9.1 Demonstrate an ability to form a team and define a role for each member	9.1.1 Recognize a variety of working and learning preferences; appreciate the value of diversity on a team
	9.1.2 Implement the norms of practice (e.g. rules, roles, charters, agendas, etc.) of effective team work, to accomplish a goal.
9.2 Demonstrate effective individual and team operations-- communication, problem solving, conflict resolution and leadership skills	9.2.1 Demonstrate effective communication, problem solving, conflict resolution and leadership skills
	9.2.2 Treat other team members respectfully
9.3 Demonstrate success in a team based project	9.3.1 Present results as a team, with smooth integration of contributions from all individual efforts

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

Competency	Indicators
10.1 Demonstrate an ability to comprehend technical literature and document project work	10.1.1 Read, understand and interpret technical and non- technical information
	10.1.2 Produce clear, well-constructed, and well-supported written engineering documents
	10.1.3 Create flow in a document or presentation - a logical progression of ideas so that the main point is clear
10.2 Demonstrate competence in listening, speaking, and presentation	10.2.1 Listen to and comprehend information, instructions, and viewpoints of others
	10.2.2 Deliver effective oral presentations to technical and non- technical audiences
10.3 Demonstrate the ability to integrate different modes of communication	10.3.1 Create engineering-standard figures, reports and drawings to complement writing and presentations
	10.3.2 Use a variety of media effectively to convey a message in a document or a presentation

PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Competency	Indicators
11.1 Demonstrate an ability to evaluate the economic and financial performance of an engineering activity	11.1.1 Analyze different forms of financial statements to evaluate the financial status of an engineering project
11.2 Demonstrate an ability to compare and contrast the costs/benefits of alternate proposals for an engineering activity	11.2.1 Analyze and select the most appropriate proposal based on economic and financial considerations.

11.3 Demonstrate an ability to plan/manage an engineering activity within time and budget constraints	11.3.1	Identify the tasks required to complete an engineering activity, and the resources required to complete the tasks.
	11.3.2	Use project management tools to schedule an engineering project so it is completed on time and on budget

PO 12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Competency	Indicators	
12.1 Demonstrate an ability to identify gaps in knowledge and a strategy to close these gaps	12.1.1	Describe the rationale for requirement for continuing professional development
	12.1.2	Identify deficiencies or gaps in knowledge and demonstrate an ability to source information to close this gap
12.2 Demonstrate an ability to identify changing trends in engineering knowledge and practice	12.2.1	Identify historic points of technological advance in engineering that required practitioners to seek education in order to stay current
	12.2.2	Recognize the need and be able to clearly explain why it is vitally important to keep current regarding new developments in your field
12.3 Demonstrate an ability to identify and access sources for new information	12.3.1	Source and comprehend technical literature and other credible sources of information
	12.3.2	Analyze sourced technical and popular information for feasibility, viability, sustainability, etc.

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COMPUTER SCIENCE AND ENGINEERING (CSE)
(Effective for the batches admitted in 2020-21)**

Semester I (First year)

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P				
1	BS	20ABS9901	Algebra & Calculus	3	0	0	3	30	70	100
2	BS	20ABS9904	Chemistry	3	0	0	3	30	70	100
3	ES	20AES0501	Problem Solving and Programming	3	0	0	3	30	70	100
4	ES	20AES0301	Engineering Graphics	1	0	4	3	30	70	100
5	ES	20AES0505	Information Technology and Numerical Methods	3	0	0	3	30	70	100
6	ES LAB	20AES0506	Computer Science and Engineering Workshop	0	0	3	1.5	30	70	100
7	BS LAB	20ABS9909	Chemistry Lab	0	0	3	1.5	30	70	100
8	ES LAB	20AES0503	Problem Solving and Programming Lab	0	0	3	1.5	30	70	100
Total credits							19.5	240	560	800

Semester II (First year)

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P				
1	BS	20ABS9902	Applied Physics	3	0	0	3	30	70	100
2	BS	20ABS9911	Probability and Statistics	3	0	0	3	30	70	100
3	HS	20AHS9901	Communicative English	3	0	0	3	30	70	100
4	ES	20AES0502	Data Structures	3	0	0	3	30	70	100
5	ES	20AES0507	Web Design	1	0	4	3	30	70	100
6	HS LAB	20AHS9902	Communicative English Lab	0	0	3	1.5	30	70	100
7	BS LAB	20ABS9907	Applied Physics Lab	0	0	3	1.5	30	70	100
8	ES LAB	20AES0504	Data Structures Lab	0	0	3	1.5	30	70	100
9	MC	20AMC9903	Environmental Studies	2	0	0	0	30	0	30
Total credits							19.5	270	560	830

Semester III (Second year) – AK20

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P				
1	BS	20ABS9914	Discrete Mathematical Structures	3	0	0	3	30	70	100
2	PC	20APC0503	Digital Electronics & Microprocessors	3	0	0	3	30	70	100
3	PC	20APC0502	Database Management Systems	3	0	0	3	30	70	100
4	PC	20APC0526	Basics of Python Programming	3	0	0	3	30	70	100
5	ES	20AES0205	Basics of Electrical and Electronics Engineering	3	0	0	3	30	70	100
6	PC Lab	20APC0505	Database Management Systems Lab	0	0	3	1.5	30	70	100
7	PC Lab	20APC0527	Basics of Python Programming Lab	0	0	3	1.5	30	70	100
8	ES Lab	20AES0206	Basics of Electrical and Electronics Engineering Lab	0	0	3	1.5	30	70	100
9	SC	20ASC0501	Client Side Scripting	1	0	2	2	100	0	100
10	MC	20AMC9902	Constitution of India	2	0	0	0	30	0	30
Total credits							21.5	370	560	930

Semester IV (Second year) – AK20

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE		
				L	T	P				
1	PC	20APC0506	Computer Organization	3	0	0	3	30	70	100
2	PC	20APC0511	Design And Analysis Of Algorithms	3	0	0	3	30	70	100
3	PC	20APC0512	Object Oriented Programming through Java	3	0	0	3	30	70	100
4	PC	20APC0515	Operating Systems	3	0	0	3	30	70	100
5	HS	20AHSMB01	Managerial Economics and Financial Analysis	3	0	0	3	30	70	100
6	HS	20AHS9905	Universal Human Values	3	0	0	3	30	70	100
7	PC Lab	20APC0504	Computer Organization Lab	0	0	2	1	30	70	100
8	PC Lab	20APC0514	Object Oriented Programming through Java Lab	0	0	4	2	30	70	100
9	PC Lab	20APC0513	Operating Systems Lab	0	0	3	1.5	30	70	100
10	SC	20ASC0502	Server Side Scripting	1	0	2	2	100	0	100
Total credits							24.5	370	630	1000
Internship 2 Months (Mandatory) during summer vacation										
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)				4	0	0	4	0	0	0

Semester V (Third year)

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P				
1	PC	20APC05	Computer Networks	3	0	0	3	30	70	100
2	PC	20APC05	Formal Languages & Automata Theory	3	0	0	3	30	70	100
3	PC	20APC05	Artificial Intelligence	3	0	0	3	30	70	100
4	OE	20APE0417 20AOE0303 20APC0428	Sensors and IoT Optimization Techniques Microprocessor and Interfacing	2	0	2	3	30	70	100
5	PE	20APE0501 20APE0502 20APE0503	Data Warehousing and Mining Design Patterns Computer Graphics	3	0	0	3	30	70	100
6	PC Lab	20APC	AI using Python Lab	0	0	3	1.5	30	70	100
7	PC Lab	20APC	CN Lab using C/Java	0	0	3	1.5	30	70	100
8	SC	20ASC	Soft Skills	1	0	2	2	100	0	100
9	MC	20AHS	Biology for Engineers	2	0	0	0	30	0	30
Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester)				0	0	0	1.5	50	0	50
Total credits							21.5	390	490	880
Honors/Minor courses (The hours distribution can be 3-0- 2 or 3-1-0 also)				4	0	0	4	0	0	0

Semester VI (Third year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P				
1	PC	20APC	Machine Learning	3	1	0	3	30	70	100
2	PC	20APC	Compiler Design	3	0	0	3	30	70	100
3	PC	20APC	Grid and Cloud Computing	3	0	0	3	30	70	100
4	PE	20APE 20APE 20APE	Mobile Application Development Object Oriented Analysis and Design Cyber Security	3	0	0	3	30	70	100
5	OE	19AHEMB02 19APC0216 19APE0413	Entrepreneurship Development Neural Networks and Fuzzy Logic Cellular and Mobile Communications	2	0	2	3	30	70	100
6	PC Lab	20APC	Machine Learning using Python Lab	0	0	3	1.5	30	70	100
7	PC Lab	20APC	Compiler Design Lab	0	0	3	1.5	30	70	100
8	PC Lab	20APC	Grid and Cloud Computing	0	0	3	1.5	30	70	100
9	SC	20ASC	R Programming	1	0	2	2	100	0	100
10	MC	20AHS	Professional Ethics and Human Values	2	0	0	0	30	0	30
Total credits							21.5	370	560	930
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)				4	0	0	4	0	0	0
Industrial/Research Internship (Mandatory) 2 Months during summer vacation										

Semester VII (Fourth year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P				
1	PE		Cryptography and Network Security Real Time Systems Blockchain and Crypto currency Technologies	3	1	0	3	30	70	100
2	PE		Predictive Analytics Natural Language Processing Full Stack Development	3	0	0	3	30	70	100
3	PE		Software Testing Advanced Databases High Computing	3	0	0	3	30	70	100
4	OE		Image Processing Embedded Systems Fundamentals of Robotics	2	0	2	3	30	70	100
5	OE		Digital Forensics Information Retrieval Systems Advanced Computer Networks	2	0	2	3	30	70	100
6	HE		Professional Communication Simulation and Mathematical Modeling Deterministic, Stochastic & Statistical Methods for Data Science	3	0	0	3	30	70	100
7	SC		Ethics in Engineering Practice	1	0	2	2	30	70	100
Industrial/Research Internship 2 Months (Mandatory) after third year (to be evaluated during VII Semester)				0	0	0	3	30	70	100
Total credits							23	240	560	800
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)				4	0	0	4	0	0	0

Semester VIII (Fourth year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	PR		Project Project work, seminar and internship in industry	0	0	0	12
Total credits							12

Course Code	Algebra and Calculus		L	T	P	C
20ABS9901			3	0	0	3
Pre-requisite	Basic Mathematics	Semester	I - I			
Course Outcomes (CO):						
<ul style="list-style-type: none"> Develop the use of matrix algebra techniques that is needed by engineers for practical applications. Utilize mean value theorems to real life problems. Familiarize with functions of several variables which is useful in optimization. Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions 						
UNIT – I	Matrix Operations and Solving Systems of Linear Equations					
Rank of a matrix by echelon form, solving system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem						
UNIT – II	Quadratic Forms and Mean Value Theorems		9 Hrs			
Diagonalisation of a matrix, quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation. Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders (without proof);						
UNIT – III	Multivariable calculus					
Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.						
UNIT – IV	Multiple Integrals		9 Hrs			
Double integrals, change of order of integration, double integration in polar coordinates, change of Variables in double integration (Cartesian to polar), areas enclosed by plane curves. Evaluation of triple integrals.						
UNIT – V	Special Functions		9 Hrs			
Beta and Gamma functions and their properties, relation between beta and gamma functions, Bessel functions, Bessel's equation, Recurrence formulae or $J_n(x)$, Generating function- Orthogonality of Bessel's functions.						
Textbooks:						
<ol style="list-style-type: none"> B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011. 						
Reference Books:						
<ol style="list-style-type: none"> Dr.T.K.V Iyengar, B.Krishna Gandhi, S. Ranganatham and M.V.S.S.N Prasad, Mathematics – 1, S.Chand publications. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002. B.V.Ramana, Higher Engineering Mathematics, Mc Graw Hill Education. N.Bali, M.Goyal, C.Watkins, Advanced Engineering Mathematics, Infinity Science Press. 						

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Apply the knowledge of mathematics	1.1	1.1.1
CO2	PO1:Apply the knowledge of mathematics	1.1	1.1.1
CO3	PO1: Apply the knowledge of mathematics	1.1	1.1.1
CO4	Po2 : analyse complex engineering problems	2.1	2.1.3
CO5	Po2 : analyse complex engineering problems	2.1	2.1.3

Course Code	Chemistry		L	T	P	C
20ABS9904			3	0	0	3
Pre-requisite	Basic Mathematics	Semester	I - I			
Course Outcomes (CO):						
<ul style="list-style-type: none"> Understand the behaviour of, and interactions between matter and energy at both the atomic and molecular levels Compare the materials of construction for battery and electrochemical sensors Understand the preparation, properties, and applications of thermoplastics & thermo-sets, elastomers & conducting polymers. HPLC and GC methods used for separation of gaseous and liquid mixtures. Understand the disadvantages of using hard water and select suitable treatments domestically and industrially. 						
UNIT - I	Structure and Bonding Models		9 Hrs			
Planck's quantum theory, Schrodinger wave equation, significance of Ψ^1 and Ψ^2 , applications to hydrogen, particle in a box and their applications for conjugated molecules, crystal field theory - salient features - energy level diagrams for transition metal ions - splitting of orbital's in tetrahedral and octahedral complexes, magnetic properties, molecular orbital theory - bonding in homo- and heteronuclear diatomic molecules - energy level diagrams of O_2 , N_2 and CO, calculation of bond order.						
UNIT - II	Electrochemistry and Applications		9 Hrs			
Electrodes - concepts, reference electrodes (Calomel electrode, Ag/AgCl electrode and glass electrode) electrochemical cell, Nernst equation, cell potential calculations, numerical problems, concept of pH, pH meter and applications of pH metry (acid-base titrations), potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations), photovoltaic cell - working and applications, photogalvanic cells with specific examples. Electrochemical sensors - potentiometric sensors with examples, amperometric sensors with examples. Primary cells - Zinc-air battery, alkali metal sulphide batteries, Fuel cells, hydrogen-oxygen, methanol fuel cells - working of the cells. Secondary cells - lead acid, nickel-metal hydride and lithium ion batteries- working of the batteries including cell reactions, button cells						
UNIT - III	Polymer Chemistry		9 Hrs			
Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, copolymerization (stereospecific polymerization) with specific examples and mechanisms of polymer formation. Plastics - Thermoplastics and Thermo settings, Preparation, properties and applications of - Bakelite, urea-formaldehyde, Nylon-66, carbon fibres, Elastomers-Buna-S, Buna-N-preparation, properties and applications. Conducting polymers - polyacetylene, polyaniline, polypyrroles - mechanism of conduction and applications.						
UNIT - IV	Instrumental Methods and Applications		9 Hrs			
Principle and applications of Colorimetry, AAS, AES, UV-Visible spectrophotometry (Beer-Lambert's law, Instrumentation), Principles and applications of Chromatographic techniques(GC & HPLC), separation of gaseous mixtures and liquid mixtures(GC & HPLC methods).						
UNIT - V	Water Technology		9 Hrs			
Introduction -Soft Water and hardness of water, Estimation of hardness by EDTA Method - Boiler troubles - scale and sludge, Industrial water treatment - specifications for drinking water, Bureau of Indian Standards(BIS) and World health organization(WHO) standards, zeolite and ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electrodialysis.						
Textbooks:						
<ol style="list-style-type: none"> Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010. 						
Reference Books:						
<ol style="list-style-type: none"> J. D. Lee, Concise Inorganic Chemistry, 5/e, Oxford University Press, 2008. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007. Ben L. Feringa and Wesley R. Browne, Molecular Switches, 2/e, Wiley-VCH, 2011. Willard Merritt Dean Settle, 7 th Edition Instrumental methods for analysis 						

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 1: Apply the knowledge of basic science	1.2	1.2.1
CO: 2	PO 1: Apply the knowledge of basic science	1.4	1.4.1
CO: 3	PO 1: Apply the knowledge of basic science	1.2	1.2.1
CO: 4	PO 4: Analyze complex engineering problems	2.4	2.4.4
CO: 5	PO 1: Apply the knowledge of Basic science	1.2	1.2.1

Course Code	Problem Solving And Programming		L	T	P	C
20AES0501			3	0	0	3
Pre-requisite	Basic Mathematics	Semester	I - I			
Course Objectives:						
<ul style="list-style-type: none"> • Introduce the internal parts of a computer, and peripherals. • Introduce the Concept of Algorithm and use it to solve computational problems • Identify the computational and non-computational problems • Teach the syntax and semantics of a C Programming language • Demonstrate the use of Control structures of C Programming language • Illustrate the methodology for solving Computational problems 						
Course Outcomes (CO):						
<ul style="list-style-type: none"> • Construct his own computer using parts. • Recognize the importance of programming language independent constructs • Solve computational problems • Select the features of C language appropriate for solving a problem • Design computer programs for real world problems • Organize the data which is more appropriated for solving a problem 						
UNIT - I			8 Hrs			
<p>Computer Fundamentals: What is a Computer, Evolution of Computers, Generations of Computers, Classification of Computers, Anatomy of a Computer, Memory revisited, Introduction to Operating systems, Operational overview of a CPU.</p> <p>Introduction to Programming, Algorithms and Flowcharts: Programs and Programming, Programming languages, Compiler, Interpreter, Loader, Linker, Program execution, Fourth generation languages, Fifth generation languages, Classification of Programming languages, Structured programming concept, Algorithms, Pseudo-code, Flowcharts, Strategy for designing algorithms, Tracing an algorithm to depict logic, Specification for converting algorithms into programs.</p>						
UNIT - II			9 Hrs			
<p>Introduction to computer problem solving: Introduction, the problem-solving aspect, top-down design, implementation of algorithms, the efficiency of algorithms, and the analysis of algorithms.</p> <p>Fundamental algorithms: Exchanging the values of two variables, counting, summation of a set of numbers, factorial computation, sine function computation, generation of the Fibonacci sequence, reversing the digits of an integer.</p>						
UNIT - III			8 Hrs			
<p>Types, Operators, and Expressions: Variable names, data types and sizes, constants, declarations, arithmetic operators, relational and logical operators, type conversions, increment and decrement operators, bitwise operators, assignment operators and expressions, conditional expressions precedence and order of evaluation.</p> <p>Input and output: standard input and output, formatted output-Printf, formatted input-Scanf.</p> <p>Control Flow: Statements and blocks, if-else, else-if, switch, Loops-while and for, Loops-Do- while, break and continue, Goto and labels.</p> <p>Functions and Program Structure: Basics of functions, functions returning non-integers, external variables, scope variables, header variables, register variables, block structure, initialization, recursion, the C processor.</p>						
UNIT - IV			9 Hrs			
<p>Factoring methods: Finding the square root of a number, the smallest divisor of a number, the greatest common divisor of two integers, generating prime numbers.</p> <p>Pointers and arrays: Pointers and addresses, pointers and function arguments, pointers and arrays, address arithmetic, character pointers and functions, pointer array; pointers to pointers, Multi-dimensional arrays, initialization of arrays, pointer vs. multi-dimensional arrays, command line arguments, pointers to functions, complicated declarations.</p> <p>Array Techniques: Array order reversal, finding the maximum number in a set, removal of duplicates from an order array, finding the kth smallest element</p>						
UNIT - V			9 Hrs			
<p>Sorting and Searching: Sorting by selection, sorting by exchange, sorting by insertion, sorting by partitioning, binary search.</p> <p>Structures: Basics of structures, structures and functions, arrays of structures, pointers to structures, self-referential structures, table lookup, typedef, unions, bit-fields.</p>						

Some other Features: Variable-length argument lists, formatted input-Scanf, file access, Error handling-stderr and exit, Line Input and Output, Miscellaneous Functions.

