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 Demonstrate competence in basic sciences	1.2.1	Apply laws of natural science to an engineering problem
1.3 Demonstrate competence in engineering fundamentals	1.3.1	Apply 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 Demonstrate an ability to execute a solution process and analyze results	2.4.1	Applies engineering mathematics to implement the solution
	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	
4.1Demonstrate an ability to conduct investigations of technical issues consistent with their level of knowledge and understanding	4.1.1	Define a problem for purposes of investigation, its scope and importance
	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 Demonstrate an ability to analyze data and reach a valid conclusion	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
	4.3.3	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 Demonstrate an ability to evaluate the suitability and limitations of tools used to solve an engineering problem	5.3.1	Discuss limitations and validate tools, techniques and resources
	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 engineering regulations, legislation and standards	6.2.1	Interpret legislation, regulations, codes, 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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Semester I (First year)

S.No	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P	C			
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**

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Semester II (First year)

S.No	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P	C			
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	3	0	0	0	30	0	30
			Total credits				**19.5**	**270**	**560**	**830**

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Semester III (Second year) – AK20

S.No	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P	C			
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**

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Semester IV (Second year) – AK20

S.No	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P	C			
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**

Community service Project with credits

(To visit the selected community to conduct survey (Socio-economic & domain survey) and conduct sensitization/awareness program/activities at the end of IV- semester before commencement of V-semester and complete immersion programme also during V-Semester and submit report in V - semester. Assessment will be done at the end of V-Semester).

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Semester V (Third year)

S.No	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P	C			
1	PC	20APC0516	Computer Networks	3	0	0	3	30	70	100
2	PC	20APC0518	Formal Languages & Automata Theory	3	0	0	3	30	70	100
3	PC	20APC0519	Software Engineering	3	0	0	3	30	70	100
4	OE-1	20APE0417 20AOE0303 20AOE9925	Sensors and IoT Optimization Techniques Deterministic & Stochastic Statistical Methods	3	0	0	3	30	70	100
5	PE-1	20APE0501 20APE0502 20APE0503	Data Warehousing and Mining Design Patterns Computer Graphics	3	0	0	3	30	70	100
6	PC Lab	20APC0520	Software Engineering Lab	0	0	3	1.5	30	70	100
7	PC Lab	20APC0517	Computer Networks Simulation Lab	0	0	3	1.5	30	70	100
8	SC	20ASA0503	Mobile Application Development	1	0	2	2	100	0	100
9	MC	20AMC9901	Biology for Engineers	3	0	0	0	30	0	30
10	CSP	20CSP0501	Community service project	0	0	0	1.5	100	0	100
Total credits							**21.5**	**440**	**490**	**930**

S. No	Professional Elective (12 weeks)	Open Elective (12 weeks)
1	The Joy Of Computing Using Python	Blockchain and its Applications
2	Software Testing	Introduction to Cyber Security
3	Privacy And Security In Online Social Media	Business analytics and data mining modeling using R.
4	Data analytics with python	Decision making with spread sheet
5	Development using UML, JAVA and Patterns.	Introduction To Wireless And Cellular Communications
6	Programming In Modern C++	Text, Textuality And Digital Media
7	Data Structure And Algorithms Using Java	Psychology Of Learning
8	Computational Complexity	Public Speaking
9	Cyber Security and Privacy	Organizational Behaviour
10	Ethical Hacking	Entrepreneurship
11	Parameterized Algorithms	Introduction to Film Studies
12	Computational number theory and algebra	Partition of India in print media and Cinema.
13	Hardware Security	Data Analysis and decision making
14	GPU architecture and programming	Education for sustainable development
15	Introduction to game theory and mechanism	Training and development
16	Statistical learning for reliability analysis	Literature Culture and Media
17	Advanced distributed systems.	Introduction to Cultural Studies
18	Secure computation: part-1	Science, Technology and Society
19	Secure computation: part-2	Human Resource Development
20	Pattern recognition and application	E- Business.

*Student shall register any number of MOOC courses listed by the department as approved by the BOS from III year. But student is required to submit the pass certificate on NPTEL platform for at least one course with in the Programme duration (Before IV-II examination notification released).

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Semester VI (Third year)

S.No	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P	C			
1	PC	20APC0521	Artificial Intelligence	3	1	0	3	30	70	100
2	PC	20APC0523	Compiler Design	3	0	0	3	30	70	100
3	PC	20APC0528	Cloud Computing	3	0	0	3	30	70	100
4	PE-2	20APE0504 20APE0505 20APE0506	Machine Learning Real Time Operating Systems Agile Methodologies	3	0	0	3	30	70	100
5	PC Lab	20APC0522	Artificial Intelligence Lab	0	0	3	1.5	30	70	100
6	PC Lab	20APC0524	Compiler Design Lab	0	0	3	1.5	30	70	100
7	PC Lab	20APC0529	Cloud Computing Lab	0	0	3	1.5	30	70	100
8	SC	20ASA0502	Soft Skills	1	0	2	2	100	0	100
9	MC	20AMC9904	Professional Ethics and Human Values	2	0	0	0	30	0	30
			Total credits				**18.5**	**340**	**490**	**830**
Industry Internship (Mandatory) for 6-8 Weeks duration during summer vacation										