Textbooks:

1. Pradip Dey, and Manas Ghosh, "Programming in C", 2018, Oxford University Press.
2. R.G. Dromey, "How to Solve it by Computer". 2014, Pearson.
3. Brian W. Kernighan, and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, Pearson.

Reference Books:

1. RS Bichkar "Programming with C", 2012, Universities Press.
2. Pelin Aksoy, and Laura Denardis, "Information Technology in Theory", 2017, Cengage Learning.
3. Byron Gottfried and Jitender Kumar Chhabra, "Programming with C", 4th Edition, 2019, McGraw Hill Education.

Online Learning Resources:

www.nptel.ac.in

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering Knowledge	1.3	1.3.1
CO2	PO2: Problem analysis	2.1	2.1.1
CO3	PO2: Problem analysis	2..2	2.2.2
CO4	PO2: Problem analysis	2.1	2.1.1
CO5	PO2: Problem analysis	2.3	2.3.1

Course Code	Engineering Graphics			L	T	P	C
20AES0301				1	0	4	3
Pre-requisite	Basic Mathematics	Semester	I - I				
Course Outcomes (CO):							
<ul style="list-style-type: none"> • Draw various curves applied in engineering. • Show projections of solids and sections graphically. • Draw the development of surfaces of solids. • Use computers as a drafting tool. • Draw isometric and orthographic drawings using CAD packages. 							
UNIT – I				8 Hrs			
Introduction to Engineering graphics: Principles of Engineering Graphics and their significance-Conventions in drawing-lettering - BIS conventions.							
<ul style="list-style-type: none"> a) Conic sections including the rectangular hyperbola- general method only, b) Cycloid, epicycloids and hypocycloid c) Involutés 							
UNIT – II				9 Hrs			
Projection of points, lines: Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line.							
UNIT – III				8 Hrs			
Projections of Planes: Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line. Projections of regular plane surfaces.							
Projections of Solids: Projections of regular solids inclined to one or both planes by rotational or auxiliary views method.							
UNIT – IV				9 Hrs			
Sections of solids: Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections.							
Development of surfaces: Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts.							
UNIT – V				9 Hrs			
Orthographic Projections: Systems of projections, conventions and application to orthographic projections.							
Isometric Projections: Principles of isometric projection- Isometric scale; Isometric views: lines, planes, figures, simple and compound solids.							
Textbooks:							
<ol style="list-style-type: none"> 1. K.L.Narayana & P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers 2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers 3. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill 4. Shah and Rana, Engineering Drawing, 2/e, Pearson Education 5. Basant Agarwal & C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill 							
Reference Books:							
Online Learning Resources:							
YouTube: http://sewor,Carleton.cag,kardos/88403/drawings.html conic sections-online, red woods.edu							

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 1: Engineering knowledge	1.3	1.3.1
CO: 2	PO 3: Design/Development of Solutions	3.2	3.2.1
CO: 3	PO 1: Engineering knowledge	1.3	1.3.1
CO: 4	PO 3: Design/Development of Solutions	3.2	3.2.2
CO: 5	PO 5: Problem analysis	5.1	5.1.1

Course Code	Information Technology And Numerical Methods		L	T	P	C
20AES0505			3	0	0	3
Pre-requisite	Basic Mathematics	Semester	I - I			
Course Outcomes (CO):						
<ul style="list-style-type: none"> • Usage of Digital World and Exploring Cyber space • Explain the needs of hardware and software required for a computation task. • Familiarize peripheral devices, networking and internet 						
UNIT - I			8 Hrs			
INTRODUCTION TO INFORMATION TECHNOLOGY Your Digital World: The Practical User: How Becoming Computer Savvy Benefits You, Information Technology & Your Life: The Future Now, Infotech Is All Pervasive: Cell phones, Email, the Internet, & the E-World, The “All-Purpose Machine”: The Varieties of Computers, Understanding Your Computer: How Can You Customize (or Build) Your Own PC?, Where Is Information Technology Headed?						
THE INTERNET & THE WORLD WIDE WEB Exploring Cyberspace: Connecting to the Internet: Narrowband, Broadband, & Access Providers, How Does the Internet Work? The World Wide Web, Email & Other Ways of Communicating over the Net, The Online Gold Mine: Telephony, Multimedia, Webcasting, Blogs, E-Commerce, & the Social Web, The Intrusive Internet: Snooping, Spamming, Spoofing, Phishing, Pharming, Cookies, & Spyware.						
UNIT - II			9 Hrs			
SOFTWARE Tools for Productivity & Creativity: SOFTWARE: TOOLS FOR PRODUCTIVITY & CREATIVITY, System Software: The Power Behind the Power, The Operating System: What It Does? Other System Software: Device Drivers & Utility Programs, Common Features of the User Interface, Common Operating Systems, Application Software: Getting Started, Word Processing, Spreadsheets, Database Software, Specialty Software						
HARDWARE: THE CPU & STORAGE How to Choose a Multimedia Computer System: HARDWARE: THE CPU & STORAGE: HOW TO CHOOSE A MULTIMEDIA COMPUTER SYSTEM, Microchips, Miniaturization, & Mobility, the System Unit: The Basics, More on the System Unit, Secondary Storage, Future Developments in Processing & Storage						
UNIT - III			8 Hrs			
HARDWARE: INPUT & OUTPUT Taking Charge of Computing & Communications: Input & Output, Input Hardware, Output Hardware, Input & Output Technology & Quality of Life: Health & Ergonomics, The Future of Input & Output						
COMMUNICATIONS, NETWORKS, & SAFEGUARDS The Wired & Wireless World: From the Analog to the Digital Age, Networks, Wired Communications Media, Wireless Communications Media, Cyber Threats, Hackers, & Safeguards						

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 12: Life-long learning	12.2	12.2.1
CO: 2	PO 12: Life-long learning	12.2	12.2.2
CO: 3	PO 12: Life-long learning	12.2	12.2.1

Numerical Methods		
Course Outcomes:		
<ul style="list-style-type: none"> • Analyze the concepts of Errors, Relative and Percentage Errors • Analyze the concepts of Algebraic & Transcendental Equations to solve different Engineering problems • Analyze Interpolation using the concepts of the Numerical Methods • Apply the concepts of Integration in Numerical Methods • Apply the concepts of O.D.E on Numerical Methods 		
UNIT – I		8 Hrs
Errors in Numerical computations: Errors and their Accuracy, Mathematical Preliminaries, Errors and their Analysis, Absolute, Relative and Percentage Errors, A general error formula, Error in a series approximation. Solution of Algebraic and Transcendental Equations: The Bisection Method – The Method of False Position– Newton-Raphson Method, Solution of linear simultaneous equation: Crout’s triangularisation method, Gauss - Seidal iteration method.		
UNIT – II		8 Hrs
Interpolation: Newton’s forward and backward interpolation formulae – Lagrange’s formulae. Gauss forward and backward formula, Stirling’s formula, Bessel’s formula. Curve fitting: Fitting of a straight line – Second degree curve – Exponential curve-Power curve by method of least squares. Numerical Differentiation for Newton’s interpolation formula. Numerical Integration: Trapezoidal rule – Simpson’s 1/3 Rule – Simpson’s 3/8 Rule.		
UNIT – III		8 Hrs
Numerical solution of Ordinary Differential equations: Solution by Taylor’s series-Picard’s Method of successive Approximations-Euler’s Method- Runge - Kutta Methods. Numerical solutions of Laplace equation using finite difference approximation. Initial Value Problem, Eigen Value Problem and Boundary-value Problem		

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Knowledge of Mathematics	1.2	1.2.1
CO2	PO1: Knowledge of Mathematics	1.2	1.2.1
CO3	PO1: Knowledge of Mathematics	1.2	1.2.1
CO4	PO1: Knowledge of Mathematics	1.2	1.2.1
CO5	PO1: Knowledge of Mathematics	1.2	1.2.1

Textbooks:
1. Using Information Technology 9th Edition By Brian Williams and Stacey Sawyer, Mcgraw Hill Publications 2. “Computer Oriented Numerical Methods” by V Rajaraman
Reference Books:
1. Uttam K Roy, –Web Technologies , Oxford University Press, 1st Edition, 2010. 2. HTML and CSS: Design and Build Websites 1st Edition by Jon Duckett (Author) india price 3. Steven Holzner, –The Complete Reference PHP , Tata McGraw-Hill, 1st Edition, 2007. 4. HTML & CSS: The Complete Reference, Fifth Edition (Complete Reference Series) 5. Deitel and Deitel and Nieto, –Internet and World Wide Web - How to Program , Prentice Hall, 5 th Edition, 2011. 6. Numerical Methods by E Balaguruswamy
Online Learning Resources:
1. http://www.scoopworld.in 2. http://www.sxecw.edu.in 3. http://www.technofest2u.blogspot.com 4. http://www.ptutorial.com/php-example/php-upload-image 5. http://www.ptutorial.com/php-example/php-change-case 6. https://www.math.ust.hk/~machas/numerical-methods.pdf

Course Code	Computer Science And Engineering Workshop		L	T	P	C
20AES0506			0	0	3	1.5
Pre-requisite	Basic Mathematics	Semester	I - I			
Course Outcomes (CO):						
<ul style="list-style-type: none"> Construct a computer from its parts and prepare it for use Develop Documents using Word processors Develop presentations using the presentation tool Perform computations using spreadsheet tool Design Graphics, Videos and Web pages Connect things to computers 						
Preparing your computer						
<p>Task 1: Assembling a Computer: Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods available (eg: beeps). Students should record the process of assembling and trouble shooting a computer.</p>						
<p>Task 2: Install Operating system: Student should install Linux on the computer. Student may install another operating system (including proprietary software) and make the system dual boot or multi boot. Students should record the entire installation process.</p>						
Productivity tools						
<p>Task 3: Word Processor: Students should be able to create documents using the word processor tool. Some of the tasks that are to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, Inserting header and Footer, changing the font, changing the colour, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Students should submit a user manual of the word processor considered.</p>						
<p>Task 4: Spreadsheet: Students should be able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells. Students should submit a user manual of the Spreadsheet application considered.</p>						
<p>Task 5: Presentations: creating, opening, saving and running the presentations, selecting the style for slides, formatting the slides with different fonts, colours, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyperlinking, running the slide show, setting the timing for slide show. Students should submit a user manual of the Presentation tool considered.</p>						
IoT						
<p>Task 6: Raspberry Pi Study the architecture of Raspberry pi, configure software, Install SD card, Connect the cables, Install Raspbian (or any other) operating system, Configure Wi-Fi, Remotely connect to your Raspberry Pi.</p>						
Story Telling						
<p>Task 7: Storytelling Use Adobe spark or any other tool to create Graphics, Webpages, and Videos.</p>						
Textbooks:						
Reference Books:						
<ol style="list-style-type: none"> B. Govindarajulu, "IBM PC and Clones Hardware Trouble shooting and Maintenance", 2nd edition, Tata McGraw-Hill, 2002 "MOS study guide for word, Excel, Powerpoint & Outlook Exams", Joan Lambert, Joyce Cox, PHI. "Introduction to Information Technology", ITL Education Solutions limited, Pearson Education. Rusen, "Networking your computers and devices", PHI Bigelows, "Trouble shooting, Maintaining & Repairing PCs", TMH. 						
Online Learning Resources:						

1. <https://www.adobe.com>
2. <https://www.raspberrypi.org>

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO 1	PO 1: Engineering knowledge	1.3	1.3.1
CO 2	PO 1: Engineering knowledge	1.3	1.3.1
CO 3	PO 1: Engineering knowledge	1.3	1.3.1
CO 4	PO 1: Engineering knowledge	1.3	1.3.1
CO 5	PO 1: Engineering knowledge	1.3	1.3.1
CO 6	PO 1: Engineering knowledge	1.3	1.3.1

Course Code	Chemistry Lab		L	T	P	C
20ABS9909			0	0	3	1.5
Pre-requisite	Basic Mathematics	Semester	I - I			
Course Outcomes (CO):						
<ul style="list-style-type: none"> To familiarize the students with the basic concepts of chemistry of materials Prepare advanced polymer materials Measure the strength of an acid present in secondary batteries To familiarize with digital and instrumental methods of analysis 						
List of Experiments:						
<ol style="list-style-type: none"> Determination of Hardness of a groundwater sample. Estimation of iron (II) using Diphenylamine indicator (Dichrometry – Internal indicator method) Determination of pH metric titration of strong acid vs. strong base, Conductometric titration of strong acid vs. strong base Determination of Fe(II) in Mohr's salt by potentiometric method. Determination of percentage of Iron in Cement sample by colorimetry Determination of Strength of an acid in Pb-Acid battery Preparation of phenol-formaldehyde resin Preparation of TiO₂/ZnO nano particles Estimation of Calcium in port land Cement Adsorption of acetic acid by charcoal Thin layer chromatography 						

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO:1	PO 4: Analysis and interpretation of data	4.3	4.3.3
CO:2	PO 4: Analysis and interpretation of data	4.3	4.3.1
CO:3	PO 4: Analysis and interpretation of data	4.3	4.3.1
CO:4	PO 4: Analysis and interpretation of data	4.3	4.3.2

Course Code	Problem Solving And Programming Lab		L	T	P	C
20AES0503			0	0	3	1.5
Pre-requisite	Basic Mathematics	Semester	I - I			
Course Objectives:						
The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs, applications in C. Also by learning the basic programming constructs they can easily switch over to any other language in future.						
Course Outcomes (CO):						
<ul style="list-style-type: none"> • Construct a Computer given its parts • Select the right control structure for solving the problem • Analyze different sorting algorithms • Design solutions for computational problems • Develop C programs which utilize the memory efficiently using programming constructs like pointers. 						
Laboratory Experiments #						
<ol style="list-style-type: none"> 1. Assemble and disassemble parts of a Computer 2. Design a C program which reverses the number 3. Design a C program which finds the second maximum number among the given list of numbers. 4. Construct a program which finds the kth smallest number among the given list of numbers. 5. Design an algorithm and implement using C language the following exchanges $a \leftarrow b \leftarrow c \leftarrow d \leftarrow a$ 6. Develop a C Program which counts the number of positive and negative numbers separately and also compute the sum of them. 7. Implement the C program which computes the sum of the first n terms of the series $\text{Sum} = 1 - 3 + 5 - 7 + 9$ 8. Design a C program which determines the numbers whose factorial values are between 5000 and 32565. 9. Design an algorithm and implement using a C program which finds the sum of the infinite series $1 - x^2/2! + x^4/4! - x^6/6! + \dots$ 10. Design a C program to print the sequence of numbers in which each number is the sum of the three most recent predecessors. Assume first three numbers as 0, 1, and 1. 11. Implement a C program which converts a hexadecimal, octal and binary number to decimal number and vice versa. 12. Develop an algorithm which computes the all the factors between 1 and 100 for a given number and implement it using C. 13. Construct an algorithm which computes the sum of the factorials of numbers between m and n. 14. Design a C program which reverses the elements of the array. 15. Given a list of n numbers, Design an algorithm which prints the number of stars equivalent to the value of the number. The stars for each number should be printed horizontally. 16. Implement the sorting algorithms a. Insertion sort b. Exchange sort c. Selection sort d. Partitioning sort. 17. Illustrate the use of auto, static, register and external variables. 18. Design algorithm and implement the operations creation, insertion, deletion, traversing on a singly linked list. 19. Develop a C program which takes two numbers as command line arguments and finds all the common factors of those two numbers. 20. Design a C program which sorts the strings using array of pointers. 						
Instructors may add some experiments to the above list. Moreover, 50% of the experiments are to be changed every academic year. Instructors can choose the experiments, provided those experiments are not repetitions.						
Textbooks:						
<ol style="list-style-type: none"> 1. Pradip Dey, and Manas Ghosh, "Programming in C", 2018, Oxford University Press. 2. R.G. Dromey, "How to Solve it by Computer". 2014, Pearson. 3. Brian W. Kernighan, and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, Pearson. 						
Reference Books:						
<ol style="list-style-type: none"> 1. B. Govindarajulu, "IBM PC and Clones Hardware Trouble shooting and Maintenance", Tata McGraw-Hill, 2nd edition, 2002. 2. R.G. Dromey, "How to Solve it by Computer". 2014, Pearson. 						

Online Learning Resources:
www.nptel.ac.in/cprogramming

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO2: Problem analysis	2.1	2.1.1
CO2	PO2: Problem analysis	2.2	2.2.2
CO3	PO2: Problem analysis	2.1	2.1.1
CO4	PO2: Problem analysis	2.3	2.3.1
CO5	PO2: Problem analysis	2.2	2.2.3

Course Code	Applied Physics		L	T	P	C
20ABS9902			3	0	0	3
Pre-requisite	Basic Mathematics	Semester	I - II			
Course Objectives:						
Course Outcomes (CO):						
<ul style="list-style-type: none"> Analyze the wave properties of light and the interaction of energy with the matter. Apply electromagnetic wave propagation in different guided media. Asses the electromagnetic wave propagation and its power in different media Analyze the conductivity of semiconductors. Interpret the difference between normal conductor and superconductor and apply the nonmaterial's for engineering applications. 						
UNIT - I			9 Hrs			
Optics and EM Theory						
Interference of light -principle of superposition-Conditions for sustained Interference-Interference in thin films (reflected light) - Newton's Rings -Determination of Wavelength. Diffraction-Fraunhofer diffraction- Single slit and double slit- Diffraction Grating. Divergence and Curl of Electric and Magnetic Fields - Gauss' theorem for divergence and Stokes' theorem for curl - Maxwell's Equations (Quantitative) - Electromagnetic wave - propagation in non-conducting medium - Poynting's Theorem.						
UNIT - II			9 Hrs			
Lasers and Fiber Optics						
Lasers - Introduction - Characteristics - Spontaneous and Stimulated Emission - Einstein Coefficients - Population Inversion - Excitation Mechanism and Optical Resonator - He-Ne Laser -Nd: YAG Laser - Semiconductor Diode Laser - Applications of Lasers and Holography. Introduction to Optical Fibers - Total Internal Reflection - Critical angle of propagation -Acceptance angle - Numerical Aperture - Classification of fibers based on Refractive index profile - Propagation of electromagnetic wave through optical fiber - modes - importance of V-number-Attenuation, Block Diagram of Fiber optic Communication - Industrial Applications -Fiber optic Sensors.						
UNIT - III			9 Hrs			
Dielectric and Magnetic Materials						
Introduction—Dielectric polarization-Dielectric polarizability, Susceptibility and Dielectric constant-Types of polarizations: Electronic and Ionic,(Quantitative), Orientation Polarizations (Qualitative)- Frequency dependence of polarization-Lorentz (internal) field-Claussius-Mosotti equation-Applications of Dielectrics: Ferroelectricity. Introduction-Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability-Origin of permanent magnetic moment - Classification of Magnetic materials - Weiss theory of ferromagnetism (qualitative) - Hysteresis- soft and hard magnetic materials - Magnetic memory device applications .						
UNIT - IV			9 Hrs			
Semiconductors						
Origin of Energy bands (Qualitative)-Intrinsic and Extrinsic semiconductors -Direct and indirect band gap semiconductors- Density of charge carriers - Fermi energy--Dependence of Fermi energy on carrier concentration and temperature - Electrical conductivity - Drift and Diffusion currents - Continuity equation - Hall effect - Applications of Hall effect and Semiconductors.						
UNIT - V			9 Hrs			
Superconductors and Nonmaterial's						
Superconductors-Properties-Meissner's effect-BCSTheory(Qualitative) - Josephson effect (AC&DC)-Types of Superconductors-Applications of superconductors. Nanomaterials--Significance of nanoscale--: Physical, Mechanical, Magnetic, Optical properties of nanomaterials - Synthesis of nanomaterials:Top-down-Ball Milling, Bottom-up-Chemical vapour deposition--Characterization of nanomaterials : X-Ray Diffraction (XRD), Scanning Electron Microscope (SEM)-Applications of Nanomaterials.						
Textbooks:						
<ol style="list-style-type: none"> M. N. Avadhanulu, P. G. Kshirsagar &TVS Arun Murthy" A Text book of Engineering Physics"-S. Chand Publications,11th Edition2019. B.K.Pandey and S.Chaturvedi, Engineering Physics, Cengage Learning,2012. 						