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Semester VII (Fourth year)

S.No	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P	C			
1	PE-3	20APE0507 20APE0508 20APE0509 20APE0510	Predictive Analytics Natural Language Processing Deep Learning Techniques Computer Vision	3	0	0	3	30	70	100
2	PE-4	20APE0511 20APE0512 20APE0513	Cryptography and Network Security Adhoc & Sensor Networks Distributed Systems	3	0	0	3	30	70	100
3	PE-5 CBCC	20APE0514 20APE0515 20APE0516	Data Analytics Software Project Management Linux Environment System	3	0	0	3	30	70	100
4	PE-6	20APE0517 20APE0518 20APE0519	Information Retrieval Techniques Soft Computing Principles of Data science	3	0	0	3	30	70	100
5	OE-3	20APE0407 20APE0411 20AOE3601 20APE0415	Digital Image Processing Embedded Systems Enabling Technologies for data science and analytics :IOT Wireless Communications	3	0	0	3	30	70	100
6	HE	20AOE0302 20AOE9901 20AHSMB02	Management Science English for Research Paper Writing Entrepreneurship Development	3	0	0	3	30	70	100
7	SA	20ASA0504	Devops	1	0	2	2	100	0	100
8	PR	20APR0501	Evaluation of Industry Internship(III-II Summer Internship)	0	0	0	3	100	0	100
			Total credits				**23**	**380**	**420**	**800**

Semester VIII (Fourth year)

S.No	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P	C			
1	MOOCS	OE/PE		**0**	**0**	**0**	**3**	25	75	100
2	PR	20APR0502	Internship	**0**	**0**	**0**	**3**	100		100
3	PR	20APR0503	Project work	0	0	0	9	60	140	200
			Total credits				15	185	215	400

LIST OF COURSES FOR HONOURS In B.Tech -CSE

Note: Students can choose a few courses from the following list approved by BOS either 3 credits/ 4 credits courses based on the availability in SWYAM-NPTEL portal, and secure minimum of 20 credits on passing the selected courses.

S.NO	SUB.CODE	COURSE NAME	WEEKS	CREDITS
1	20AHN0501	DESIGN AND IMPLEMENTATION OF HUMAN COMPUTER INTERFACES	12 Weeks	3 or 4
2	20AHN0502	SOCIAL NETWORKS	12 Weeks	3 or 4
3	20AHN0503	NO SQL DATABASES	12 Weeks	3 or 4
4	20AHN0504	ADVANCED IOT APPLICATIONS	12 Weeks	3 or 4
5	20AHN0505	INTRODUCTION TO INDUSTRY 4.0 AND INDUSTRIAL INTERNET OF THINGS	12 Weeks	3 or 4
6	20AHN0506	GETTING STARTED WITH COMPETITIVE PROGRAMMING	12 Weeks	3 or 4
7	20AHN0507	COMMUNICATION NETWORKS	12 Weeks	3 or 4
8	20AHN0508	COMPUTER NETWORKS AND INTERNET PROTOCOL	12 Weeks	3 or 4
9	20AHN0509	ALGORITHMIC GAME THEORY	12 Weeks	3 or 4
10	20AHN0510	SCALABLE DB.	12 Weeks	3 or 4
11	20AHN0511	APPLIED ACCELERATED ARTIFICIAL INTELLIGENCE.	12 Weeks	3 or 4
12	20AHN0512	AI: SEARCH METHODS FOR PROBLEM SOLVING.	12 Weeks	3 or 4
13	20AHN0513	ARTIFICIAL INTELLIGENCE: KNOWLEDGE REPRESENTATION AND REASONING	12 Weeks	3 or 4
14	20AHN0514	MULTI-CORE COMPUTER ARCHITECTURE-STORAGE	12 Weeks	3 or 4
15	20AHN0515	SOCIAL NETWORK ANALYSIS.	12 Weeks	3 or 4
		TOTAL		**20**

MINOR DEGREE IN COMPUTER SCIENCE AND ENGINEERING FOR ECE, EEE, CE & ME

Note: Students of other programmes to get "minor in CSE" shall pass a few SWAYAM-NPTEL courses listed below which are approved by BOS and obtain 15 credits and submitting a minor discipline project in CSE for scoring 5 credits is compulsory and all together total credits requirement count to be minimum of 20.

S.NO	SUB.CODE	COURSE NAME	WEEKS	CREDITS
1	20AMN0501	OPERATING SYSTEMS	12 Weeks	3 or 4
2	20AMN0502	COMPUTER ORGANIZATION	12 Weeks	3 or 4
3	20AMN0503	COMPUTER NETWORKS	12 Weeks	3 or 4
4	20AMN0504	DESIGN AND ANALYSIS OF ALGORITHMS	12 Weeks	3 or 4
5	20AMN0505	OBJECT ORIENTED PROGRAMMING THROUGH JAVA	12 Weeks	3 or 4
6	20AMN0506	PROGRAMMING IN MODERN C++	12 Weeks	3 or 4
7	20AMN0507	DATA ANALYTICS WITH PYTHON	12 Weeks	3 or 4
8	20AMN0508	SOFTWARE ENGINEERING	12 Weeks	3 or 4
9	20AMN0509	SOFTWARE PROJECT MANAGEMENT	12 Weeks	3 or 4
10	20AMN0510	INTRODUCTION TO DATABASE SYSTEMS	12 Weeks	3 or 4
11	20AMN0511	CLOUD COMPUTING	12 Weeks	3 or 4
12	20AMN0512	FOUNDATION OF CRYPTOGRAPHY	12 Weeks	3 or 4
13	20AMN0513	HARDWARE SECURITY	12 Weeks	3 or 4
14	20AMN0514	COMPUTER NETWORKS AND INTERNET PROTOCOL	12 Weeks	3 or 4
15	20AMN0515	COMMUNICATION NETWORKS	12 Weeks	3 or 4
16	20AMN0516	**MINOR DISCIPLINE PROJECT IN CSE (COMPULSORY)**	-	5
		TOTAL		**20**

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)
COMPUTER SCIENCE AND ENGINEERING (CSE)
(Effective for the batches admitted in 2020-21)

Semester I (First year)

S.No	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P	C			
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**

Course Code	Algebra and Calculus		L	T	P	C
20ABS9901			3	0	0	3
Pre-requisite	**Matrices**	**Semester**	**I - I**			

Course Outcomes (CO):

CO1: Make use of matrix algebra techniques that is needed by engineers for practical applications.
CO2: Utilize mean value theorems to real life problems.
CO3: Interpret with functions of several variables which is useful in optimization
CO4: Analyze 2-dimensional and 3- dimensional concepts in coordinate systems
CO5: utilize the concept of special functions.

UNIT – I	**Matrix Operations and Solving Systems of Linear Equations**	12 Hrs

Rank of a matrix by echelon form, Consistency of system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigen vectors of the matrix of the linear transformation 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 of functions of single variable with remainders (without proof);

UNIT – III	**Multivariable calculus**	9 Hrs

Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT – IV	**Multiple Integrals**	10 Hrs

Double integrals, change of order of integration, double integration in polar coordinates, change of Variables in double integration (Cartesian to polar),areas of plane regions enclosed by plane curves. Evaluation of triple integrals(Cartesian coordinates only).

UNIT – V	**Special Functions**	10 Hrs

Beta and Gamma functions and their properties, relation between beta and gamma functions, Bessel functions, Bessel's equation, Recurrence formulae or Jn(x), Generating function- Orthoganality of Bessels functions.

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.

Reference Books:

1. Dr.T.K.V Iyengar, B.Krishna Gandhi, S. Ranganatham amd M.V.S.S.N Prasad, Mathematics – 1, S.Chand publications.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
3. B.V.Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.
4. N.Bali, M.Goyal, C.Watkins, Advanced Engineering Mathematics, Infinity Science Press.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3													
CO3	3													
CO4		3												
CO5		3												

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Chemistry		L	T	P	C
20ABS9904			3	0	0	3
Pre-requisite	Basics of chemical formulas and equations	Semester	I - I			

Course Outcomes (CO):

CO1: Interpret the behaviour and interactions between matter and energy at both the atomic and molecular levels

CO2: Apply the electrochemical principles to the construction of batteries, fuel cells and electrochemical sensors

CO3: Outline the preparation, mechanism properties and applications of polymer and conducting polymers.

CO4: Analyze the separation of gaseous and liquid mixtures using instrumental methods and their applications.

CO5: Understand the disadvantages of using hardwater in domestically and industrially and select suitable treatments.

UNIT – I	Structure and Bonding Models	10 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	10 Hrs

Electrodes – concepts, concept of redox-reactions, reference electrodes (Calomel electrode, Ag/AgCl electrode and glass electrode) electrochemical cell, Nern'st 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, button cells, 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

UNIT – III	Polymer Chemistry	10 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	10 Hrs

Beer-Lambert's law,, Principle and applications of UV-Visible spectrophotometer, Principle and applications of Colorometry, AAS, AES, Instrumentation ,Principles and applications of Chromatographic techniques(GC & HPLC), Methods for separation of gaseous mixtures and liquid mixtures.

UNIT – V	Water Technology	10 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:

1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.
3. Engineering Chemistry by G V Subba Reddy, K N Jayaveera and C Ramachandraiah, Mc Graw Hill education(India) Private Limited.

Reference Books:

1. J. D. Lee, Concise Inorganic Chemistry, 5/e, Oxford University Press, 2008.
2. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
3. Ben L. Feringa and Wesley R. Browne, Molecular Switches, 2/e, Wiley-VCH, 2011.
4. Willard Merritt Dean Settle, 7 th Edition Instrumental methods for analysis

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3		2		1							1		
CO3	3		2		1									
CO4	3													
CO5	3	2			1									

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Problem Solving And Programming		L	T	P	C
20AES0501			3	0	0	3
Pre-requisite	**Basic Mathematics**	**Semester**	**I - I**			

Course Objectives:

- 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):

CO1: Able to know interconnection of peripherals and connects of algorithms and flowcharts
CO2: Able to know problem solving aspects, design and analysis of algorithm
CO3: Able to know flow control, input output and implementation functions
CO4: Able to solve computational problems using functions, array and pointers
CO5: Able to organise real world heterogeneous data and apply searching ,sorting techniques with exception handling

UNIT – I — 8 Hrs

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.
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.