Reference Books:
<ol style="list-style-type: none"> 1. K Thyagarajan “Engineering Physics”,-Mc Graw Hill Publishing Company Ltd, 2016 2. Shatendra Sharma, Jyotsna Sharma, “ Engineering Physics”, Pearson Education,2018 3. David J.Griffiths,“Introduction to Electrodynamics”-4/e, Pearson Education, 2014 4. T Pradeep, “A Text book of NanoScience and NanoTechnology”-Tata Mc Graw Hill 2013.
Online Learning Resources:
www.nptel.ac.in

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO1 : Apply the knowledge of science	1.2	1.2.1
CO: 2	PO1: Apply the knowledge of science	1.2	1.2.1
CO: 3	PO1: Apply the knowledge of science	1.2	1.2.1
CO: 4	PO1: Apply the knowledge of science	1.2	1.2.1
CO: 5	PO1: Apply the knowledge of science	1.2	1.2.1

Course Code	Probability And Statistics		L	T	P	C
20ABS9911			3	0	0	3
Pre-requisite	Basic Mathematics	Semester	I - II			
Course Objectives:						
Course Outcomes (CO):						
<ul style="list-style-type: none"> Interpret the association of characteristics and through correlation and regression tools. Make use of the concepts of probability and their applications. Apply discrete and continuous probability distributions. Design the components of a classical hypothesis test for large sample. Design the components of a classical hypothesis test for small samples. 						
UNIT - I			9 Hrs			
Descriptive statistics and methods for data science						
Data science, Statistics Introduction, Population vs Sample, Collection of data, primary and secondary data, Type of variable: dependent and independent Categorical and Continuous variables, Data visualization, Measures of Central tendency, Measures of Variability (spread or variance) Skewness Kurtosis, correlation, correlation coefficient, rank correlation, regression coefficients, principle of least squares, method of least squares, regression lines						
UNIT - II			9 Hrs			
Probability						
Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.						
UNIT - III			9 Hrs			
Probability distributions						
Probability distribution - Binomial, Poisson approximation to the binomial distribution and normal distribution-their properties.						
UNIT - IV			9 Hrs			
Estimation and Testing of hypothesis, large sample tests						
Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems						
UNIT - V			9 Hrs			
Small sample tests						
Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), χ^2 - test for goodness of fit.						
Textbooks:						
<ol style="list-style-type: none"> Miller and Freunds, Probability and Statistics for Engineers, 7/e, Pearson, 2008. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012. 						
Reference Books:						
<ol style="list-style-type: none"> S. Chand ,Probability and Statistics, Dr.T.K.V. Iyengar, Dr.B. Krishna Gandhi, S. Ranganatham, Dr.M.V.S.S.N. Prasad S. Ross, a First Course in Probability, Pearson Education India, 2002. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968. 						
Online Learning Resources:						
www.nptel.ac.in						

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Knowledge of Engineering fundamentals	1.2	1.2.2
CO2	PO 2: Principles of mathematics	2.8	2.8.1
CO3	PO 2 : Principles of mathematics	2.6	2.6.4
CO4	PO 4: Analysis and interpretation of data	4.6	4.6.1
CO5	PO 4: Analysis and interpretation of data	4.6	4.6.4

Course Code	Communicative English		L	T	P	C
20AHS9901			3	0	0	3
Pre-requisite	Basic Mathematics	Semester	I - II			
Course Objectives:						
Course Outcomes (CO):						
<ul style="list-style-type: none"> Identify the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English Formulate sentences using proper grammatical structures and correct word forms Speak clearly on a specific topic using suitable discourse markers in informal discussions Write summaries based on global comprehension of reading/listening texts Produce a coherent paragraph interpreting a figure/graph/chart/table Take notes while listening to a talk/lecture to answer questions 						
UNIT - I			9 Hrs			
EXPLORATION						
Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.						
Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.						
Reading: A Proposal to Girdle the Earth, Nellie Bly - Skimming to get the main idea of a text; scanning to look for specific pieces of information.						
Reading for Writing: Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph.						
Grammar and Vocabulary: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and un countable; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences.						
UNIT - II			9 Hrs			
ON CAMPUS						
Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts.						
Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks.						
Reading: The District School As It Was by One who Went to it, Warren Burton - Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.						
Writing: Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters.						
Grammar and Vocabulary: Cohesive devices -linkers, sign posts and transition signals; use of articles and zero article; prepositions.						
UNIT - III			9 Hrs			
THE FUTURE OF WORK						
Listening: Listening for global comprehension and summarizing what is listened to.						
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed						
Reading: The Future of Work - Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension.						
Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.						
Grammar and Vocabulary: Verbs -tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.						
UNIT - IV			9 Hrs			
FABRIC OF CHANGE						
Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.						
Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.						
Reading: H.G. Wells and the Uncertainties of Progress, Peter J. Bowler - Studying the use of graphic elements in texts to convey information, reveal trends / patterns / relationships, communicate processes or display complicated data.						
Writing: Information transfer; describe, compare, contrast, identify significance / trends based on information provided in figures/charts/graphs/tables.						
Grammar and Vocabulary: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms.						
UNIT - V			9 Hrs			

TOOLS FOR LIFE
Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.
Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides.
Reading: Leaves from the Mental Portfolio of a Eurasian, Sui Sin Far - Reading for comprehension.
Writing: Writing structured essays on specific topics using suitable claims and evidences.
Grammar and Vocabulary: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject- verb agreement)
Textbooks:
1. English all round: Communication Skills for Under graduation Learners Vol. I, Orient BlackSwan Publisers, First Edition 2019.
Reference Books:
1. Bailey, Stephen. <i>Academic writing: A handbook for international students</i> . Routledge,2014. Chase, Becky Tarver. <i>Pathways: Listening, Speaking and Critical Thinking</i> . Heinley,ELT; 2nd Edition, 2018.
2. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
3. Hewings, Martin. <i>Cambridge Academic English (B2)</i> . CUP, 2012.
Online Learning Resources:
1. Grammar/Listening/Writing, 1-language.com, http://www.5minuteenglish.com/ , https://www.englishpractice.com/ , Grammar/Vocabulary, English Language Learning Online http://www.bbc.co.uk/learningenglish/ , http://www.better-english.com/ , http://www.nonstopenglish.com/ , https://www.vocabulary.com/ , BBC Vocabulary Games Free Rice Vocabulary Game
2. Reading https://www.usingenglish.com/comprehension/ , https://www.englishclub.com/reading/short-stories.htm , https://www.english-online.at/
3. Listening https://learningenglish.voanews.com/z/3613 , http://www.englishmedialab.com/listening.html
4. Speaking https://www.talkenglish.com/ , BBC Learning English – Pronunciation tips, Merriam-Webster – Perfect pronunciation Exercises
5. All Skills https://www.englishclub.com/ , http://www.world-english.org/ , http://learnenglish.britishcouncil.org/ Online Dictionaries, Cambridge dictionary online, MacMillan dictionary, Oxford learner’s dictionaries

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1.	PO6: Apply contextual knowledge to assess societal, health, safety, legal, and cultural issues.	6.1	6.1.1
CO2.	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.1	10.1.1
CO3.	PO9-Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	9.2	9.2.1
CO4.	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.1	10.1.1
CO5	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.3	10.3.1
CO6.	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.2.1

Course Code	Data Structures		L	T	P	C
20AES0502			3	0	0	3
Pre-requisite	Basic Mathematics	Semester	I - II			
Course Objectives:						
<ul style="list-style-type: none"> To teach the representation of solution to the problem using algorithm To explain the approach to algorithm analysis To introduce different data structures for solving the problems To demonstrate modelling of the given problem as a graph To elucidate the existing hashing techniques 						
Course Outcomes (CO):						
<ul style="list-style-type: none"> Select Appropriate Data Structure for solving a real world problem Select appropriate file organization technique depending on the processing to be done Construct Indexes for Databases Analyse the Algorithms Develop Algorithm for Sorting large files of data 						
UNIT - I			9 Hrs			
Introduction						
Algorithm Specification, Performance analysis, Performance Measurement. Arrays: Arrays, Dynamically Allocated Arrays. Structures and Unions. Sorting: Motivation, Quick sort, how fast can we sort, Merge sort, Heap sort						
UNIT - II			9 Hrs			
Stack, Queue and Linked lists						
Stacks, Stacks using Dynamic Arrays, Queues, Circular Queues Using Dynamic Arrays, Evaluation of Expressions, Multiple Stacks and Queues. Linked lists: Singly Linked Lists and Chains, Representing Chains in C, Linked Stacks and Queues, Additional List Operations, Doubly Linked Lists.						
UNIT - III			9 Hrs			
Trees						
Introduction, Binary Trees, Binary Tree Traversals, Additional Binary Tree Operations, Binary Search Trees, Counting Binary Trees, Optimal Binary search Trees, AVL Trees. B-Trees: B- Trees, B + Trees.						
UNIT - IV			9 Hrs			
Graphs and Hashing						
The Graph Abstract Data Type, Elementary Graph Operations, Minimum Cost Spanning Trees, Shortest Paths and Transitive Closure Hashing: Introduction to Hash Table, Static Hashing, Dynamic Hashing.						
UNIT - V			9 Hrs			
Files and Advanced sorting						
File Organization: Sequential File Organization, Direct File Organization, Indexed Sequential File Organization. Advanced sorting: Sorting on Several keys, List and Table sorts, Summary of Internal sorting, External sorting.						
Textbooks:						
<ol style="list-style-type: none"> Ellis Horowitz and Sartaj Sahni, "Fundamentals of Data Structures in C", 2nd Edition, Galgotia Book Source, Pvt. Ltd., 2004. Alan L. Tharp, "File Organization and Processing", Wiley and Sons, 1988. 						
Reference Books:						
<ol style="list-style-type: none"> D. Samanta, "Classic Data Structures", 2nd Edition, Prentice-Hall of India, Pvt. Ltd., India, 2012. Peter Bras, "Advanced Data Structures", Cambridge University Press, 2016 Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures A Pseudo code Approach with C", Second Edition, Cengage Learning 2005. 						
Online Learning Resources:						
www.nptel.ac.in						

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering Knowledge	1.4	1.4.1
CO2	PO4: Conduct investigations of complex problems	4.1	4.1.4
CO3	PO1: Engineering Knowledge	1.3	1.3.1
CO4	PO2: Problem analysis	2.1	2.1.2
CO5	PO2: Problem analysis	2.3	2.3.1

Course Code	Web Design		L	T	P	C
20AES0507			1	0	4	3
Pre-requisite	Basic Mathematics	Semester	I - II			
Course Objectives:						
Course Outcomes (CO):						
<ul style="list-style-type: none"> Add elements to web pages, including colors, text, images, and more Add advanced features to your website including special effects 						
UNIT - I			9 Hrs			
<p>Where Do I Start-What Does a Web Designer Do, What Languages Do I Need to Learn, What Do I Need to Buy, How the Web Works-The Internet Versus the Web, Serving Up Your Information, A Word About Browsers, Web Page Addresses (URLs), The Anatomy of a Web Page, Some Big Concepts You Need to Know-A Dizzying Multitude of Devices, Sticking with the Standards, Progressive Enhancement, Responsive Web Design, One Web for All (Accessibility), The Need for Speed (Site Performance)</p> <p>HTML Markup for Structure: Creating a Simple Page-A Web Page, Launch a Text Editor, Step 1: Start with Content, Step 2: Give the Document Structure, Step 3: Identify Text Elements, Step 4: Add an Image, Step 5: Change the Look with a Style Sheet, When Good Pages Go Bad, Validating Your Documents. Marking Up Text-Paragraphs, Headings, Lists, More Content Elements, Organizing Page Content, The Inline Element Roundup, Generic Elements (div and span), Some Special Characters</p>						
UNIT - II			9 Hrs			
<p>HTML Markup for Structure: Adding Links-The href Attribute, Linking to Pages on the Web, Linking Within Your Own Site, Targeting a New Browser Window, Mail Links, Telephone Links. Adding Images-First, a Word on Image Formats, The img Element, A Window in a Window. Table Markup-How Tables Are Used, Minimal Table Structure, Spanning Cells, Table Accessibility, Wrapping Up Tables</p> <p>HTML Markup for Structure: Forms-How Forms Work, The form Element, Variables and Content, The Great Form Control Roundup, Form Accessibility Features, Form Layout and Design. What's Up, HTML5-A Funny Thing Happened on the Way to XHTML 2, In the Markup Department, Meet the APIs, Video and Audio, Canvas</p>						
UNIT - III			9 Hrs			
<p>CSS for Presentation: Cascading Style Sheets Orientation-The Benefits of CSS, How Style Sheets Work, The Big Concepts, Moving Forward with CSS. Formatting Text-The Font Properties, Changing Text Color, A Few More Selector Types, Text Line Adjustments, Underlines and Other "Decorations", Changing Capitalization, Spaced Out, Text Shadow, Changing List Bullets and Numbers. Colors and Backgrounds-Specifying Color Values, Foreground Color, Background Color, Playing with Opacity, Introducing...Pseudo-class Selectors, Pseudo-element Selectors, Attribute Selectors, Background Images, The Shorthand background Property, Like a Rainbow (Gradients), External Style Sheets. Thinking Inside the Box-The Element Box, Specifying Box Dimensions, Padding, Borders, Margins, Assigning Display Roles, Adding Drop Shadows to Boxes</p>						
UNIT - IV			9 Hrs			
<p>CSS for Presentation: Floating and Positioning- Normal Flow, Floating, Positioning Basics, Relative Positioning, Absolute, Positioning, Fixed Positioning. Page Layout with CSS- Page Layout Strategies, page Layout Techniques, Multicolumn Layouts Using Floats, Positioned Layout, Top-to-Bottom Column Backgrounds. Transitions, Transforms, and Animation- Ease-y Does It (CSS Transitions), CSS Transforms, Keyframe Animation. CSS Techniques- A Clean Slate (CSS Reset), Image Replacement Techniques, CSS Sprites, Styling Forms, Styling Tables, Basic Responsive Web Design, Wrapping Up Style Sheets.</p>						
UNIT - V			9 Hrs			
<ol style="list-style-type: none"> Design a page having suitable background colour and text colour with title "My First Web Page" using all the attributes of the Font tag. Create a HTML document giving details of your [Name, Age], [Address, Phone] and [Register Number, Class] aligned in proper order using alignment attributes of Paragraph tag. Write HTML code to design a page containing some text in a paragraph by giving suitable heading style. Create a page to show different character formatting (B, I, U, SUB, SUP) tags. <ol style="list-style-type: none"> $\text{viz: } \log_b m^p = p \log_b m$ Write HTML code to create a Web Page that contains an Image at its centre. Create a web page with an appropriate image towards the left hand side of the page, when user clicks on the image another web page should open. 						

7. Create web Pages using Anchor tag with its attributes for external links.
8. Create a web page for internal links; when the user clicks on different links on the web page it should go to the appropriate locations/sections in the same page.
9. Write a HTML code to create a web page with pink colour background and display moving message in red colour.
10. Create a web page, showing an ordered list of all second semester courses (Subjects).
11. Create a web page, showing an unordered list of names of all the Diploma Programmes (Branches) in your institution.
12. Create a HTML document containing a nested list showing a content page of any book.
13. Create the following table in HTML

Student	Maths	Physics	Chemistry	Computer
I-R2C1	I-R1C1	I-R4C1	I-C2	
	II-C1		II-C1	
III-R2C2			III-C1	
			IV-C1	
		II-R1C5		

14. Create a web page which divides the page in two equal frames and place the audio and video clips in frame-1 and frame-2 respectively.

i. FRAME-1	ii. FRAME-2
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15. Create a web page which should generate following output:

i. FRAME-1	ii. FRAME-2
	iii. FRAME-3

16. Create a table to show your class time table.
17. Use tables to provide layout to your HTML page describing your college infrastructure.
18. Use and <div> tags to provide a layout to the above page instead of a table layout.
19. Use frames such that page is divided into 3 frames 20% on left to show contents of pages, 60% in center to show body of page, remaining on right to show remarks.
20. Embed Audio and Video into your HTML web page.
21. Create a webpage with HTML describing your department use paragraph and list tags.
22. Apply various colors to suitably distinguish key words , also apply font styling like italics, underline and two other fonts to words you find appropriate , also use header tags.
23. Create links on the words e.g. –Wi-Fi and –LAN| to link them to Wikipedia pages.
24. Insert an image and create a link such that clicking on image takes user to other page.
25. Change the background color of the page; At the bottom create a link to take user to the top of the page.
26. Develop static pages (using only HTML) of an online book store, the pages should resemble: www.amazon.com, the website should consist the following pages, home page, registration and user login, user profile page, books catalog, shopping cart, payment by credit card, order confirmation.
27. Create a web page using Embedded CSS and multimedia
28. Write an HTML page that contains a selection box with a list of 5 countries, when the user selects a country, its capital should be printed next to the list; Add CSS to customize the properties of the font of the capital (color, bold and font size).
29. Wap in html to design a Bio-Data.
30. Wap in html to create a webpage with four frames (Picture, table, list, and hyperlink).
31. Wap in html to show all character elements in html.
32. Wap in html to create a webpage to show the block level elements and text level elements.
33. Wap in html to create a webpage to show various confectionary items using ordered list and unordered list.
34. Wap in html to create a webpage to show different hobbies.
35. Wap in html to show India map.
36. Wap in html to create a web page using style sheet.
37. Wap in html to create a web page to show registration
38. Wap in html to show books in inventory in different tables by using rowspan and colspan.
39. Create a Web Page in HTML to show Admission form in OITM
40. A Web Page in HTML to show your resume using Appropriate Formatting Elements.

41. A Web Page in HTML to show all the Text, Color, Background and Font Elements
42. Write a Program to Create a Nested List.

Textbooks:

1. Jennifer Niederst Robbins, "Learning Web Design", OREILLY 4th Edition

Reference Books:

1. Uttam K Roy, –Web Technologies, Oxford University Press, 1st Edition, 2010.
2. HTML and CSS: Design and Build Websites 1st Edition by Jon Duckett (Author) india price
3. Steven Holzner, –The Complete Reference PHP, Tata McGraw-Hill, 1st Edition, 2007.
4. HTML & CSS: The Complete Reference, Fifth Edition (Complete Reference Series)
5. Deitel and Deitel and Nieto, –Internet and World Wide Web - How to Program, Prentice Hall, 5 th Edition, 2011.