UNIT – II — 9 Hrs

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.
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.

UNIT – III — 8 Hrs

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.
Input and output: standard input and output, formatted output-Printf, formatted input-Scanf.
Control Flow: Statements and blocks, if-else, else-if, switch, Loops-while and for, Loops-Do- while, break and continue, Goto and labels.
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.

UNIT – IV — 9 Hrs

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.
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.
Array Techniques: Array order reversal, finding the maximum number in a set, removal of duplicates from an order array, finding the k^{th} smallest element

UNIT – V — 9 Hrs

Sorting and Searching: Sorting by selection, sorting by exchange, sorting by insertion, sorting by partitioning, binary search.
Structures: Basics of structures, structures and functions, arrays of structures, pointers to structures, self-referential structures, table lookup, typedef, unions, bit-fields.
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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2											3	
CO2	3	3	2										2	
CO3	2	3	3										2	
CO4	2	1	3	2									2	
CO5	2	1	3	3	2			2				3	2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Engineering Graphics		L	T	P	C
20AES0301			1	0	4	3
Pre-requisite	NIL	Semester	I - I			

Course Outcomes (CO):

CO1: Draw various curves applied in Engineering
CO2: Draw the projection of points and lines located in different quadrants.
CO3: Draw the projection of planes and solids located in different quadrants.
CO4: Draw sectional views and develop surfaces of a given object
CO5: Draw orthographic projections and isometric projections.

UNIT – I	8 Hrs

Introduction to Engineering graphics: Principles of Engineering Graphics and their significance-Conventions in drawing-lettering - BIS conventions.

a) Conic sections including the rectangular hyperbola- general method only,
b) Cycloid, epicycloids and hypocycloid

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, traces

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 and Reference Books:

K.L.Narayana & P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers
N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers
Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill
Shah and Rana, Engineering Drawing, 2/e, Pearson Education
Basant Agarwal & C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3	1												
CO3	3											1		
CO4	3											2		
CO5	3				3							3		

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Information Technology And Numerical Methods		L	T	P	C
20AES0505			3	0	0	3
Pre-requisite	**Basic Computer Knowledge**	**Semester**	**I - I**			

Course Outcomes (CO):

CO1: Usage of Digital World and Exploring Cyber space
CO2: Explain the needs of hardware and software required for a computation task.
CO3: Peripheral devices, networking and internet concepts

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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2			2							2	2	
CO2	3	3	2						2			2	2	
CO3	3	2			2							2		

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

20AES0505	Numerical Methods	
Pre-requisite	**Basic Statistics**	I-I

Course Outcomes:

CO4: Analyze the concepts of Errors, Algebraic & Transcendental Equations to solve different Engineering problems

CO5: Analyze Interpolation using the concepts of the numerical methods and apply the Integration in numerical methods

CO6: Apply the concepts of O.D.E on numerical method

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

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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO4	3													
CO5	3													
CO6	3													

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Computer Science And Engineering Workshop		L	T	P	C
20AES0506			0	0	3	1.5
Pre-requisite	Basic Computer Knowledge	Semester	I - I			

Course Outcomes (CO):

CO1: Assemble and disassembling parts of a computer
CO2: Develop Documents using Word processors
CO3: Develop presentations using the presentation tool
CO4: Perform computations using spreadsheet tool
CO5: Design Graphics, Videos and Web pages

Preparing your computer

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.

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.

Productivity tools

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.

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.

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.

IoT

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.

Story Telling

Task 7: Storytelling

Use Adobe spark or any other tool to create Graphics, Webpages, and Videos.

Reference Books:

1. B. Govindarajulu, "IBM PC and Clones Hardware Trouble shooting and Maintenance", 2nd edition, Tata McGraw-Hill, 2002
2. "MOS study guide for word, Excel, Powerpoint & Outlook Exams", Joan Lambert, Joyce Cox, PHI.
3. "Introduction to Information Technology", ITL Education Solutions limited, Pearson Education.
4. Rusen, "Networking your computers and devices", PHI
5. Bigelows, "Trouble shooting, Maintaining & Repairing PCs", TMH.

Online Learning Resources:

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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2							2			2	2	
CO2	3	2	2		2				1			2	2	2
CO3	3	2	2		2	2			1			2	2	2
CO4	3	2	2		2	2			1			2	2	
CO5	3	3	2			2			2			2	2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Chemistry Lab		L	T	P	C
20ABS9909			0	0	3	1.5
Pre-requisite	Basics of chemical formulas and equations	Semester	I - I			

Course Outcomes (CO):

CO1: Demonstrate volumetric analysis involved with emphasis on solution preparation, dilution and chemical calculations

CO2: Develop knowledge to prepare advanced materials.

CO3: Acquire knowledge to measure the strength an acid present in secondary batteries

CO4: Familiarize with digital and instrumental methods of analysis

CO5: Apply important chemical concepts and principles to analyse mixture of components by chromatographic techniques

List of Experiments:

1. Determination of Hardness of a groundwater sample.
2. Estimation of iron (II) using Diphenylamine indicator (Dichrometry – Internal indicator method)
3. Determination of pH metric titration of strong acid vs. strong base,
4. Conductometric titration of strong acid vs. strong base
5. Determination of Fe(II) in Mohr's salt by potentiometric method.
6. Determination of percentage of Iron in Cement sample by colorimetry
7. Determination of Strength of an acid in Pb-Acid battery
8. Preparation of phenol-formaldehyde resin
9. Preparation of TIO_2/ZnO nano particles
10. Estimation of Calcium in port land Cement
11. Adsorption of acetic acid by charcoal
12. Thin layer chromatography

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1				3										
CO2				3										
CO3				3										
CO4				3										
CO5				3										

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

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):

CO1: Assemble and disassembling parts of a Computer
CO2: Identify to control structure to solving the problem
CO3: Analyze different sorting algorithms
CO4: Design solutions for computational problems
CO5: Develop C programs which utilize the memory efficiently using programming constructs like pointers.

Laboratory Experiments #

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 ← b ← c ← d ← 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 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 $1 - x^2/2! + x^4/4! - x^6/6! + ...$
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 1and100 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 starts 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:

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. 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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2							2				2	
CO2	2	2	2										2	
CO3	2	2											2	
CO4	2	2	3	2									2	2
CO5	2	2	3	3	2							3	2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)
COMPUTER SCIENCE AND ENGINEERING (CSE)
(Effective for the batches admitted in 2020-21)

Semester II (First year)

S.No	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P	C			
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	3	0	0	0	30	0	30
			Total credits				**19.5**	**270**	**560**	**830**

Course Code	Applied Physics		L	T	P	C
20ABS9902			3	0	0	3
Pre-requisite	Basics of Physics	Semester	I - II			

Course Outcomes (CO):

CO1: Analyze the intensity variation of light due to interference, diffraction and polarization
CO2: Analyze and apply the concepts of LASERs and optical fibers.
CO3: Infer the properties of dielectric and magnetic materials.
CO4: Apply the fundamentals of semiconductors for device applications
CO5: Implement the behavior of superconductors in diverse fields & interpret the properties of nanomaterials for multiple applications.

UNIT – I — 10 Hrs

Optics

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.

Polarization of Electromagnetic Waves: Description of Linear, Circular and Elliptical Polarization, Uniaxial and Biaxial Crystal, Double Refraction, Polarization by Double Refraction, Nicol Prism.

UNIT – II — 10 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.

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

UNIT – III — 8 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 — 8 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 — 10 Hrs

Superconductors and Nonmaterial's

Superconductors-Properties-Meissner'seffect-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:

1. M. N. Avadhanulu, P. G. Kshirsagar &TVS Arun Murthy" A Text book of Engineering Physics"-S. Chand Publications,11th Edition2019.
2. B.K.Pandey and S.Chaturvedi, Engineering Physics, Cengage Learning,2012.

Reference Books:

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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3													
CO3	3													
CO4	3		1											
CO5	3		1											

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Probability And Statistics		L	T	P	C
20ABS9911			3	0	0	3
Pre-requisite	Probability	Semester	I - II			

Course Outcomes (CO):

CO1: Interpret the characteristics through correlation and regression tools.
CO2: Make use of the concepts of probability and their applications.
CO3: Apply discrete and continuous probability distributions.
CO4: Inference the components of a classical hypothesis test for large sample
CO5: Inspect the components of a classical hypothesis test for small samples.

UNIT – I 10 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 8 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 8 Hrs

Probability distributions

Probability distribution - Binomial, Poisson approximation to the binomial distribution and normal distribution-their properties.

UNIT – IV 8 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 8 Hrs

Small sample tests

Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), x2 - test for goodness of fit.

Textbooks:

1. Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

Reference Books:

1. S. Chand ,Probability and Statistics, Dr.T.K.V. Iyengar, Dr.B. Krishna Gandhi, S. Ranganatham, Dr.M.V.S.S.N. Prasad
2. S. Ross, a First Course in Probability, Pearson Education India, 2002.
3. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968.

Online Learning Resources:

www.nptel.ac.in

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2		3												
CO3		3												
CO4				3										
CO5				3										

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Communicative English		L	T	P	C
20AHS9901			3	0	0	3
Pre-requisite	**Grammar and Literature**	**Semester**	**I - II**			

Course Objectives:

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Course Outcomes (CO):

Students will able to

CO1: Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English.
CO2: Apply grammatical structures to formulate sentences and correct word forms
CO3: Analyze discourse markers to speak clearly on a specific topic in informal discussions
CO4: Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.
CO5: Create a coherent paragraph interpreting a figure/graph/chart/table

UNIT – I		9 Hrs

Lesson: On the Conduct of Life: William Hazlitt
Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.
Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.
Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.
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- I : Parts of Speech, Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and uncountable; singular and plural; basic sentence structures; simple question form – Wh questions; word order in sentences.
Vocabulary -2: Formal/academic words and phrases.