Online Learning Resources:

1. <http://www.scoopworld.in>
2. <http://www.sxecw.edu.in>
3. <http://www.technofest2u.blogspot.com>
4. <http://www.ptutorial.com/php-example/php-upload-image>
5. <http://www.ptutorial.com/php-example/php-change-case>

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO3: Design/Development of Solutions	3.3	3.3.1
CO2	PO 3: Design/Development of Solutions	3.4	3.4.1

Course Code	Communicative English Lab		L	T	P	C
20AHS9902			0	0	3	1.5
Pre-requisite	Basic Mathematics	Semester	I - II			
Course Objectives:						
Course Outcomes (CO):						
<ul style="list-style-type: none"> Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills Apply communication skills through various language learning activities Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension. Evaluate and exhibit acceptable etiquette essential in social and professional settings. Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English. 						
UNIT - I						9 Hrs
<ol style="list-style-type: none"> Phonetics for listening comprehension of various accents Reading comprehension Describing objects/places/persons 						
UNIT - II						9 Hrs
<ol style="list-style-type: none"> JAM Group Discussions Oral Presentations – Power Point Presentations and Poster Presentations 						
UNIT - III						9 Hrs
<ol style="list-style-type: none"> Situational dialogues – Greeting and Introduction Formal letter writing and e-mail writing 						
UNIT - IV						9 Hrs
<ol style="list-style-type: none"> Asking for Information and Giving Directions CV/Resume writing – Cover letter 						
UNIT - V						9 Hrs
<ol style="list-style-type: none"> Vocabulary Building Debates 						
Software Source:						
K-Van Solutions Software						
Textbooks:						
Reference Books:						
Teaching English - British Council						
Online Learning Resources:						

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO10: Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.1.1
CO2	PO10: Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.3	10.3.1
CO3	PO10: Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.2.1
CO4	PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	9.2	9.2.1
CO5	PO10: Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.2.1

Course Code	Applied Physics Lab		L	T	P	C
20ABS9907			0	0	3	1.5
Pre-requisite	Basic Mathematics	Semester	I - II			
Course Objectives:						
Course Outcomes (CO):						
<ul style="list-style-type: none"> Analyze the wave properties of light and the interaction of energy with the matter. Apply electromagnetic wave propagation in different guided media. Asses the electromagnetic wave propagation and its power in different media Analyze the conductivity of semiconductors. Interpret the difference between normal conductor and superconductor and apply the nanomaterials for engineering applications. 						
List of Experiments						
<ol style="list-style-type: none"> Determination of the thickness of the wire using wedge shape method. Determination of the radius of curvature of the lens by Newton's ring method Determination of wavelength by plane diffraction grating method Dispersive power of a diffraction grating Study of the Magnetic field along the axis of a circular coil carrying current. Study the variation of B versus H of the magnetic material (B-H curve) Determination of the numerical aperture of a given optical fiber and angle of acceptance. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect. Determination of the energy gap of a semiconductor Determination of crystallite size using X-Ray diffraction spectra. Determination of Wavelength of LASER using diffraction grating. Determination of particle size using LASER. Determination of the resistivity of semiconductor by Four probe method. Determination of dielectric constant by charging and discharging method. Study the temperature dependence of resistance of a thermister. 						
Textbooks:						
Reference Books:						
<ol style="list-style-type: none"> S. Balasubramanian, M.N.Srinivasan, "A Text book of Practical Physics"-S Chand Publishers, 2017. http://vlab.amrita.edu/index.php-VirtualLabs, Amrita University. 						
Online Learning Resources:						

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 4: Analysis and interpretation of data	4.3	4.3.3
CO: 2	PO 4: Analysis and interpretation of data	4.3	4.3.1
CO: 3	PO 4: Analysis and interpretation of data	4.3	4.3.1
CO: 4	PO 4: Analysis and interpretation of data	4.3	4.3.2
CO: 5	PO 4: Analysis and interpretation of data	4.3	4.3.2

Course Code	Data Structures Lab		L	T	P	C
20AES0504			0	0	3	1.5
Pre-requisite	Basic Mathematics	Semester	I - II			
Course Objectives:						
<ul style="list-style-type: none"> To introduce to the different data structures To elucidate how the data structure selection influences the algorithm complexity To explain the different operations that can be performed on different data structures To introduce to the different search and sorting algorithms. 						
Course Outcomes (CO):						
<ul style="list-style-type: none"> Select the data structure appropriate for solving the problem Implement searching and sorting algorithms Design new data types Illustrate the working of stack and queue Organize the data in the form of files 						
Laboratory Experiments						
<ol style="list-style-type: none"> String operations using array of pointers Searching Algorithms (With the Number of Key Comparisons) Sequential, Binary and Fibonacci Search Algorithms. Sorting Algorithms: Insertion Sort, Selection Sort, Shell Sort, Bubble Sort, Quick Sort, Heap Sort, Merge Sort, and Radix Sort. Using the system clock, compute the time taken for sorting of elements. The time for other operations like I/O etc should not be considered while computing time. Implementation of Singly Linked List, Doubly Linked List, Circular Linked List Stack implementation using arrays Stack implementation using linked lists Queue implementation using arrays. Implement different forms of queue. While implementing you should be able to store elements equal to the size of the queue. No positions should be left blank. Queue implementation using linked lists Creation of binary search tree, performing operations insertion, deletion, and traversal. Breadth first search Depth first search Travelling sales man problem File operations Indexing of a file Reversing the links (not just displaying) of a linked list. Consider a linked list consisting of name of a person and gender as a node. Arrange the linked list using 'Ladies first' principle. You may create new linked lists if necessary. An expression can be represented in three ways: infix, prefix and postfix. All the forms are necessary in different contexts. Write modules to convert from one form to another form. 18. A table can be defined as a collection of rows and columns. Each row and column may have a label. Different values are stored in the cells of the table. The values can be of different data types. Numerical operations like summation, average etc can be performed on rows/columns which contain numerical data. Such operations are to be prevented on data which is not numeric. User may like to insert row/columns in the already existing table. User may like to remove row/column. Create table data type and support different operations on it. 						
Textbooks:						
<ol style="list-style-type: none"> Ellis Horowitz and Sartaj Sahni, "Fundamentals of Data Structures in C", 2nd Edition, Galgotia Book Source, Pvt. Ltd., 2004. Alan L. Tharp, "File Organization and Processing", Wiley and Sons, 1988. 						
Reference Books:						
<ol style="list-style-type: none"> D. Samanta, "Classic Data Structures", 2nd Edition, Prentice-Hall of India, Pvt. Ltd., India, 2012. Peter Bras, "Advanced Data Structures", Cambridge University Press, 2016 Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures A Pseudo code Approach with C", Second Edition, Cengage Learning 2005. 						

Online Learning Resources:

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering Knowledge	1.4	1.4.1
CO2	PO 2: Problem analysis	2.2	2.2.4
CO3	PO1: Engineering Knowledge	1.3	1.3.1
CO4	PO1: Engineering Knowledge	1.4	1.4.1
CO5	PO1: Engineering Knowledge	1.4	1.4.1

Course Code	Environmental Studies		L	T	P	C
20AMC9903			2	0	0	0
Pre-requisite	Basic Mathematics	Semester	I - II			
Course Objectives:						
Course Outcomes (CO):						
<ul style="list-style-type: none"> Students get sufficient information that clarifies modern environmental concepts like equitable use of natural resources, more sustainable life styles etc. Students realize the need to change their approach, so as to perceive our own environmental issues correctly, using practical approach based on observation and self learning. Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it. . Interpretation of different types of environmental pollution problems and designing of new solid waste management techniques usage To get knowledge on various environmental acts and to engage all the students life - long learning of rain water harvesting 						
UNIT - I			9 Hrs			
<p>Multidisciplinary Nature of Environmental Studies: Introduction – Multidisciplinary Nature of Environmental Studies – Definition, Scope and Importance – Need for Public Awareness.</p> <p>Natural Resources: Renewable and non-renewable energy resources – Natural resources and associated problems.</p> <p>Forest resources: Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people.</p> <p>Water resources: Use and over utilization of surface and sub-surface – Floods, drought, conflicts over water, dams – benefits and problems.</p> <p>Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.</p> <p>Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticides problems, water logging, salinity, case studies.</p> <p>Energy resources: Renewable and non-renewable energy resources.</p>						
UNIT - II			9 Hrs			
<p>Ecosystems: Concept of an ecosystem. – Structure and functions of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).</p> <p>Biodiversity And Its Conservation : Introduction- Definition: genetic, species and ecosystem diversity – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man – wildlife conflicts – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.</p>						
UNIT - III			9 Hrs			
<p>Environmental Pollution: Definition, Causes, effects and its control measures of : Air Pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution and Nuclear hazards.</p> <p>Solid Waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone, Tsunami and landslides.</p>						
UNIT - IV			9 Hrs			
<p>Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting and watershed management – Resettlement and rehabilitation of people – Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies– Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Public awareness.</p>						

UNIT – V	9 Hrs
Human Population and the Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.	
Textbooks:	
<ol style="list-style-type: none"> 1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press. 2. Environmental Studies by Kaushik, New Age Publishers. 3. Environmental Studies by Sri Krishna Hitech publishing Pvt. Ltd. 	
Reference Books:	
<ol style="list-style-type: none"> 1. Environmental studies by R.Rajagopalan, Oxford University Press. 2. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications. 3. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited. 4. Environmental studies by A. Ravi Krishnan, G. Sujatha Sri Krishna Hitech publications. 	
Online Learning Resources:	
www.nptel.ac.in	

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO:1	PO1:Apply the knowledge of Basic science	1.2	1.2.1
CO:2	PO1:Apply the knowledge of Basic science	1.2	1.2.1
CO:3	PO1:Apply the knowledge of Basic science	1.2	1.2.1
CO:4	PO1:Apply the knowledge of Basic science	1.2	1.2.1
CO:5	PO1:Apply the knowledge of Basic science	1.2	1.2.1

Course Code	Discrete Mathematical Structures		L	T	P	C
20ABS9914			3	0	0	3
Pre-requisite	Basic Mathematics	Semester	II-I			
Course Objectives:						
Introduce the concepts of mathematical logic and gain knowledge in sets, relations and functions and Solve problems using counting techniques and combinatorics and to introduce generating functions and recurrence relations. Use Graph Theory for solving real world problems.						
Course Outcomes (CO):						
After completion of the course, students will be able to						
<ul style="list-style-type: none"> • Apply mathematical logic to solve problems. • Understand the concepts and perform the operations related to sets, relations and functions. • Gain the conceptual background needed and identify structures of algebraic nature. • Apply basic counting techniques to solve combinatorial problems. • Formulate problems and solve recurrence relations. • Apply Graph Theory in solving computer science problems 						
UNIT – I	Mathematical Logic		9 Hrs			
Introduction, Statements and Notation, Connectives, Well-formed formulas, Tautology, Duality law, Equivalence, Implication, Normal Forms, Functionally complete set of connectives, Inference Theory of Statement Calculus, Predicate Calculus, Inference theory of Predicate Calculus.						
UNIT – II	Set theory		9 Hrs			
Basic Concepts of Set Theory, Relations and Ordering, The Principle of Inclusion- Exclusion, Pigeon hole principle and its application, Functions composition of functions, Inverse Functions, Recursive Functions, Lattices and its properties. Algebraic structures: Algebraic systems-Examples and General Properties, Semi groups and Monoids, groups, sub groups, homomorphism, Isomorphism.						
UNIT – III	Elementary Combinatorics		9 Hrs			
Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multinomial Theorems.						
UNIT – IV	Recurrence Relations		9 Hrs			
Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence relations, Solving Recurrence Relations by Substitution and Generating functions, The Method of Characteristic roots, Solutions of Inhomogeneous Recurrence Relations.						
UNIT – V	Graphs		9 Hrs			
Basic Concepts, Isomorphism and Sub-graphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multigraphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four Color Problem						
Textbooks:						
<ol style="list-style-type: none"> 1. Joe L. Mott, Abraham Kandel and Theodore P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians, 2nd Edition, Pearson Education. 2. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 2002. 						
Reference Books:						
<ol style="list-style-type: none"> 1. Kenneth H. Rosen, Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, McGraw Hill Education (India) Private Limited. 2. Graph Theory with Applications to Engineering and Computer Science by Narsingh Deo. 						
Online Learning Resources:						
http://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf						

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Apply the knowledge of mathematics	1.2	1.2.1
CO2	PO1:Apply the knowledge of mathematics	1.2	1.2.1
CO3	PO1: Apply the knowledge of mathematics	1.2	1.2.2
CO4	PO1: Apply the knowledge of mathematics	1.6	1.6.1
CO5	PO1: Apply the knowledge of mathematics	1.6	1.6.1
CO6	PO1: Apply the knowledge of mathematics	1.6	1.6.1

Course Code	Digital Electronics & Microprocessors		L	T	P	C
20APC0503			3	0	0	3
Pre-requisite	Basic Electronics	Semester	II-I			
Course Objectives:						
<ul style="list-style-type: none"> To understand all the concepts of Logic Gates and Boolean Functions. To learn about Combinational Logic and Sequential Logic Circuits. To design logic circuits using Programmable Logic Devices. To understand basics of 8086 Microprocessor and 8051 Microcontroller. To understand architecture of 8086 Microprocessor and 8051 Microcontroller. To learn Assembly Language Programming of 8086 and 8051. 						
Course Outcomes (CO):						
After Completion of this course, the student will be able to: <ul style="list-style-type: none"> Design any Logic circuit using basic concepts of Boolean algebra. Design any Logic circuit using basic concepts of PLDs. Design and develop any application using 8086 Microprocessor. Design and develop any application using 8051 Microcontroller. 						
UNIT - I	Number Systems & Code Conversion		9 Hrs			
Number Systems & Code conversion, Boolean Algebra & Logic Gates, Truth Tables, Universal Gates, Simplification of Boolean functions, SOP and POS methods – Simplification of Boolean functions using K-maps, Signed and Unsigned Binary Numbers.						
UNIT - II	Combinational Circuits		9 Hrs			
Combinational Logic Circuits: Adders & Subtractors, Multiplexers, Demultiplexers, Encoders, Decoders, Programmable Logic Devices.						
UNIT - III	Sequential Circuits		9 Hrs			
Sequential Logic Circuits: RS, Clocked RS, D, JK, Master Slave JK, T Flip-Flops, Shift Registers, Types of Shift Registers, Counters, Ripple Counter, Synchronous Counters, Asynchronous Counters, Up-Down Counter.						
UNIT - IV	Microprocessors - I		9 Hrs			
8085 microprocessor Review (brief details only), 8086 microprocessor, Functional Diagram, register organization 8086, Flag register of 8086 and its functions, Addressing modes of 8086, Pin diagram of 8086, Minimum mode & Maximum mode operation of 8086, Interrupts in 8086.						
UNIT - V	Microprocessors - II		9 Hrs			
Instruction set of 8086, Assembler directives, Procedures and Macros, Simple programs involving arithmetic, logical, branch instructions, Ascending, Descending and Block move programs, String Manipulation Instructions. Overview of 8051 microcontroller, Architecture, I/O ports and Memory organization, addressing modes and instruction set of 8051(Brief details only), Simple Programs.						
Text Books:						
<ol style="list-style-type: none"> M. Morris Mano, Michael D. Ciletti, Digital Design, Pearson Education, 5th Edition, 2013 Anil K. Maini, Digital Electronics: Principles, Devices and Applications, John Wiley & Sons, Ltd., 2007. N. Senthil Kumar, M. Saravanan, S. Jeevanathan, Microprocessor and Microcontrollers, Oxford Publishers, 2010. Advanced microprocessors and peripherals-A.K Ray and K.M. Bhurchandani, TMH, 2nd edition, 2006. 						
Reference Books:						
<ol style="list-style-type: none"> Thomas L. Floyd, Digital Fundamentals – A Systems Approach, Pearson, 2013. Charles H. Roth, Fundamentals of Logic Design, Cengage Learning, 5th, Edition, 2004. D.V.Hall, Microprocessors and Interfacing. TMGH, 2nd edition, 2006. Kenneth.J.Ayala, The 8051 microcontroller, 3rd edition, Cengage Learning,2010. 						
Online Learning Resources:						
NPTEL, SWAYAM						

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Apply the knowledge of mathematics	1.1	1.1.1
CO2	PO3: Design system components	3.4	3.4.3
CO3	PO2: Analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics	2.2	2.2.3
CO4	PO2: Analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics	2.2	2.2.3

Course Code	Database Management Systems		L	T	P	C
20APC0502			3	0	0	3
Pre-requisite	NIL	Semester	II-I			
Course Objectives:						
This course is designed to: <ul style="list-style-type: none"> • Train in the fundamental concepts of database management systems, database modeling and design, SQL, PL/SQL and system implementation techniques. • Enable students to model ER diagrams for any customized application • Inducting appropriate strategies for optimization of queries. • Provide knowledge on transaction and concurrency techniques 						
Course Outcomes (CO):						
After completion of the course, students will be able to <ul style="list-style-type: none"> • know the fundamentals of Databases • Understand SQL and PL/SQL Concepts • Design a database for a real-world information system • Process and Optimize the query • Working of transaction and concurrency techniques in real time applications 						
UNIT - I	Introduction, Introduction to Relational Model		9Hrs			
Introduction: Database systems applications, Purpose of Database Systems, view of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database users and Administrators, Introduction to Relational Model: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations						
UNIT - II	Introduction to SQL, Advanced SQL		9 Hrs			
Introduction to SQL: Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub-queries, Modification of the Database. Intermediate SQL: Joint Expressions, Views, Transactions, Integrity Constraints, SQL Data types and schemas, Authorization. Advanced SQL: Accessing SQL from a Programming Language, Functions and Procedures, Triggers, Recursive Queries, OLAP, Formal relational query languages.						
UNIT - III	Database Design and the E-R Model, Relational Database Design		9 Hrs			
Database Design and the E-R Model: Overview of the Design Process, The Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Reduction to Relational Schemas, Entity-Relationship Design Issues. Relational Database Design: Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional-Dependency Theory, Algorithms for Decomposition, Decomposition Using Multivalued Dependencies, More Normal Forms.						
UNIT - IV	Query Processing, Query optimization		9 Hrs			
Query Processing: Overview, Measures of Query cost, Selection operation, sorting, Join Operation, other operations, Evaluation of Expressions. Query optimization: Overview, Transformation of Relational Expressions, Estimating statistics of Expression results, Choice of Evaluation Plans, Materialized views, Advanced Topics in Query Optimization.						
UNIT - V	Transaction Management, Concurrency control and Recovery System		10Hrs			
Transaction Management: Transactions: Concept, A Simple Transactional Model, Storage Structures, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Isolation and Atomicity, Transaction Isolation Levels, Implementation of Isolation Levels, Transactions as SQL Statements. Concurrency Control: Lock-based Protocols, Deadlock Handling, Multiple granularity, Timestamp-based Protocols, and Validation-based Protocols. Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with Loss of Nonvolatile Storage, Early Lock Release and Logical Undo Operations.						
Textbooks:						
1. A. Silberschatz, H.F.Korth, S.Sudarshan, "Database System Concepts",6/e, TMH 2019						
Reference Books:						
1. Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA 2. Database Principles Fundamentals of Design Implementation and Management, Carlos Coronel, Steven Morris, Peter Robb, Cengage Learning. 3. Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH						
Online Learning Resources:						