UNIT – II		9 Hrs

Lesson: The Brook: Alfred Tennyson
Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts.
Speaking: Discussion in pairs/small groups on specific topics followed by short structured talks.
Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
Writing: Paragraph writing (specific topics) using suitable cohesive devices;
Mechanics of writing – punctuation, capital letters.
Grammar & Vocabulary building-1: Cohesive devices – linkers, sign posts and transition signals; use of articles and zero article; prepositions.
Vocabulary building: 2 Idioms and Phrases, Homonyms, Homophones and Homographs.

UNIT – III		9 Hrs

Lesson: The Death Trap: Saki
Listening: Listening for global comprehension and summarizing what is listened to.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed Reading: Reading a text in detail by making basic inferences – recognizing and interpreting specific context clues; strategies to use text clues for comprehension.
Writing: Summarizing – identifying main idea/s and rephrasing what is read.
Grammar and Vocabulary building-II: Direct and indirect speech, reporting verbs for academic purposes.
Technical Writing-1: personal experiences, unforgettable incidents, travelogues. (Imaginative, Narrative and Descriptive)

UNIT – IV		9 Hrs

Lesson: Innovation: Muhammad Yunus
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: Studying the use of graphic elements in texts to convey information, reveal trends / patterns / relationships, communicate processes or display complicated data.
Writing: Letter Writing: Official Letters/Report writing, *e-mail writing*
Grammar and Vocabulary: Quantifying expressions – adjectives and adverbs; comparing and contrasting; Voice – Active & Passive Voice.

Vocabulary:2 : Jigsaw Puzzles, Vocabulary Activities through Web tools		
UNIT – V		9 Hrs

Lesson: Politics and the English Language: George Orwell
Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.
Speaking: Formal oral presentations on topics from academic contexts – without the use of PPT slides.
Reading: Reading for comprehension.
Writing: Writing structured essays on specific topics using suitable claims and evidences.
Grammar and Vocabulary: Editing short texts –identifying and correcting common errors in grammar and usage.
Technical Writing-2: Narrative short story, News paper articles on science fiction.

Textbooks:

1. Language and Life: A Skills Approach- I Edition 2019, Orient Black Swan

Reference Books:

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Raymond Murphy's English Grammar in Use Fourth Edition (2012) E-book
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.
5. Oxford Learners Dictionary, 12th Edition, 2011
6. Norman Lewis Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary (2014)
7. Speed Reading with the Right Brain: Learn to Read Ideas Instead of Just Words by David Butler

Online Learning Resources:

1. www.englishclub.com
2. www.easyworldofenglish.com
3. www.languageguide.org/english/
4. www.bbc.co.uk/learningenglish
5. www.eslpod.com/index.html
6. www.myenglishpages.com

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1										3				
CO2									3					
CO3										3				
CO4										3				
CO5										3				

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Data Structures		L	T	P	C
20AES0502			3	0	0	3
Pre-requisite	C Programming, Mathematics	Semester	I - II			

Course Objectives:

- 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):

CO1: Analyze and evaluate the efficiency of an algorithm
CO2: Implement linear data structures
CO3: implement non -linear data structures
CO4: Solve the problem of efficiently using graphs and Hashing techniques
CO5: Implement advanced sorting and organizing the file

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:

1. Ellis Horowitz and Sartaj Sahni, "Fundamentals of Data Structures in C", 2nd Edition, Galgotia Book Source, Pvt. Ltd., 2004.
2. Alan L. Tharp, "File Organization and Processing", Wiley and Sons, 1988.

Reference Books:

1. D. Samanta, "Classic Data Structures", 2nd Edition, Prentice-Hall of India, Pvt. Ltd., India, 2012.
2. Peter Bras, "Advanced Data Structures", Cambridge University Press, 2016
3. 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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3										2	2	
CO2	3	2	2		2							1	2	1
CO3	3	2	2		2							1	2	1
CO4	3	2	2	2								1	2	2
CO5	3	2	2	2	2							1	2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Web Design		L	T	P	C
20AES0507			1	0	4	3
Pre-requisite	**Basic Knowledge on Computers and Internet Concepts**	**Semester**	**I - II**			

Course Outcomes (CO):

CO1: Add elements to web pages, including colors, text, images, and more
CO2: Add advanced features to your website including special effects
CO3: Apply the CSS Knowledge to add colors and text formatting
CO4: Apply advanced CSS style presentation and techniques
CO5: Develop HTML and CSS Programs.

UNIT – I 9 Hrs

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)
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

UNIT – II 9 Hrs

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
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

UNIT – III 9 Hrs

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

UNIT – IV 9 Hrs

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.