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO 1: Engineering knowledge	1.4	1.4.1
CO2	PO 2: Problem analysis	2.2	2.2.3
CO3	PO 3: Design/Development of Solutions	3.2	3.2.1
CO4	PO 4: Conduct investigations of complex problems	4.2	4.2.1
CO5	PO 2: Problem analysis	2.3	2.3.1

Course Code	Basics of Python Programming			L	T	P	C
20APC0526				3	0	0	3
Pre-requisite	NILL	Semester	II-I				
Course Objectives:							
<ul style="list-style-type: none"> To learn the fundamentals of Python To elucidate problem-solving using a Python programming language To introduce a function-oriented programming paradigm through python To get training in the development of solutions using modular concepts To introduce the programming constructs of python 							
Course Outcomes (CO):							
<ul style="list-style-type: none"> Apply the features of Python language in various real applications. Select appropriate data structure of Python for solving a problem. Design object oriented programs using Python for solving real-world problems. Apply modularity to programs. 							
UNIT - I							9Hrs
Introduction: What is a program, Running python, Arithmetic operators, Value and Types. Variables, Assignments and Statements: Assignment statements, Script mode, Order of operations, string operations, comments. Functions: Function calls, Math functions, Composition, Adding new Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters are local, Stack diagrams, Fruitful Functions and Void Functions, Why Functions.							
UNIT - II							9 Hrs
Case study: The turtle module, Simple Repetition, Encapsulation, Generalization, Interface design, Refactoring, docstring. Conditionals and Recursion: floor division and modulus, Boolean expressions, Logical operators, Conditional execution, Alternative execution, Chained conditionals, Nested conditionals, Recursion, Infinite Recursion, Keyboard input. Fruitful Functions: Return values, Incremental development, Composition, Boolean functions, more recursion, Leap of Faith, Checking types							
UNIT - III							9 Hrs
Iteration: Reassignment, Updating variables, The while statement, Break, Square roots, Algorithms. Strings: A string is a sequence, len, Traversal with a for loop, String slices, Strings are immutable, Searching, Looping and Counting, String methods, The in operator, String comparison. Case Study: Reading word lists, Search, Looping with indices. Lists: List is a sequence, Lists are mutable, Traversing a list, List operations, List slices, List methods, Map filter and reduce, Deleting elements, Lists and Strings, Objects and values, Aliasing, List arguments.							
UNIT - IV							8 Hrs
Dictionaries: A dictionary is a mapping, Dictionary as a collection of counters, Looping and dictionaries, Reverse Lookup, Dictionaries and lists, Memos, Global Variables. Tuples: Tuples are immutable, Tuple Assignment, Tuple as Return values, Variable-length argument tuples, Lists and tuples, Dictionaries and tuples, Sequences of sequences. Files: Persistence, Reading and writing, Format operator, Filename and paths, Catching exceptions, Databases, Pickling, Pipes, Writing modules. Classes and Objects: Programmer-defined types, Attributes, Instances as Return values, Objects are mutable, Copying.							
UNIT - V							10Hrs
Classes and Functions: Time, Pure functions, Modifiers, Prototyping versus Planning Classes and Methods: Object oriented features, Printing objects, The init method, The <code>__str__</code> method, Operator overloading, Type-based Dispatch, Polymorphism, Interface and Implementation Inheritance: Card objects, Class attributes, Comparing cards, decks, Printing the Deck, Add Remove shuffle and sort, Inheritance, Class diagrams, Data encapsulation. The Goodies: Conditional expressions, List comprehensions, Generator expressions, any and all, Sets, Counters, default dict, Named tuples, Gathering keyword Args							
Textbooks:							
1. Allen B. Downey, "Think Python", 2nd edition, SPD/O'Reilly, 2016.							
Reference Books:							
1. Martin C.Brown, "The Complete Reference: Python", McGraw-Hill, 2018.							
2. Kenneth A. Lambert, B.L. Juneja, "Fundamentals of Python", CENGAGE, 2015.							
3. R. Nageswara Rao, "Core Python Programming", 2nd edition, Dreamtech Press, 2019							

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1 Engineering knowledge	1.3	1.3.1
CO2	PO2 Problem analysis	2.1	2.1.2
CO3	PO3 Design/Development of Solutions	3.1	3.1.6
CO4	PO1 Engineering knowledge	1.4	1.4.1

Course Code	Basics of Electrical & Electronics Engineering		L	T	P	C
20AES0205			3	0	0	3
Pre-requisite	NIL	Semester	II-I			
Course Outcomes (CO):						
<ul style="list-style-type: none"> Apply concepts of KVL/KCL in solving DC circuits Illustrate working principles of induction motor - DC Motor Identify type of electrical machine based on their operation Describe operation and characteristics of diodes and transistors. Make use of diodes and transistors in simple, typical circuit applications. Understand operation of basic op-amp circuits. 						
PART-A (Electrical Engineering)						
UNIT - I	DC & AC Circuits		9Hrs			
Electrical circuit elements (R - L and C) - Kirchhoff laws - Series and parallel connection of resistances with DC excitation. Superposition Theorem - Representation of sinusoidal waveforms - peak and rms values - phasor representation - real power - reactive power - apparent power - power factor - Analysis of single-phase ac circuits consisting of RL - RC - RLC series circuits.						
UNIT - II	DC & AC Machines		9 Hrs			
Principle and operation of DC Generator - EMF equations - OCC characteristics of DC generator - principle and operation of DC Motor - Performance Characteristics of DC Motor - Speed control of DC Motor - Principle and operation of Single Phase Transformer - OC and SC test on transformer - principle and operation of Induction Motor [Elementary treatment only]						
UNIT - III	Basics of Power Systems		9 Hrs			
Layout & operation of Hydro, Thermal, Nuclear Stations - Solar & wind generating stations - Typical AC Power Supply scheme - Elements of Transmission line - Types of Distribution systems: Primary & Secondary distribution systems						
Text Books:						
<ol style="list-style-type: none"> D. P. Kothari and I. J. Nagrath - "Basic Electrical Engineering" - Tata McGraw Hill - 2010. V.K. Mehta & Rohit Mehta, "Principles of Power System" - S.Chand - 2018. 						
References:						
<ol style="list-style-type: none"> L. S. Bobrow - "Fundamentals of Electrical Engineering" - Oxford University Press - 2011. E. Hughes - "Electrical and Electronics Technology" - Pearson - 2010. C.L. Wadhwa - "Generation Distribution and Utilization of Electrical Energy", 3rd Edition, New Age International Publications. 						
PART-B (Electronics Engineering)						
UNIT - I	PN JUNCTION DIODE & SPECIAL DIODE CHARACTERISTICS		9 Hrs			
Overview of Semiconductors, PN junction diode, Zener diode, Applications of diode as switch and rectifier, Zener diode as regulator, special purpose diodes: schottky diode, tunnel diode, varactor diode, photodiode, phototransistor and LED.						
UNIT - II	TRANSISTOR CHARACTERISTICS		10Hrs			
BJT construction, operation, configuration and characteristics, JFET and MOSFET construction, operation, characteristics (CS configuration), applications Operational Amplifiers: Introduction, block diagram, basic op-amp circuits: Inverting, Non Inverting, summer, subtractor, voltage follower.						
UNIT - III	COMMUNICATION SYSTEMS					
Introduction, Elements of Communication Systems, EM spectrum, basics of electronic communication, Amplitude and Frequency modulation, Pulse modulation, Communication receivers, Examples of communication systems: Microwave & Satellite, Fibre optic, Television, mobile communication (block diagram approach).						
Textbooks:						
<ol style="list-style-type: none"> D.P. Kothari, I.J.Nagrath, Basic Electronics, 2nd edition, McGraw Hill Education(India)Private Limited S.K. Bhattacharya, Basic Electrical and Electronics Engineering, 2nd edition, Pearson India Private Limited 						
Reference Books:						
<ol style="list-style-type: none"> R. Muthu subramanian, S. Salivahanan, "Basic Electrical and Electronics Engineering", Tata McGraw-Hill Education, Reprint 2012. David Bell, Electronic Devices and Circuits: Oxford University Press, 5th edition. 2008. 						

CO	PO	CI	PI
CO1	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO2	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO3	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO4	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO5	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO6	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1

Course Code	Database Management Systems Laboratory		L	T	P	C												
20APC0505			0	0	3	1.5												
Pre-requisite		Semester	II-I															
Course Objectives:																		
<ul style="list-style-type: none"> To implement the basic knowledge of SQL queries and relational algebra. To construct database models for different database applications. To apply normalization techniques for refining of databases. To practice various triggers, procedures, and cursors using PL/SQL. To design and implementation of a database for an organization 																		
Course Outcomes (CO):																		
After completion of the course, students will be able to <ul style="list-style-type: none"> Design database for any real world problem Implement PL/SQL programs Define SQL queries Decide the constraints Investigate for data inconsistency 																		
List of Experiments:																		
Week-1: CREATION OF TABLES																		
1. Create a table called Employee with the following structure.																		
<table border="1"> <thead> <tr> <th>Name</th> <th>Type</th> </tr> </thead> <tbody> <tr> <td>Empno</td> <td>Number</td> </tr> <tr> <td>Ename</td> <td>Varchar2(20)</td> </tr> <tr> <td>Job</td> <td>Varchar2(20)</td> </tr> <tr> <td>Mgr</td> <td>Number</td> </tr> <tr> <td>Sal</td> <td>Number</td> </tr> </tbody> </table>							Name	Type	Empno	Number	Ename	Varchar2(20)	Job	Varchar2(20)	Mgr	Number	Sal	Number
Name	Type																	
Empno	Number																	
Ename	Varchar2(20)																	
Job	Varchar2(20)																	
Mgr	Number																	
Sal	Number																	
<ul style="list-style-type: none"> Add a column commission with domain to the Employee table. Insert any five records into the table. Update the column details of job Rename the column of Employ table using alter command. Delete the employee whose empno is 19. 																		
2. Create department table with the following structure.																		
<table border="1"> <thead> <tr> <th>Name</th> <th>Type</th> </tr> </thead> <tbody> <tr> <td>Deptno</td> <td>Number</td> </tr> <tr> <td>Deptname</td> <td>Varchar2(20)</td> </tr> <tr> <td>location</td> <td>Varchar2(20)</td> </tr> </tbody> </table>							Name	Type	Deptno	Number	Deptname	Varchar2(20)	location	Varchar2(20)				
Name	Type																	
Deptno	Number																	
Deptname	Varchar2(20)																	
location	Varchar2(20)																	
<ol style="list-style-type: none"> Add column designation to the department table. Insert values into the table. List the records of emp table grouped by deptno. Update the record where deptno is 9. Delete any column data from the table 																		
3. Create a table called Customer table																		
<table border="1"> <thead> <tr> <th>Name</th> <th>Type</th> </tr> </thead> <tbody> <tr> <td>Cust name</td> <td>Varchar2(20)</td> </tr> <tr> <td>Cust street</td> <td>Varchar2(20)</td> </tr> <tr> <td>Cust city</td> <td>Varchar2(20)</td> </tr> </tbody> </table>							Name	Type	Cust name	Varchar2(20)	Cust street	Varchar2(20)	Cust city	Varchar2(20)				
Name	Type																	
Cust name	Varchar2(20)																	
Cust street	Varchar2(20)																	
Cust city	Varchar2(20)																	
<ol style="list-style-type: none"> Insert records into the table. Add salary column to the table. Alter the table column domain. Drop salary column of the customer table. Delete the rows of customer table whose ust_city is 'hyd'. 																		
4. Create a table called branch table.																		
<table border="1"> <thead> <tr> <th>Name</th> <th>Type</th> </tr> </thead> <tbody> <tr> <td>Branch name</td> <td>Varchar2(20)</td> </tr> </tbody> </table>							Name	Type	Branch name	Varchar2(20)								
Name	Type																	
Branch name	Varchar2(20)																	

Branch city	Varchar2(20)
asserts	Number

5. Increase the size of data type for asserts to the branch.
 - a. Add and drop a column to the branch table.
 - b. Insert values to the table.
 - c. Update the branch name column
 - d. Delete any two columns from the table

6. Create a table called sailor table

Name	Type
Sid	Number
Sname	Varchar2(20)
rating	Varchar2(20)

- a. Add column age to the sailor table.
- b. Insert values into the sailor table.
- c. Delete the row with rating>8.
- d. Update the column details of sailor.
- e. Insert null values into the table.

7. Create a table called reserves table

Name	Type
Boat id	Integer
sid	Integer
day	Integer

- a. Insert values into the reserves table.
- b. Add column time to the reserves table.
- c. Alter the column day data type to date.
- d. Drop the column time in the table.
- e. Delete the row of the table with some condition.

Week-2: QUERIES USING DDL AND DML

1.
 - a. Create a user and grant all permissions to the user.
 - b. Insert the any three records in the employee table and use rollback. Check the result.
 - c. Add primary key constraint and not null constraint to the employee table.
 - d. Insert null values to the employee table and verify the result.
2.
 - a. Create a user and grant all permissions to the user.
 - b. Insert the any three records in the employee table and use rollback. Check the result.
 - c. Add primary key constraint and not null constraint to the employee table.
 - d. Insert null values to the employee table and verify the result.
3.
 - a. Create a user and grant all permissions to the user.
 - b. Insert values in the department table and use commit.
 - c. Add constraints like unique and not null to the department table.
 - d. Insert repeated values and null values into the table.
4.
 - a. Create a user and grant all permissions to the user.
 - b. Insert values into the table and use commit.
 - c. Delete any three records in the department table and use rollback.
 - d. Add constraint primary key and foreign key to the table.
5.
 - a. Create a user and grant all permissions to the user.
 - b. Insert records in the sailor table and use commit.
 - c. Add save point after insertion of records and verify save point.
 - d. Add constraints not null and primary key to the sailor table.
 - e. Create a user and grant all permissions to the user.
 - f. Use revoke command to remove user permissions.
 - g. Change password of the user created.
 - h. Add constraint foreign key and not null.
6.
 - a. Create a user and grant all permissions to the user.
 - b. Update the table reserves and use savepoint and rollback.

- c. Add constraint primary key , foreign key and not null to the reserves table
- d. Delete constraint not null to the table column

Week-3:QUERIES USING AGGREGATE FUNCTIONS

1.
 - a. By using the group by clause, display the enames who belongs to deptno 10 along with average salary.
 - b. Display lowest paid employee details under each department.
 - c. Display number of employees working in each department and their department number.
 - d. Using built-in functions, display number of employees working in each department and their department name from dept table. Insert deptname to dept table and insert deptname foreach row, do the required thing specified above.
 - e. List all employees which start with either B or C.
 - f. Display only these ename of employees where the maximum salary is greater than or equal to 5000.
2.
 - a. Calculate the average salary for each different job.
 - b. Show the average salary of each job excluding manager.
 - c. Show the average salary for all departments employing more than three people.
 - d. Display employees who earn more than the lowest salary in department 30
 - e. Show that value returned by sign (n)function.
 - f. How many days between day of birth to current date
3.
 - a. Show that two substring as single string.
 - b. List all employee names, salary and 15% rise in salary.
 - c. Display lowest paid emp details under each manager
 - d. Display the average monthly salary bill for each deptno.
 - e. Show the average salary for all departments employing more than two people.
 - f. By using the group by clause, display the eid who belongs to deptno 05 along with average salary.
4.
 - a. Count the number of employees in department20
- b. Find the minimum salary earned by clerk.**
 - c. Find minimum, maximum, average salary of all employees.
 - d. List the minimum and maximum salaries for each job type.
 - e. List the employee names in descending order.
 - f. List the employee id, names in ascending order by empid.
5.
 - a. Find the sids ,names of sailors who have reserved all boats called“INTERLAKE
Find the age of youngest sailor who is eligible to vote for each rating level with at least twosuch sailors.
 - b. Find the sname, bid and reservation date for each reservation.
 - c. Find the ages of sailors whose name begin and end with B and has at least 3characters.
 - d. List in alphabetic order all sailors who have reserved redboat.
 - e. Find the age of youngest sailor for each rating level.
6.
 - a. List the Vendors who have delivered products within 6 months from order date.
 - b. Display the Vendor details who have supplied both Assembled and Subparts.
 - c. Display the Sub parts by grouping the Vendor type (Local or Nonlocal).
 - d. Display the Vendor details in ascending order.
 - e. Display the Sub part which costs more than any of the Assembled parts.
 - f. Display the second maximum cost Assembled part

Week-4: PROGRAMS ON PL/SQL

1.
 - a. Write a PL/SQL program to swap two numbers.
 - b. Write a PL/SQL program to find the largest of three numbers.
2.
 - a. Write a PL/SQL program to find the total and average of 6 subjects and display the grade.
 - b. Write a PL/SQL program to find the sum of digits in a given number.
3.
 - a. Write a PL/SQL program to display the number in reverse order.
 - b. Write a PL/SQL program to check whether the given number is prime or not.
4.
 - a. Write a PL/SQL program to find the factorial of a given number.
 - b. Write a PL/SQL code block to calculate the area of a circle for a value of radius varying from 3 to 7. Store the radius and the corresponding values of calculated area in an empty table named areas, consisting of two columns radius and area.
5.
 - a. Write a PL/SQL program to accept a string and remove the vowels from the string. (When 'hello' passed to the program it should display 'Hll' removing e and o from the world Hello).

b. Write a PL/SQL program to accept a number and a divisor. Make sure the divisor is less than or equal to 10. Else display an error message. Otherwise Display the remainder in words.

Week-5: PROCEDURES AND FUNCTIONS

1. Write a function to accept employee number as parameter and return Basic +HRA together as single column.
2. Accept year as parameter and write a Function to return the total net salary spent for a given year.
3. Create a function to find the factorial of a given number and hence find NCR.
4. Write a PL/SQL block to print prime Fibonacci series using local functions.
5. Create a procedure to find the lucky number of a given birth date.
6. Create function to the reverse of given number

Week-6: TRIGGERS

1. Create a row level trigger for the customers table that would fire for INSERT or UPDATE or DELETE operations performed on the CUSTOMERS table. This trigger will display the salary difference between the old values and new values:

CUSTOMERS table:

ID	NAME	AGE	ADDRESS	SALARY
1	Alive	24	Khammam	2000
2	Bob	27	Kadappa	3000
3	Catri	25	Guntur	4000
4	Dena	28	Hyderabad	5000
5	Eeshwar	27	Kurnool	6000
6	Farooq	28	Nellore	7000

2. Creation of insert trigger, delete trigger, update trigger practice triggers using the passenger database. Passenger(Passport_ id INTEGER PRIMARY KEY, Name VARCHAR (50) Not NULL, Age Integer Not NULL, Sex Char, Address VARCHAR (50) Not NULL);
 - a. Write a Insert Trigger to check the Passport_id is exactly six digits or not.
 - b. Write a trigger on passenger to display messages '1 Record is inserted', '1 record is deleted', '1 record is updated' when insertion, deletion and updation are done on passenger respectively.
3. Insert row in employee table using Triggers. Every trigger is created with name any trigger have same name must be replaced by new name. These triggers can raised before insert, update or delete rows on data base. The main difference between a trigger and a stored procedure is that the former is attached to a table and is only fired when an INSERT, UPDATE or DELETE occurs.
4. Convert employee name into uppercase whenever an employee record is inserted or updated. Trigger to fire before the insert or update.
5. Trigger before deleting a record from emp table. Trigger will insert the row to be deleted into table called delete _emp and also record user who has deleted the record and date and time of delete.
6. Create a transparent audit system for a table CUST_MSTR. The system must keep track of the records that are being deleted or updated

Week-7: PROCEDURES

1. Create the procedure for palindrome of given number.
2. Create the procedure for GCD: Program should load two registers with two Numbers and then apply the logic for GCD of two numbers. GCD of two numbers is performed by dividing the greater number by the smaller number till the remainder is zero. If it is zero, the divisor is the GCD if not the remainder and the divisors of the previous division are the new set of two numbers. The process is repeated by dividing greater of the two numbers by the smaller number till the remainder is zero and GCD is found.
3. Write the PL/SQL programs to create the procedure for factorial of given number.
4. Write the PL/SQL programs to create the procedure to find sum of N natural number.
5. Write the PL/SQL programs to create the procedure to find Fibonacci series.
6. Write the PL/SQL programs to create the procedure to check the given number is perfect or not

Week-8: CURSORS

1. Write a PL/SQL block that will display the name, dept no, salary of first highest paid employees. Update the balance stock in the item master table each time a transaction takes place in the item transaction table. The change in item master table depends on the item id is already present in the item master then update operation is performed to decrease the balance stock by the quantity specified in the item transaction in case the item id is not present in the item master table then the record is inserted in the item master table.