UNIT – V 9 Hrs

1. Design a page having suitable background colour and text colour with title "My First Web Page" using all the attributes of the Font tag.
2. 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.
3. Write HTML code to design a page containing some text in a paragraph by giving suitable heading style.
4. Create a page to show different character formatting (B, I, U, SUB, SUP) tags.
   i. *viz :* $log_b m^p = p\ log_b m$
5. Write HTML code to create a Web Page that contains an Image at its centre.
6. 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

<table>
<tr><th>Student</th><th>Maths</th><th>Physics</th><th>Chemistry</th><th>Computer</th></tr>
<tr><td rowspan="2">I-R2C1</td><td>I-R1C1</td><td rowspan="4">I-R4C1</td><td colspan="2">I-C2</td></tr>
<tr><td>II-C1</td><td>II-C1</td><td rowspan="3">II-R1C5</td></tr>
<tr><td colspan="2" rowspan="3">III-R2C2</td><td>III-C1</td></tr>
<tr><td>IV-C1</td></tr>
</table>

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

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 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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2						1				2	2
CO2	3		2						1				2	2
CO3	3		2						1				2	2
CO4	3		2						1				2	2
CO5	3		3						1				2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Communicative English Lab		L	T	P	C
20AHS9902			0	0	2	1.5
Pre-requisite	Language and Grammar	Semester	I - II			

Course Objectives:

- Students will be exposed to a variety of self instructional, learner friendly modes of language learning.
- Students will learn better pronunciation through Phonetics.
- Students will be trained to use language effectively to face interviews, group discussions, public speaking .
- Students will be initiated into greater use of the computer in resume preparation, report writing, format making etc.

Course Outcomes (CO):

CO1: Create Awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English

CO2: Understanding the different aspects of the language with emphasis on LSRW skills and make use of different strategies in discussions.

CO3: Improve word knowledge and apply skills in various languages learning activities

CO4: Analyze speech sounds, stress ,rhythm, intonation and syllable division for better listening and speaking comprehension

CO5: Evaluate and exhibit acceptable etiquette essential in social and professional presentations.

UNIT – I	9 Hrs

1. Phonetics
2. Non - verbal communication
3. Vocabulary (word formation, one word substitutes, words often misused & confused, collocations idioms & phrases)

UNIT – II	9 Hrs

1. Reading Comprehension
2. JAM
3. Distinction between Native and Indian English accent (Speeches by TED and Kalam).

UNIT – III	9 Hrs

1. Situational dialogues/ Giving Directions
2. Describing objects/places/persons

UNIT – IV	9 Hrs

1. Fun – Buzz (Tongue twisters, riddles, puzzles etc)
2. Formal Presentations

UNIT – V	9 Hrs

1. Debate (Contemporary / Complex topics)
2. Group Discussion

Software Source:
K-Van Solutions Software

Reference Books:

Teaching English - British Council

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1										3				
CO2									3					
CO3										3				
CO4										3				
CO5										3				

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Applied Physics Lab		L	T	P	C
20ABS9907			0	0	3	1.5
Pre-requisite	Basic of Physics	Semester	I - II			

Course Outcomes (CO):

- **CO1:** Analyze the wave properties of light and the interaction of energy with the matter.
- **CO2:** Apply electromagnetic wave propagation in different guided media.
- **CO3:**Asses the electromagnetic wave propagation and its power in different media
- **CO4:** Analyze the conductivity of semiconductors.
- **CO5:** Interpret the difference between normal conductor and superconductor and apply the nanomaterials for engineering applications.

List of Experiments

1. Determination of the thickness of the wire using wedge shape method.
2. Determination of the radius of curvature of the lens by Newton's ring method
3. Determination of wavelength by plane diffraction grating method
4. Dispersive power of a diffraction grating
5. Study of the Magnetic field along the axis of a circular coil carrying current.
6. Study the variation of B versus H of the magnetic material (B-H curve)
7. Determination of the numerical aperture of a given optical fiber and angle of acceptance.
8. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
9. Determination of the energy gap of a semiconductor
10. Determination of crystallite size using X-Ray diffraction spectra.
11. Determination of Wavelength of LASER using diffraction grating.
12. Determination of particle size using LASER.
13. Determination of the resistivity of semiconductor by Four probe method.
14. Determination of dielectric constant by charging and discharging method.
15. Study the temperature dependence of resistance of a thermister.

Textbooks:

Reference Books:

1. S. Balasubramanian, M.N.Srinivasan, "A Text book of Practical Physics"-S Chand Publishers, 2017.
2. http://vlab.amrita.edu/index.php-VirtualLabs, Amrita University.

Online Learning Resources:

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1				3										
CO2				3										
CO3				3										
CO4				3										
CO5				3										

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Data Structures Lab		L	T	P	C
20AES0504			0	0	3	1.5
Pre-requisite	Basic Mathematics	Semester	I - II			

Course Objectives:

- 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):

- **CO1:** Select the data structure appropriate for solving the problem
- **CO2:** Implement searching and sorting algorithms
- **CO3:** Derive new data types
- **CO4:** Illustrate the working of linear and non linear data structure
- **CO5:** Organize the data using Files structure

Laboratory Experiments

1. String operations using array of pointers
2. Searching Algorithms (With the Number of Key Comparisons) Sequential, Binary and Fibonacci Search Algorithms.
3. 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.
4. Implementation of Singly Linked List, Doubly Linked List, Circular Linked List
5. Stack implementation using arrays
6. Stack implementation using linked lists
7. 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.
8. Queue implementation using linked lists
9. Creation of binary search tree, performing operations insertion, deletion, and traversal.
10. Breadth first search
11. Depth first search
12. Travelling sales man problem
13. File operations
14. Indexing of a file
15. Reversing the links (not just displaying) of a linked list.
16. 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.
17. 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:

1. Ellis Horowitz and Sartaj Sahni, "Fundamentals of Data Structures in C", 2nd Edition, Galgotia Book Source, Pvt. Ltd., 2004.
2. Alan L. Tharp, "File Organization and Processing", Wiley and Sons, 1988.