3. Write a PL/SQL block that will display the employee details along with salary using cursors.
4. To write a Cursor to display the list of employees who are working as a Managers or Analyst.
5. To write a Cursor to find employee with given job and deptno.
6. Write a PL/SQL block using implicit cursor that will display message, the salaries of all the employees in the 'employee' table are updated. If none of the employee's salary is updated we get a message 'None of the salaries were updated'. Else we get a message like for example, 'Salaries for 1000 employees are updated' if there are 1000 rows in 'employee' table

Week-9: CASE STUDY: BOOK PUBLISHING COMPANY

A publishing company produces scientific books on various subjects. The books are written by authors who specialize in one particular subject. The company employs editors who, not necessarily being specialists in a particular area, each take sole responsibility for editing one or more publications.

A publication covers essentially one of the specialist subjects and is normally written by a single author. When writing a particular book, each author works with an editor, but may submit another work for publication to be supervised by other editors. To improve their competitiveness, the company tries to employ a variety of authors, more than one author being a specialist in a particular subject for the above case study, do the following:

1. Analyze the data required.
2. Normalize the attributes.

Create the logical data model using E-R diagrams

Week-10: CASE STUDY GENERAL HOSPITAL

A General Hospital consists of a number of specialized wards (such as Maternity, Pediatric, Oncology, etc.). Each ward hosts a number of patients, who were admitted on the recommendation of their own GP and confirmed by a consultant employed by the Hospital. On admission, the personal details of every patient are recorded. A separate register is to be held to store the information of the tests undertaken and the results of a prescribed treatment. A number of tests may be conducted for each patient. Each patient is assigned to one leading consultant but may be examined by another doctor, if required. Doctors are specialists in some branch of medicine and may be leading consultants for a number of patients, not necessarily from the same ward. For the above case study, do the following.

1. Analyze the data required.
2. Normalize the attributes.

Create the logical data model using E-R diagrams

Week-11: CASE STUDY: CAR RENTAL COMPANY

A database is to be designed for a car rental company. The information required includes a description of cars, subcontractors (i.e. garages), company expenditures, company revenues and customers. Cars are to be described by such data as: make, model, year of production, engine size, fuel type, number of passengers, registration number, purchase price, purchase date, rent price and insurance details. It is the company policy not to keep any car for a period exceeding one year. All major repairs and maintenance are done by subcontractors (i.e. franchised garages), with whom CRC has long-term agreements. Therefore the data about garages to be kept in the database includes garage names, addresses, range of services and the like. Some garages require payments immediately after a repair has been made; with others CRC has made arrangements for credit facilities.

Company expenditures are to be registered for all outgoings connected with purchases, repairs, maintenance, insurance etc. Similarly the cash inflow coming from all sources: Car hire, car sales, insurance claims must be kept of file. CRC maintains a reasonably stable client base. For this privileged category of customers special credit card facilities are provided. These customers may also book in advance a particular car. These reservations can be made for any period of time up to one month. Casual customers must pay a deposit for an estimated time of rental, unless they wish to pay by credit card. All major credit cards are accepted. Personal details such as name, address, telephone number, driving license, number about each customer are kept in the database. For the above case study, do the following:

1. Analyze the data required.
2. Normalize the attributes.

Create the logical data model using E-R diagrams

Week-12: CASE STUDY: STUDENT PROGRESS MONITORING SYSTEM

A database is to be designed for a college to monitor students' progress throughout their course of study. The students are reading for a degree (such as BA, BA (Hons.) M.Sc., etc) within the framework of the modular system. The college provides a number of modules, each being characterized by its code, title, credit value, module leader, teaching staff and the department they come from. A module is coordinated by a module leader who shares teaching duties with one or more lecturers. A lecturer may teach (and be a module leader for) more than one module. Students are free to choose any module they wish but the following rules must be observed: Some modules require pre-requisites modules and some degree programs have compulsory modules. The

database is also to contain some information about students including their numbers, names, addresses, degrees they read for, and their past performance i.e. modules taken and examination results.

For the above case study, do the following:

1. Analyze the data required.
2. Normalize the attributes.
3. Create the logical data model i.e., ER diagrams.
4. Comprehend the data given in the case study by creating respective tables with primary keys and foreign keys wherever required.
5. Insert values into the tables created (Be vigilant about Master- Slave tables).
6. Display the Students who have taken M.Sc course
7. Display the Module code and Number of Modules taught by each Lecturer.
8. Retrieve the Lecturer names who are not Module Leaders.
9. Display the Department name which offers 'English' module.
10. Retrieve the Prerequisite Courses offered by every Department (with Department names).
11. Present the Lecturer ID and Name who teaches 'Mathematics'.
12. Discover the number of years a Module is taught.
13. List out all the Faculties who work for 'Statistics' Department.
14. List out the number of Modules taught by each Module Leader.
15. List out the number of Modules taught by a particular Lecturer.
16. Create a view which contains the fields of both Department and Module tables. (Hint- The fields like Module code, title, credit, Department code and its name).

Update the credits of all the prerequisite courses to 5. Delete the Module 'History' from the Module table.

References:

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

Online Learning Resources/Virtual Labs:

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

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO 3: Design/Development of Solutions	3.2	3.2.2
CO2	PO 3: Design/Development of Solutions	3.2	3.2.1
CO3	PO 3: Design/Development of Solutions	3.2	3.2.1
CO4	PO 3: Design/Development of Solutions	3.2	3.2.2
CO5	PO 4: Conduct investigations of complex problems	4.1	4.1.2

should not use string related Python built-in functions.

12. Given a text of characters, Write a program which counts number of vowels, consonants and special characters.
13. Given a word which is a string of characters. Given an integer say 'n', Rotate each character by 'n' positions and print it. Note that 'n' can be positive or negative.
14. Given rows of text, write it in the form of columns.
15. Given a page of text. Count the number of occurrences of each letter (Assume case insensitivity and don't consider special characters). Draw a histogram to represent the same
16. Write program which performs the following operations on list's. Don't use built-in functions
 - a) Updating elements of a list
 - b) Concatenation of list's
 - c) Check for member in the list
 - d) Insert into the list
 - e) Sum the elements of the list
 - f) Push and pop element of list
 - g) Sorting of list
 - h) Finding biggest and smallest elements in the list
 - i) Finding common elements in the list
17. Write a program to count the number of vowels in a word.
18. Write a program that reads a file, breaks each line into words, strips whitespace and punctuation from the words, and converts them to lowercase.
19. Go to Project Gutenberg (<http://gutenberg.org>) and download your favorite out-of-copyright book in plain text format. Read the book you downloaded, skip over the header information at the beginning of the file, and process the rest of the words as before. Then modify the program to count the total number of words in the book, and the number of times each word is used. Print the number of different words used in the book. Compare different books by different authors, written in different eras.
20. Go to Project Gutenberg (<http://gutenberg.org>) and download your favorite out-of-copyright book in plain text format. Write a program that allows you to replace words, insert words and delete words from the file.
21. Consider all the files on your PC. Write a program which checks for duplicate files in your PC and displays their location. Hint: If two files have the same checksum, they probably have the same contents.
22. Consider turtle object. Write functions to draw triangle, rectangle, polygon, circle and sphere. Use object oriented approach.
23. Write a program illustrating the object oriented features supported by Python.
24. Design a Python script using the Turtle graphics library to construct a turtle bar chart representing the grades obtained by N students read from a file categorizing them into distinction, first class, second class, third class and failed.
25. Design a Python script to determine the difference in date for given two dates in YYYY:MM:DD format(0 <= YYYY <= 9999, 1 <= MM <= 12, 1 <= DD <= 31) following the leap year rules.
26. Design a Python Script to determine the time difference between two given times in HH:MM:SS format.(0 <= HH <= 23, 0 <= MM <= 59, 0 <= SS <= 59)

References:

1. Allen B. Downey , “ Think Python: How to Think Like a Computer Scientist”, Second Edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016.
2. Shroff “Learning Python: Powerful Object-Oriented Programming; Fifth edition, 2013.
3. David M.Baezly “Python Essential Reference”. Addison-Wesley Professional; Fourth edition, 2009.
4. David M. Baezly “Python Cookbook” O'Reilly Media; Third edition (June 1, 2013)

Online Learning Resources/Virtual Labs:

<http://www.edx.org>

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1:Engineering Knowledge	1.4	1.4.1
CO2	PO2: Problem Analysis	2.2	2.2.4
CO3	PO1:Engineering Knowledge	1.3	1.3.1
CO4	PO1:Engineering Knowledge	1.4	1.4.1

Course Code	Basics of Electrical & Electronics Engineering Lab		L	T	P	C
20AES0206			0	0	3	1.5
Pre-requisite	NIL	Semester	II-I			
Course Outcomes (CO):						
<ul style="list-style-type: none"> Verify Kirchoff's Laws & Superposition theorem for dc supply Analyze the performance of AC and DC Machines by testing. Study I – V Characteristics of PV Cell & Perform speed control of dc shunt motor Ability to operate diodes for finding V-I Characteristics. Ability to construct and operate rectifiers without & with filters Ability to construct and operate BJT & FET Characteristics. 						
List of Experiments:						
Part A: Electrical Engineering Lab						
<ol style="list-style-type: none"> Verification of Kirchoff laws. Verification of Superposition Theorem. Open circuit characteristics of a DC Shunt Generator. Speed control of DC Shunt Motor. OC & SC test of 1 – Phase Transformer. Brake test on 3 - Phase Induction Motor. I – V Characteristics of Solar PV cell Brake test on DC Shunt Motor. 						
Part B: Electronics Engineering Lab						
<ol style="list-style-type: none"> Draw and study the characteristics of semi-conductor diode Draw and study the characteristics of Zener diode Construct half wave rectifier without filter and with filter and also find the ripple factor and plot the output waveforms. Construct full wave rectifier without filter and with filter and also find the ripple factor and plot the output waveforms. Draw and study the input and output characteristics of transistor in common emitter configuration Draw and study the static and transfer characteristics of FET in common source configuration Study of op-amp as an inverting amplifier, non-inverting amplifier, voltage follower, summer and subtractor. Conduct an experiment on am modulation & de-modulation; plot the corresponding modulated and demodulated signals. Conduct an experiment on fm modulation & demodulation, plot the corresponding modulated and demodulated signals. 						

CO	PO	CI	PI
CO1	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO2	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO3	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO4	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO5	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO6	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1

Course Code	Client Side Scripting		L	T	P	C
20ASC0501			1	0	2	2
Pre-requisite	HTML	Semester	II-I			
Course Objectives:						
<ul style="list-style-type: none"> To provide knowledge on basic concepts of web Programming To design Web Pages and form validation using java scripting. To learn the important concepts like CSS, DOM, DNS,AJAX and XML. To Demonstrate the functions of html in web communication. To quickly be able to understand the different parts of a web page 						
Course Outcomes (CO):						
<ul style="list-style-type: none"> Analyze and understand the basic concepts of web programming. Apply techniques of form validation using Java Script. Describe important concepts related to client side Web Security. Demonstrate the function of Hypertext Markup Language (HTML) in Web communications. Develop the function of JavaScript as a dynamic webpage creating tool 						
UNIT - I	Basics of JavaScript Programming		3+6 Hrs			
<p>Features of JavaScript, Object Name, Property, Method, Dot Syntax, Main Event, Values and Variables, Operators and Expressions – Primary Expressions, Object and Array Initializers, Function Definition Expression, Property Access Expressions, Invocation Expressions, If Statement, if...else, if...elseif, Nested if Statement, Switch... Case Statement, Loop Statement – for Loop, for...in Loop, while Loop, do...while Loop, continue Statement, Querying and Setting Properties and Deleting Properties, Property Getters and Setters.</p> <ul style="list-style-type: none"> WAP to print hello world WAP to use comments in JavaScript. WAP to add a noscript block. Write a Script in <head>...</head> section. Write a Script in <body>...</body> section. Write a Script in <body>...</body> and <head>...</head> sections. Write a Script using arithmetic, Comparison, Logical, Bitwise, and Assignment operators Write code to understand how the Conditional Operator and typeof operator works in JavaScript. Write code to understand the working of if statement, if...else statement, and if...else if... statement. Implement switch-case statement. Implement while loop, do-while and for loop in JavaScript. WAP to print the web browser's Navigator object using for loop. WAP To implement break, continue and label in JavaScript. Write code to call the function that displays the text message on clicking a button. 						
UNIT - II	Array, Function and String		3+6 Hrs			
<p>Array – Declaring an Array, Initializing an Array, Defining an Array Elements, Looping an Array, Adding an Array Element, Sorting an Array Element, Combining an Array Elements into a String, Changing Elements of an Array, Objects as Associative Arrays, Function – Defining a Function, Writing a Function, Adding an Arguments, Scope of Variable and Arguments, Calling a Function – Calling a Function With or Without an Argument, Calling Function from HTML, Function Calling another Function, Returning the Value from a Function, String – Manipulate a String, Joining a String, Retrieving a Character from given Position, Retrieving a Position of Character in a String, Dividing Text, Copying a Sub-string, Converting String to Number and Numbers to String, Changing the Case of String, Finding a Unicode of a Character – charCodeAt(), fromCharCode().</p> <ul style="list-style-type: none"> Write code to call the function that displays the text message on clicking a button. WAP to call a function that takes two parameters, name and age. Print the same. Define a function that takes two parameters and concatenates them before returning the resultant in the calling program. 						
UNIT - III	Form and Event Handling		3+6 Hrs			
<p>Building Blocks of a Form, Properties and Methods of Form, Button, Text, Text Area, Checkbox, Radio Button, Select Element, Form Events – Mouse Event, Key Events, Form Objects and Elements, Changing Attribute Value Dynamically, Changing Option List Dynamically, Evaluating Checkbox Selection, Changing a Label Dynamically, Manipulating Form Elements, Intrinsic JavaScript Functions, Disabling Elements, Read Only Elements.</p> <ul style="list-style-type: none"> Write code to implement the following events – onclick, onsubmit, onmouseover and onmouseout. Design a Registration form (include email id and password) and perform validation to all its fields. 						
UNIT - IV	Objects		3+6 Hrs			
<p>Window Object, Math, Number, and Date Objects, Handling Strings Using Regular Expressions. Implement Number, Date, Math, Boolean, Strings, Arrays, RegEx, and HTML DOM objects with all its properties</p>						

and methods.		
UNIT - V	Cookies and Browser Data	3+6 Hrs
<p>Cookies – Basic of Cookies, Reading a Cookie Value, Writing a Cookie Value, Creating a Cookies, Deleting a Cookies, Setting the Expiration Date of Cookie, Browser – Opening a Window, Giving the New Window Focus, Window Position, Changing the Content of Window, Closing a Window, Scrolling a Web Page, Multiple Windows at Once, Creating a Web Page in New Window, JavaScript in URLs, JavaScript Security, Timers, Browser Location and History.</p> <ul style="list-style-type: none"> • Set a customer name in an input cookie. • WAP to get all the cookies. • Extend the expiry date of a cookie by 1 Month. • Delete a cookie by setting its expiry date to one month behind the current date. • Do a page redirect using JavaScript at client side. • Show an appropriate message to your site visitors before redirecting them to a new page. WAP with a time delay to load a new page. • Redirect your site visitors onto a different page based on their browsers. • Use an alert box to give a warning message. • Implement a confirmation dialog box to take user's consent on any option. • Use a prompt dialog box. • Use of void is to purposely generate the undefined value. • Demonstrates how to create an Object. • Create an object with a User-Defined Function. • Write code to add a function along with an object. • Demonstrate with keyword in JavaScript. 		
Textbooks:		
<ol style="list-style-type: none"> 1. Javascript Beginners Guide, John Pollock, TMH, 4th Edition 2. JavaScript. Demystified, JIM KEOGH , McGraw-Hill. 		
Reference Books:		
<ol style="list-style-type: none"> 1. JavaScript™ For Dummies,® 4th Edition, by Emily Vander Veer, Published by Wiley Publishing, Inc © 2005. 2. JavaScript for impatient programmers (beta), by Dr. Axel Rauschmayer © 2019. 3. Javascript: Beginners Guide on Javascript Programming, by Nick Goddard © 2016. 		
Online Learning Resources:		
W3Schools, https://www.tutorialspoint.com/javascript/index.htm , nptel Videos		

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO2:Problem Analysis	2.4	2.4.3
CO2	PO1:Engineering Knowledge	1.4	1.4.1
CO3	PO1:Engineering Knowledge	1.4	1.4.1
CO4	PO5:Modern tool Usage	5.2	5.2.2
CO5	PO3:Design/Development	3.1	3.1.6

Course Code	Constitution Of India (Common to : CSE, CIC, AIM, AID)			L	T	P	C
20AMC9902				2	0	0	0
Pre-requisite	NIL	Semester	II-I				
Course Outcomes (CO):							
Students will be able to:							
<ul style="list-style-type: none"> Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution. Discuss the Powers and functions of Governor, President, Judiciary. Discuss the functions of local administration bodies 							
UNIT - I				8Hrs			
History of Making of the Indian Constitution - History Drafting Committee, (Composition & Working).							
UNIT - II				9Hrs			
Philosophy of the Indian Constitution - Preamble Salient Features							
UNIT - III				8Hrs			
Contours of Constitutional Rights & Duties - Fundamental Rights - Right to Equality- Right to Freedom - Right against Exploitation - Right to Freedom of Religion - Cultural and Educational Rights - Right to Constitutional Remedies - Directive Principles of State Policy - Fundamental Duties.							
UNIT - IV				8Hrs			
Organs of Governance - Parliament - Composition - Qualifications and Disqualifications - Powers and Functions - Executive - President - Governor - Council of Ministers - Judiciary, Appointment and Transfer of Judges, Qualifications - Powers and Functions							
UNIT - V				9 Hrs			
Local Administration - District's Administration head: Role and Importance - Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation- Pachayati raj: Introduction, PRI: ZillaPachayat - Elected officials and their roles, CEO Zilla Panchayat: Position and role - Block level: Organizational Hierarchy (Different departments) - Village level: Role of Elected and Appointed officials - Importance of grass root democracy.							
Textbooks:							
<ol style="list-style-type: none"> The Constitution of India, 1950 (Bare Act), Government Publication. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015. 							

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO 6: The engineer and society	6.2	6.2.1
CO2	PO 6: The engineer and society	6.2	6.2.1
CO3	PO 6: The engineer and society	6.2	6.2.1
CO4	PO 6: The engineer and society	6.2	6.2.1
CO5	PO 6: The engineer and society	6.2	6.1.1

Course Code	Computer Organization		L	T	P	C
20APC0506			3	0	0	3
Pre-requisite	Digital Electronics	Semester	II-II			
Course Objectives:						
<ul style="list-style-type: none"> To learn the fundamentals of computer organization and its relevance to classical and modern problems of computer design To understand the structure and behavior of various functional modules of a computer. To learn the techniques that computers use to communicate with I/O devices To acquire the concept of pipelining and exploitation of processing speed. To learn the basic characteristics of multiprocessors 						
Course Outcomes (CO):						
After completion of the course, students will be able to						
<ul style="list-style-type: none"> Understand computer architecture concepts related to the design of modern processors, memories and I/Os Identify the hardware requirements for cache memory and virtual memory Design algorithms to exploit pipelining and multiprocessors Understand the importance and trade-offs of different types of memories. Identify pipeline hazards and possible solutions to those hazards 						
UNIT - I	Basic Structure of Computer, Machine Instructions and Programs		9 Hrs			
Basic Structure of Computer: Computer Types, Functional Units, Basic operational Concepts, Bus Structure, Software, Performance, Multiprocessors and Multicomputer. Machine Instructions and Programs: Numbers, Arithmetic Operations and Programs, Instructions and Instruction Sequencing, Addressing Modes, Basic Input/output Operations, Stacks and Queues, Subroutines, Additional Instructions.						
UNIT - II	Arithmetic, Basic Processing Unit		9Hrs			
Arithmetic: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations. Basic Processing Unit: Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control, and Multi programmed Control.						
UNIT - III	The Memory System		9 Hrs			
The Memory System: Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage.						
UNIT - IV	Input/Output Organization		9 Hrs			
Input/Output Organization: Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces.						
UNIT - V	Pipelining, Large Computer Systems		9 Hrs			
Pipelining: Basic Concepts, Data Hazards, Instruction Hazards, Influence on Instruction Sets. Large Computer Systems: Forms of Parallel Processing, Array Processors, The Structure of General- Purpose multiprocessors, Interconnection Networks.						
Textbooks:						
1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, "Computer Organization", 5th Edition, McGraw Hill Education, 2013.						
Reference Books:						
<ol style="list-style-type: none"> M. Morris Mano, "Computer System Architecture", 3rd Edition, Pearson Education. Themes and Variations, Alan Clements, "Computer Organization and Architecture", CENGAGE Learning. Smruti Ranjan Sarangi, "Computer Organization and Architecture", McGraw Hill Education. John P. Hayes, "Computer Architecture and Organization", McGraw Hill Education 						
Online Learning Resources:						
https://nptel.ac.in/courses/106/103/106103068/						

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering fundamentals	1.4	1.4.1
CO2	PO3: Design solutions for complex engineering problems	3.4	3.4.1
CO3	PO3: Design solutions for complex engineering problems	3.4	3.4.1
CO4	PO1: Engineering fundamentals	1.4	1.4.1
CO5	PO3: Design solutions for complex engineering problems	3.4	3.4.1

Course Code	Design And Analysis Of Algorithms			L	T	P	C
20APC0511				3	0	0	3
Pre-requisite	NIL	Semester	II-II				
Course Objectives:							
<ul style="list-style-type: none"> To know the importance of the complexity of a given algorithm. To study various algorithm design techniques. To utilize data structures and/or algorithmic design techniques in solving new problems. To know and understand basic computability concepts and the complexity classes P, NP, and NP-Complete. To study some techniques for solving hard problems. 							
Course Outcomes (CO):							
<ul style="list-style-type: none"> Analyze the complexity of the algorithms Use techniques divide and conquer, greedy, dynamic programming, backtracking, branch and bound to solve the problems. Identify and analyze criteria and specifications appropriate to new problems, and choose the appropriate algorithmic design technique for their solution. Able to prove that a certain problem is NP-Complete 							
UNIT - I				9Hrs			
Introduction: What is an Algorithm, Algorithm specification, Performance analysis. Divide and Conquer: General method, Binary Search, Finding the maximum and minimum, Merge sort, Quick Sort, Selection sort, Strassen's matrix multiplication.							
UNIT - II				9 Hrs			
Greedy Method: General method, Knapsack problem, Job Scheduling with Deadlines, Minimum cost Spanning Trees, Optimal storage on tapes, Single-source shortest paths. Dynamic programming: General Method, Multistage graphs, All-pairs shortest paths, Optimal binary search trees, 0/1 knapsack, The traveling sales person problem.							
UNIT - III				9 Hrs			
Basic Traversal and Search Techniques: Techniques for binary trees, Techniques for Graphs, Connected components and Spanning trees, Bi-connected components and DFS Back tracking: General Method, 8 – queens problem, Sum of subsets problem, Graph coloring and Hamiltonian cycles, Knapsack Problem.							
UNIT - IV				8 Hrs			
Branch and Bound: The method, Travelling salesperson, 0/1 Knapsack problem, Efficiency Considerations. Lower Bound Theory: Comparison trees, Lower bounds through reductions – Multiplying triangular matrices, inverting a lower triangular matrix, computing the transitive closure.							
UNIT - V				10Hrs			
NP – Hard and NP – Complete Problems: NP Hardness, NP Completeness, Consequences of being in P, Cook's Theorem, Reduction Source Problems, Reductions: Reductions for some known problems							
Textbooks:							
<ol style="list-style-type: none"> "Fundamentals of Computer Algorithms", Ellis Horowitz, S. Satraj Sahani and Rajasekhran, 2nd edition, University Press.2014, "Design and Analysis of Algorithms", Parag Himanshu Dave, Himanshu Bhalchandra Dave, Pearson Education, Second Edition, 2009. 							
Reference Books:							
<ol style="list-style-type: none"> "Introduction to Algorithms", second edition, T.H.Cormen, C.E.Leiserson, R.L.Rivest and C.Stein, PHI Pvt. Ltd./ Pearson Education. "Introduction to Design and Analysis of Algorithms A strategic approach", R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, Mc Graw Hill. "Design and Analysis of algorithms", Aho, Ullman and Hopcroft, Pearson education. 							
Online Learning Resources:							
nptel videos							

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO 3: Design/Development of Solutions	3.1	3.1.1
CO2	PO 3: Design/Development of Solutions	3.2	3.2.1
CO3	PO 4: Conduct investigations of complex problems	4.1	4.1.2
CO4	PO 4: Conduct investigations of complex problems	4.1	4.1.4

Course Code	Operating Systems		L	T	P	C
20APC0515			3	0	0	3
Pre-requisite	Basics of CO and DBMS	Semester	II-II			
Course Objectives:						
<p>The course is designed to</p> <ul style="list-style-type: none"> • Understand basic concepts and functions of operating systems • Understand the processes, threads and scheduling algorithms. • Provide good insight on various memory management techniques • Expose the students with different techniques of handling deadlocks • Explore the concept of file-system and its implementation issues • Familiarize with the basics of the Linux operating system • Implement various schemes for achieving system protection and security 						
Course Outcomes (CO):						
<p>After completion of the course, students will be able to</p> <ul style="list-style-type: none"> • Distinguish between the different types of operating system environments. • Apply the concepts of process synchronization & CPU scheduling • Develop solutions to deadlock and memory management • Analyze various disk scheduling algorithms and file system interfaces • Analyze the various security issues and goals of protection 						
UNIT - I						9 Hrs
<p>Operating Systems Overview: Operating system functions, Operating system structure, operating systems Operations, protection and security, Computing Environments, Open- Source Operating Systems</p> <p>System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, operating system structure, operating system debugging, System Boot.</p> <p>Processes: Process concept, process Scheduling, Operations on processes, Inter process Communication, Examples of IPC systems.</p>						
UNIT - II						10Hrs
<p>Threads: overview, Multi-core Programming, Multithreading Models, Thread Libraries, Implicit Threading, Threading Issues.</p> <p>Process Synchronization: The critical-section problem, Peterson’s Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic problems of synchronization, Monitors, Synchronization examples, Alternative approaches.</p> <p>CPU Scheduling: Scheduling-Criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling, Real-Time CPU Scheduling, Algorithm Evaluation.</p>						
UNIT - III						8Hrs
<p>Memory Management: Swapping, contiguous memory allocation, segmentation, paging, structure of the page table.</p> <p>Virtual memory: demand paging, page-replacement, Allocation of frames, Thrashing, Memory-Mapped Files, Allocating Kernel Memory</p> <p>Deadlocks: System Model, deadlock characterization, Methods of handling Deadlocks, Deadlock prevention, Detection and Avoidance, Recovery from deadlock.</p>						
UNIT - IV						9Hrs
<p>Mass-storage structure: Overview of Mass-storage structure, Disk structure, Disk attachment, Disk scheduling, Swap-space management, RAID structure, Stable-storage implementation.</p> <p>File system Interface: The concept of a file, Access Methods, Directory and Disk structure, File system mounting, File sharing, Protection.</p> <p>File system Implementation: File-system structure, File-system Implementation, Directory Implementation, Allocation Methods, Free-Space management.</p>						
UNIT - V						8Hrs
<p>I/O systems: I/O Hardware, Application I/O interface, Kernel I/O subsystem, Transforming I/O requests to Hardware operations.</p> <p>Protection: Goals of Protection, Principles of Protection, Domain of protection, Access Matrix, Implementation of Access Matrix, Access control, Revocation of Access Rights, Capability- Based systems, Language – Based Protection</p> <p>Security: The Security problem, Program threats, System and Network threats, Cryptography as a security tool, User authentication, Implementing security defenses, Firewalling to protect systems and networks, Computer–security classifications.</p>						
Textbooks:						

1. Operating System Concepts, Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Wiley, Eight Edition, 2018

Reference Books:

1. Operating systems by A K Sharma, Universities Press,
2. Operating Systems, S.Haldar, A.A.Aravind, Pearson Education.
3. Operating Systems, A.S.Godbole, Second Edition, TMH.
4. An Introduction to Operating Systems, P.C.P. Bhatt, PHI.
5. Operating Systems, G.Nutt, N.Chaki and S.Neogy, Third Edition, Pearson Education.
6. Operating Systems, R.Elmasri, A.G.Carrick and D.Levine, Mc Graw Hill.
7. Principles of Operating Systems, B.L.Stuart, Cengage learning, India Edition.
8. Operating System Desgin, Douglas Comer, CRC Press, 2nd Edition.
9. Modern Operating Systems, Andrew S Tanenbaum, Second Edition, PHI.

Online Learning Resources:

<https://nptel.ac.in/courses/106/106/106106144/> <http://peterindia.net/OperatingSystems.html>

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO3. Design/development of solutions	3.1 & 3.3	3.1.6 & 3.3.1
CO2	PO3. Design/development of solutions	3.1	3.1.6
CO3	PO2. Problem Analysis	2.2	2.2.1 & 2.1.3
CO4	PO5. Modern tool usage	5.1	5.1.1
CO5	PO2. Problem Analysis	2.1, 2.2	2.1.3 & 2.2.1

Course Code	Managerial Economics And Financial Analysis (Common to : CSE, CIC, AIM, AID)		L	T	P	C
20AHSMBO1			3	0	0	3
Pre-requisite	NIL	Semester	II-II			
Course Outcomes (CO):						
After completion of this course, the student will able, <ul style="list-style-type: none"> Understand the fundamentals of Economics and Managerial economics viz., Demand, Production, cost, revenue and markets. Apply the Concept of Production cost and revenues for effective Business decision Analyze how to invest their capital and maximize returns. Evaluate the capital budgeting techniques. Define the concepts related to financial accounting and management and able to develop the Accounting statements and evaluate the financial performance of business entity. 						
UNIT - I	Managerial Economics		8Hrs			
Introduction – meaning, nature, significance, functions, and advantages, ME and its role in other fields. Demand - Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing forecasting, Methods.						
UNIT - II	Production and Cost Analysis		10Hrs			
Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least-cost combination– Short run and Long run Production Function- Isoquants and Isocosts, MRTS - Cobb-Douglas Production Function - Laws of Returns - Internal and External Economies of scale. Cost& Break-Even Analysis - Cost concepts and Cost behavior- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems)-Managerial significance and limitations of Break-Even Analysis.						
UNIT - III	Business Organizations and Markets		8Hrs			
Introduction – Nature, meaning, significance, functions and advantages. Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition–Oligopoly-Price-Output Determination - Pricing Methods and Strategies.						
UNIT - IV	Capital Budgeting		9Hrs			
Introduction to Capital, Sources of Capital. Short-term and Long-term Capital : Working capital, types, Estimating Working capital requirements. Capital Budgeting – Features, Proposals, Time value of money. Methods and Evaluation of Projects – Pay Back Method, Accounting Rate of Return (ARR), Net Present Value (NPV), and Internal Rate Return (IRR) Method (simple problems).						
UNIT - V	Financial Accounting and Analysis		8Hrs			
Introduction – Nature, meaning, significance, functions and advantages. Concepts and Conventions- Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profitand Loss Account and Balance Sheet with simple adjustments). Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.						
Textbooks:						
<ol style="list-style-type: none"> Varshney&Maheswari: Managerial Economics, Sultan Chand, 2013. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019 						
Reference Books:						
<ol style="list-style-type: none"> Ahuja HI Managerial economics Schand,3/e,2013 S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2013. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage, 2013. 						
Online Learning Resources:						
https://www.slideshare.net/123ps/managerial-economics-ppt https://www.slideshare.net/rossanz/production-and-cost-45827016 https://www.slideshare.net/darkyla/business-organizations-19917607 https://www.slideshare.net/balarajbl/market-and-classification-of-market https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396 https://www.slideshare.net/ashu1983/financial-accounting						

List of Cos	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO 1: Engineering knowledge	1.2	1.2.1
CO2	PO 1: Engineering knowledge	1.2	1.2.1
CO3	PO 1: Engineering knowledge PO 6: The engineer and society	1.2 6.2	1.2.1 6.2.1
CO4	PO 11: Project management and finance	11.2	11.2.1
CO5	PO 11: Project management and finance	11.1	11.1.2

Course Code	Universal Human Values (Common to : CSE, CIC, AIM, AID)		L	T	P	C
20AHS9905			3	1	0	3
Pre-requisite	NIL	Semester	II-II			
Course Objectives :						
<ul style="list-style-type: none"> Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence Strengthening of self-reflection. Development of commitment and courage to act. 						
Course Outcomes (CO):						
On completion of this course, the students will be able to						
<ul style="list-style-type: none"> Students are expected to become more aware of themselves, and their surroundings (family, society, nature) They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction. 						
UNIT - I	Course Introduction - Need, Basic Guidelines, Content and Process for Value Education		8Hrs			
<ul style="list-style-type: none"> Purpose and motivation for the course, recapitulation from Universal Human Values-I Self-Exploration-what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration Continuous Happiness and Prosperity- A look at basic Human Aspirations Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority Understanding Happiness and Prosperity correctly- A critical appraisal of the current. scenario Method to fulfill the above human aspirations: understanding and living in harmony at various levels. <p>Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.</p>						
UNIT - II	Understanding Harmony in the Human Being - Harmony in Myself!		10Hrs			
<ul style="list-style-type: none"> 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. <p>Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.</p>						
UNIT -III	Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship.		8Hrs			
<ul style="list-style-type: none"> Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment 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 						

<ul style="list-style-type: none"> Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family <p>Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives</p>		
UNIT –IV	Understanding Harmony in the Nature and Existence - Whole existence as Coexistence	9Hrs
<ul style="list-style-type: none"> Understanding the harmony in the Nature Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature Understanding Existence as Co-existence of mutually interacting units in all- pervasive space Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film “Home” can be used), pollution, depletion of resources and role of technology etc. <p>Include practice sessions to discuss human being as cause of imbalance in nature (film “Home” can be used), pollution, depletion of resources and role of technology etc.</p>		
UNIT – V	Implications of the above Holistic Understanding of Harmony on Professional Ethics.	8Hrs
<ul style="list-style-type: none"> 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. <p>Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.</p>		
Textbooks:		
<ol style="list-style-type: none"> R R Gaur, R Asthana, G P Bagaria, “A Foundation Course in Human Values and Professional Ethics”, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034-47-1 R R Gaur, R Asthana, G P Bagaria, “Teachers’ Manual for A Foundation Course in Human Values and Professional Ethics”, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2 		
Reference Books:		
<ol style="list-style-type: none"> Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999. A. N. Tripathi, “Human Values”, New Age Intl. Publishers, New Delhi, 2004. The Story of Stuff (Book). Mohandas Karamchand Gandhi “The Story of My Experiments with Truth” E. FSchumacher. “Small is Beautiful” Slow is Beautiful –Cecile Andrews J C Kumarappa “Economy of Permanence” Pandit Sunderlal “Bharat Mein Angreji Raj” Dharampal, “Rediscovering India” Mohandas K. Gandhi, “Hind Swaraj or Indian Home Rule” India Wins Freedom - Maulana Abdul Kalam Azad Vivekananda - Romain Rolland(English) Romain Rolland (English) 		

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO 1	PO 7: Environment and sustainability : Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development	7.1	7.1.2
CO 2	PO 7: Environment and sustainability : Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development	7.1	7.1.2
CO 3	PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice	8.1 8.2	8.1.1 8.2.2
CO 4	PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice	8.1 8.2	8.1.1 8.2.2
CO5	PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice	8.1 8.2	8.1.1 8.2.2

Course Code	Object Oriented Programming through Java	L	T	P	C
20APC0512			3	0	0
Pre-requisite	NIL	Semester		II-I	
Course Objectives:					
At the end of the course, the students will be able to:					
<ul style="list-style-type: none"> To understand object oriented programming concepts, and apply them in solving Problems. To introduce the principles of inheritance and polymorphism and implementation of packages and interfaces. To learn java's exception handling mechanism, String Handling Methods. To introduce the concepts of multithreading and Collection Framework and internet programming using applets. To introduce the design of Graphical User Interface swing controls. 					
Course Outcomes (CO):					
<ul style="list-style-type: none"> Understanding the Syntax, Semantics and features of Java Programming Language. To gain knowledge on Object Oriented Programming concepts. Design the method of creating Multi-threading programs and handle exceptions. Understanding the concepts of java Collection Framework and Applets. Ability to create GUI applications & perform event handling. 					
UNIT - I		9Hrs			
Object Oriented Thinking: History of Java, Java Buzzwords, Overview of OOP CLASSES AND Objects: Classes, Objects, Simple Java Program, Methods, Constructors, this Keyword, Garbage Collection, Data Types, Variables, Arrays, Operators, Control Statements Overloading of Methods and Constructors, Parameter Passing, Recursion, String Class and String handling methods.					
UNIT - II		9 Hrs			
Inheritance: Inheritance Basics, Using Super, Multilevel Hierarchy, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Using final with Inheritance, Object Class.					
Packages: Packages, Access Protection, Importing Packages.					
Interfaces: Defining an Interface, Implementing Interface, Applying Interface, Variables in Interfaces, Interfaces can be extended.					
UNIT - III		8Hrs			
Exception Handling: Exception Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built in Exceptions, Creating Own Exception Sub Classes.					
Input and Output Operations: I/O basics, reading console input, writing console output, the PrintWriter class, reading and writing files, automatically closing a file.					
Generic Programming : Generic classes, generic methods, Bounded Types, Restrictions and Limitations.					
UNIT - IV		8 Hrs			
Multithreading: Java Thread Model, The Main Thread, Thread Life Cycle, Creating Thread and Multiple Threads, isAlive() and join(), Thread Priorities, Synchronization, Inter thread Communication, Suspending, Resuming and Stopping Threads.					
Collection Framework: Collection Overview, Collection Interfaces: The Collection Interface, the List Interface, the Queue Interface, Collection Classes: Array List Class, Linked List Class, String Tokenizer, Scanner.					
UNIT - V		10Hrs			
Applets: Applet Basics, Life Cycle of an Applet, Simple Applet Display Methods, The HTML APPLET tag, Passing Parameters to Applets.					
Swing: Introduction to Swing Model-View, Controller design pattern button, layout management, Swing Components.					
Textbooks:					
<ol style="list-style-type: none"> Herbert Schildt, Java. The complete reference, TMH. 9thEdition, 2014 Cay. S. Horstmann and Gary Cornell Core Java 2, Vol 2, Advanced Features, Pearson Education, 7thEdition, 2004 					
Reference Books:					
<ol style="list-style-type: none"> J.Nino and F.A. Hosch, An Introduction to programming and OO design using Java, John Wiley & sons. Y. Daniel Liang, Introduction to Java programming, Pearson Education 6th Edition R.A. Johnson- Thomson, An introduction to Java programming and object oriented application development. P. Radha Krishna, Object Oriented Programming through Java, University Press. 					
Online Learning Resources:					
www.javatpoint.com					

	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Understand Basics of concepts	1.4	1.4.1
CO2	PO1: Demonstrate competence in engineering fundamentals	1.3	1.3.1
CO3	PO3: Demonstrate an ability to generate a diverse set of alternative design solutions	3.2	3.2.1
CO4	PO1: Understand Basics of concepts	1.4	1.4.1
CO5	PO5: ability to identify / create modern engineering tools, techniques and resources	5.1	5.1.2

Course Code	Computer Organization Lab		L	T	P	C
20APC0504			0	0	2	1
Pre-requisite	C programming	Semester	II-II			
Course Objectives:						
<ul style="list-style-type: none"> Understanding the behavior of logic gates, adders, decoders, multiplexers and flipflops. Understanding the behavior of ALU, RAM, STACK and PROCESSOR from working modules and the modules designed by the student as part of the experiment. 						
Course Outcomes (CO):						
<ul style="list-style-type: none"> Represent numbers and perform arithmetic operations. Minimize the Boolean expression using Boolean algebra and design it using logic gates Analyze and design combinational circuit. Design and develop sequential circuits Understand and apply the working of different operations on binary numbers. 						
List of Experiments:						
Exercises in Digital Electronics:						
<ul style="list-style-type: none"> Implement Logic gates using NAND and NOR gates Design a Full adder using gates Design and implement the 4:1 MUX, 8:1 MUX using gates /ICs. Design and Implement a 3 to 8 decoder using gates Design a 4 bit comparator using gates/IC Design and Implement a 4 bit shift register using Flip flops Design and Implement a Decade counter 						
Microprocessors (8086 Assembly Language Programming)						
<ul style="list-style-type: none"> 8 Bit Addition and Subtraction. 16 Bit Addition. BCD Addition. BCD Subtraction. 8 Bit Multiplication. 8 Bit Division. Searching for an Element in an Array. Sorting in Ascending and Descending Orders. Finding Largest and Smallest Elements from an Array. 						
Exercises in Computer Organization						
<ul style="list-style-type: none"> Implement a C program to perform Binary Addition & Subtraction. Implement a C program to perform Multiplication of two binary numbers Implement a C program to perform Multiplication of two binary numbers (signed) using Booth's Algorithms. Implement a C program to perform division of two binary numbers (Unsigned) using restoring division algorithm. Implement a C program to perform division of two binary numbers (Unsigned) using non-restoring division algorithm. 						
References:						
<ul style="list-style-type: none"> Switching theory and logic design –A. Anand Kumar PHI, 2013 Advanced microprocessor & Peripherals-A. K. Ray and K. M. Bherchandavi, TMH, 2nd edition. Switching and Finite Automatic theory-Zvi Kohavi, Niraj K.Jha Cambridge, 3rd edition Digital Design –Morris Mano, PHI, 3rd edition Microprocessor and Interfacing –Douglas V. Hall, TMGH 2nd edition. 						
Online Learning Resources/Virtual Labs:						
http://www.edx.org						

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Apply the knowledge of mathematics PO2: Analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics	1.1, 2.4	1.1.1, 2.4.1
CO2	PO1: Apply the knowledge of mathematics PO3: Design system components	1.1, 3.4	1.1.1, 3.4.3
CO3	PO1: Apply the knowledge of mathematics PO3: Design system components	1.1, 3.4	1.1.1, 3.4.3
CO4	PO1: Apply the knowledge of mathematics PO2: Analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics	1.1, 2.4	1.1.1, 2.4.1
CO5	PO1: Apply the knowledge of mathematics PO2: Analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics	1.1, 2.4	1.1.1, 2.4.1

Course Code	Object Oriented Programming through Java Lab		L	T	P	C
20APC0514			0	0	4	2
Pre-requisite	NIL	Semester	II-II			
Course Objectives:						
<ul style="list-style-type: none"> To experiment with the syntax and semantics of java language and gain experience with java programming Learn to use object orientation to solve problems and use java language to implement them. 						
Course Outcomes (CO):						
<ul style="list-style-type: none"> Demonstrate java compiler and eclipse platform and learn how to use net beans IDE to create java application Ability to create user friendly interfaces Ability to solve the problem using object oriented approach and design solutions which are robust Implement exception handling and Templates 						
List of Experiments:						
Week-1: (Unit-1)						
Installation of Java software, study of any integrated development environment, Use Eclipse or Net bean platform and acquaint with the various menus. Create a test project, add a test class and run it. Practice Java Basic Programs on Classes and Objects.						
Week-2: (Unit-1)						
Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection (i.e domestic or commercial). Commute the bill amount using the following tariff. If the type of the EB connection is domestic, calculate the amount to be paid as follows: First 100 units - Rs. 1 per unit; 101-200 units - Rs. 2.50 per unit; 201 -500 units - Rs. 4 per unit; 501 units - Rs. 6 per unit. If the type of the EB connection is commercial, calculate the amount to be paid as follows: First 100 units - Rs. 2 per unit; 101-200 units - Rs. 4.50 per unit; 201 -500 units - Rs. 6 per unit; > 501 units - Rs. 7 per unit. Write a java program to illustrate the concept of class with method overloading. C) Write a java program to illustrate the concept of class with Constructors overloading.						
Week-3:(Unit-2)						
a) Write a program to create a class named shape. It should contain 2 methods, draw() and erase() that prints "Drawing Shape" and "Erasing Shape" respectively. For this class, create three sub classes, Circle, Triangle and Square and each class should override the parent class functions - draw () and erase (). The draw() method should print "Drawing Circle", "Drawing Triangle" and "Drawing Square" respectively. The erase() method should print "Erasing Circle", "Erasing Triangle" and "Erasing Square" respectively. Create objects of Circle, Triangle and Square in the following way and observe the polymorphic nature of the class by calling draw() and erase() method using each object. Shape c=new Circle(); Shape t=new Triangle(); Shape s=new Square()); b) Write a Java Program to demonstrate inheritance &usage of super						
Week-4:(Unit-2)						
Write a Java Program to implement multilevel inheritance. Write a Java program to implement the method overriding Write a Java program to implement dynamic method dispatch.						
Week-5:(Unit-2)						
Write a Java program to implement abstract class. Write a Java Program to implement Packages. Write a Java Program to implement Access Protection in Packages.						
Week-6:(Unit-2)						
Write a Java program to demonstrate interfaces. Write a Java program to implement the multiple inheritance using interfaces.						
Week-7:(Unit-3)						
Write a Java program to implement the exception handling mechanism. Write a Java program to implement the nested try statement. Write a Java program to implement your own exception class.						
Week-8:(Unit-3)						
Write a Java Program to demonstrate the following String Handlings. String Length& Concatenation. Character Extraction. String Comparison. Searching and modifying String. Write a Java Program to demonstrate String Buffer Class.						
Week-9:(Unit-4)						
Write a Java program for multi-thread implementation. Write a Java program to implement producer consumer problem using inter-thread communication						

mechanism.

Week-10:(Unit-4)

Practice any two Programs on Collections.

Practice any two Programs on String Tokenizer & Scanner.

Week-11:(Unit-5)

Write a Java Program to develop an applet that displays a simple message.

Develop an applet that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named –Computel is clicked.

Write a java program to handle keyboard events.

Write a java program to handle Mouse events

Week-12:(Unit-5)

Write a Java Program to demonstrate AWT Label & Button.

Write a Java Program to demonstrate JLabel, JTextField & JButton.

Write a program to design a calculator using event driven programming paradigm of java

References:

1. Herbert Schildt.Java. The complete reference, TMH. 9thEdition.
2. H.M.Dietel and P.J.Dietel, Java How to Program 6thEdition,PearsonEducation/PHI
3. Y.Daniel Liang, Introduction to Java programming, Pearson Education, 6thEdition.
4. Cay Horstmann, Big Java, 2ndedition, Wiley Student Edition, Wiley India Private Limited.

Online Learning Resources/Virtual Labs:

<http://www.javatpoint.com>

List of CO's	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Apply the knowledge of mathematics	1.1	1.1.1
CO2	PO1:Apply the knowledge of mathematics	1.1	1.1.1
CO3	PO2:Analyse complex engineering problems	2.1	2.1.3
CO4	PO2:Analyse complex engineering problems	2.4	2.4.1

Course Code	Operating Systems Lab	L	T	P	C
20APC0513		0	0	3	1.5
Pre-requisite	Basics of CO and DBMS	Semester	II-II		
Course Objectives:					
<ul style="list-style-type: none"> To understand the design aspects of operating system To solve various synchronization problems 					
Course Outcomes (CO):					
<ul style="list-style-type: none"> Ensure the development of applied skills in operating systems related areas. Able to write software routines modules or implementing various concepts of operating system. 					
List of Experiments to be implemented in C/Java					
<ol style="list-style-type: none"> Practicing of Basic UNIX Commands. Write programs using the following UNIX operating system calls Fork, exec, getpid, exit, wait, close, stat, opendir and readdir Simulate UNIX commands like cp, ls, grep, etc., Simulate the following CPU scheduling algorithms: a) Round Robin b) SJF c) FCFS d) Priority Simulate all file allocation strategies: a) Sequential b) Indexed c) Linked Simulate MVT and MFT Simulate all File Organization Techniques a) Single level directory b) Two level c) Hierarchical d) DAG Simulate Bankers Algorithm for Deadlock Avoidance Simulate Bankers Algorithm for Deadlock Prevention Simulate all page replacement algorithms a) FIFO b) LRU c) LFU Etc. ... Simulate Paging Technique of memory management Control the number of ports opened by the operating system with a) Semaphore b) monitors Simulate how parent and child processes use shared memory and address space Simulate sleeping barber problem Simulate dining philosopher's problem Simulate producer and consumer problem using threads (use java) Simulate little's formula to predict next burst time of a process for SJF scheduling algorithm. Develop a code to detect a cycle in wait-for graph Develop a code to convert virtual address to physical address Simulate how operating system allocates frame to process Simulate the prediction of deadlock in operating system when all the processes announce their resource requirement in advance. 					
References:					
<ol style="list-style-type: none"> "Operating System Concepts", Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Eighth Edition, John Wiley. "Operating Systems: Internals and Design Principles", Stallings, Sixth Edition-2009, Pearson Education "Modern Operating Systems", Andrew S Tanenbaum, Second Edition, PHI. "Operating Systems", S.Haldar, A.A.Aravind, Pearson Education. "Principles of Operating Systems", B.L.Stuart, Cengage learning, India Edition.2013-2014 "Operating Systems", A.S.Godbole, Second Edition, TMH. "An Introduction to Operating Systems", P.C.P. Bhatt, PHI. 					
Online Learning Resources/Virtual Labs:					
https://www.cse.iitb.ac.in/~mythili/os/ http://peterindia.net/OperatingSystems.html					

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO3. Design/development of solutions	3.3	3.3.1
CO2	PO5. Modern tool usage	5.1	5.1.1

Course Code	Server Side Scripting		L	T	P	C
20ASC0502			1	0	2	2
Pre-requisite	HTML, JavaScript	Semester	II-II			
Course Objectives:						
<ul style="list-style-type: none"> To learn about Java, HTML , DHTML concepts. To know about server side programming To gain the Knowledge of XML and its applications 						
Course Outcomes (CO):						
<ul style="list-style-type: none"> Learn the installation guide of MYSQL,XAMPP5,APACHE and PHP Able to design code for simple dynamic web pages Design PHP and SQL/MySQL Integration. Design Basic Projects like Creating an Online Address Book - Creating a Simple Discussion Forum etc. Able to provide protection to web server 						
UNIT - I		10 Hrs				
<p>Getting Up and Running: Installation Quick Start Guide with XAMPP5 - Installing and Configuring MySQL - Installing and Configuring Apache - Installing and Configuring PHP - PHP Language Structure: The Building Blocks of PHP - Flow Control Functions in PHP - Working with Functions - Working with Arrays - Working with Objects</p> <ol style="list-style-type: none"> Installation of XAMPP server Write PHP code to print Hello World program Demonstrate 8 basic data types in PHP. Demonstrate the scope of variables declared in PHP code. Demonstrate Arithmetic, Comparison, Logical (or Relational), Assignment and Conditional (or ternary) Operators. Demonstrate if, elseif ...else and switch statements. Demonstrate for, while, do – while, and for each loop. Write code to create and access numeric arrays. Demonstrate the usage of associative arrays. Implement Multi-dimensional arrays Create a multidimensional array of movies organized by genre. This should take the form of an associative array with genres as keys, such as Science Fiction, Action, Adventure, and so forth. Each of the array's elements should be an array containing movie names, such as Alien, Terminator 3, Star Wars, and so on. After creating your arrays, loop through them, printing the name of each genre and its associated movies. Create a function that accepts four string variables and returns a string that contains an HTML table element, enclosing each of the variables in its own cell. Create a class called baseCalc() that stores two numbers as properties. Next, create a calculate() method that prints the numbers to the browser. Create classes called addCalc(), subCalc(), mulCalc(), and divCalc() that inherit functionality from baseCalc() but override the calculate() method and print appropriate totals to the browser. 						
UNIT - II		10 Hrs				
<p>Working with Strings, Dates, and Time - Working with Forms - Working with Cookies and User Sessions - Working with Files and Directories - Working with Images</p> <ol style="list-style-type: none"> Create a feedback form that accepts a user's full name and an email address. Use case-conversion functions to capitalize the first letter of each name the user submits and print the result back to the browser. Check that the user's email address contains the @ symbol and print a warning otherwise. Create an array of doubles and integers. Loop through the array, converting each element to a floating-point number with a precision of 2. Right-align the output within a field of 20 characters. Create a birthday countdown script. Given form input of month, day, and year, output a message that tells the user how many days, hours, minutes, and seconds until the big day. Create a calculator script that enables the user to submit two numbers and choose an operation (addition, multiplication, division, or subtraction) to perform on them. Use hidden fields with the script you created in activity 1 to store and display the number of requests that the user submitted. Create a script that uses session functions to track which pages in your environment the user has visited. Create a new script that will list for the user all the pages he/she has visited within your environment, and when. Create a form that accepts a user's first and second name. Create a script that saves this data to a file. Create a script that reads the data file you created in the first activity. In addition to writing its contents to the browser (adding a tag to each line), print a summary that includes the number of lines in the file and the file's size. Draw a New Image, shapes and lines. 						

<ul style="list-style-type: none"> 11. Create a New Image with Color Fills. 12. Draw A Basic Pie Chart and 3D Pie Chart 13. Creating a New Image from an Existing Image. 14. Creating an Image from User Input. 15. Creating an Image with Custom Font and Text 		
UNIT - III	PHP with database connectivity	10 Hrs
<p>Understanding the Database Design Process - Learning Basic SQL Commands - Using Transactions and Stored Procedures in MySQL - Interacting with MySQL Using PHP</p> <p>Write PHP code</p> <ul style="list-style-type: none"> 1. to open and close a database connection. 2. to select a database. to select a database. 3. to create a table 4. to drop a database. 5. to drop a table 6. to insert record into employee table. 7. take input using HTML Form and insert records into table. 8. to display all the records from employee table. 9. to display all the records from employee table using mysql_fetch_assoc() function. 10. to display all the records from employee table using MYSQL_NUM argument. 11. to release cursor memory at the end of SELECT statement. 12. to display 10 records per page. 13. to take user input of employee ID and update employee salary. 14. to take user input of employee ID and delete an employee record from employee table. 15. Use SELECT INTO OUTFILE query for creating table backup. 		
UNIT - IV		10 Hrs
<p>Managing a Simple Mailing List - Creating an Online Address Book - Creating a Simple Discussion Forum - Creating an Online Storefront - Creating a Shopping Cart Mechanism - Creating a Simple Calendar - Restricting Access to Your Applications - Logging and Monitoring Web Server Activity - Application Localization - Working with XML and JSON</p> <ul style="list-style-type: none"> 1. Common Functions in an Included File 2. Subscribe and Unsubscribe with manage.php 3. Send Mail to Your List of Subscribers 4. Modify the manage.php script to display the user's email as part of the response message for any action that is taken. 5. Modify the sendmymail.php script to add additional form fields that will correspond to section headings in the message string itself. Remember that when the form is submitted, those strings will have to be concatenated into one message string that is sent to the mail() function. 		
UNIT - V		5 Hrs
<p>Apache Performance Tuning and Virtual Hosting - Setting Up a Secure Web Server - Optimizing and Tuning MySQL - Performing Software Upgrades - Using Application Frameworks</p>		
Textbooks:		
<ul style="list-style-type: none"> 1. Sams Teach Yourself PHP, MySQL and Apache All in One, by Julie C. Meloni, Pearson Education, Inc © 2012. 		
Reference Books:		
<ul style="list-style-type: none"> 1. Beginning PHP6, Apache, MySQL Web Development, by Timothy Boronczyk, Elizabeth Naramore, 2. Jason Gerner, Yann Le Scouarnec, Jeremy Stolz, Michael K. Glass, Wiley Publishing, Inc © 2009 3. PHP 6 and MySQL 6 Bible, by Steve Suehring, Tim Converse, Joyce Park, Wiley Publishing, Inc © 2009. 4. PHP & MySQL Web Development All-in-One Desk Reference For Dummies, by Janet Valade with Tricia Ballad and Bill Ballad, Wiley Publishing, Inc © 2008. 		
Online Learning Resources:		
<p>www.nptelvideos.com, https://www.tutorialspoint.com/php/</p>		

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO2: Apply the knowledge of algorithms	2.1	2.1.1
CO2	PO1:Apply the knowledge of modules	2.1	2.1.1
CO3	PO1:Apply the knowledge to design database connection process	1.1	1.1.1
CO4	PO3: Design solutions for complex engineering problems	3.2	3.2.1
CO5	PO1:Apply the knowledge of modules	1.4	1.4.1