Reference Books:

1. D. Samanta, "Classic Data Structures", 2nd Edition, Prentice-Hall of India, Pvt. Ltd., India, 2012.
2. Richard F.Gilberg, Behrouz A.Forouzan, "Data Structures A Pseudo code Approach with C", Second Edition, Cengage Learning 2005.

Online Learning Resources:

https://www.youtube.com/watch?v=zWg7U0OEAoE&list=PLBF3763AF2E1C572F

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2		2								2	2	
CO2	3	2	2	2	2							1	2	2
CO3	3	2	2	2								1	2	1
CO4	3	2	2	2	2							1	2	
CO5	3	2	2	2								1	2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Environmental Studies		L	T	P	C
20AMC9903			3	0	0	0
Pre-requisite	Basic Environmental Knowledge	Semester	I - II			

Course Outcomes (CO):

- **CO1:** Students get sufficient information that clarifies modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.
- **CO2:** 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.
- **CO3:** 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.
- **CO4:** . Interpretation of different types of environmental pollution problems and designing of new solid waste management techniques usage.
- **CO5:** To get knowledge on various environmental acts and to engage all the students life - long learning of rain water harvesting.

UNIT – I 18 Hrs

Multidisciplinary Nature o**f Environmental Studies:** Introduction – Multidisciplinary Nature of Environmental Studies – Definition, Scope and Importance – Need for Public Awareness.
Natural Resources: Renewable and non-renewable energy resources – Natural resources and associated problems.
Forest resources: Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people.
Water resources: Use and over utilization of surface and sub-surface – Floods, drought, conflicts over water, dams – benefits and problems.
Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticides problems, water logging, salinity, case studies.
Energy resources: Renewable and non-renewable energy resources.

UNIT – II 20 Hrs

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).
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-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man – wildlife conflicts – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III 10 Hrs

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.
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.

UNIT – IV 15 Hrs

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.

UNIT – V 10 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:

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:

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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2					1					1		
CO2		3					2							
CO3		3			2							1		
CO4		2												
CO5					3		2					1		

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)
COMPUTER SCIENCE AND ENGINEERING (CSE)
(Effective for the batches admitted in 2020-21)

Semester III (Second year) – AK20

S.No	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P	C			
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**

Course Code	Discrete Mathematical Structures (common to CSE,CIC,AIDS,AIML,CSE(DS))		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):

CO1: Make use of mathematical logic to solve problems
CO2: Analyse the concepts and perform the operations related to sets, relations and functions.
CO3: Identify basic counting techniques to solve combinatorial problems.
CO4: evaluate solutions by using recurrence relations
CO5: utilize 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:

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:

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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3													
CO3	3													
CO4	3													
CO5	3													

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Digital Electronics & Microprocessors (common to CSE,CIC,AIDS,AIML,CSE(DS))		L	T	P	C
20APC0503			3	0	0	3
Pre-requisite	**Basic Electronics**	**Semester**	**II-I**			

Course Objectives:

- 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:

CO1: Design Logic circuit using basic concepts of Boolean algebra.
CO2: Design Logic circuit using basic concepts of PLDs.
CO3: Design sequential logic circuits.
CO4: Design application using 8086 Microprocessor.
CO5: Design 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:

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

Reference Books:

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

Online Learning Resources:

NPTEL, SWAYAM

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2										1	
CO2	3	2	2										2	
CO3	3	2	2	1									2	
CO4	3	2	2	1									2	1
CO5	3	2	2	1									2	1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Database Management Systems (common to CSE,CIC,AIDS,AIML,CSE(DS))		L	T	P	C
20APC0502			3	0	0	3
Pre-requisite	NIL	Semester	II-I			

Course Objectives:

This course is designed to:

- 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

CO1: know the fundamentals of Databases
CO2: Understand SQL and PL/SQL Concepts
CO3: Design a database for a real-world information system
CO4: Process and Optimize the query
CO5: 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, StevenMorris, Peter Robb, Cengage Learning.
3. Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke,TMH

Online Learning Resources:

https://onlinecourses.nptel.ac.in/noc21_cs04/preview

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2													
CO2	2				2									
CO3	2	1	2											
CO4	3	2	3										2	
CO5	2	2												

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Basics of Python Programming (common to CSE,CIC)		L	T	P	C
20APC0526			3	0	0	3
Pre-requisite	**NILL**	**Semester**	**II-I**			

Course Objectives:

- 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):

CO1: Understanding the syntax and semantics of Python programming.
CO2: Apply modularity to programs.
CO3: Select appropriate data structure of Python for solving a problem.
CO4: Implement Mutable and Immutable data types
CO5: Interpret the concepts of object oriented programming as used in Python

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 __str__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, 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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2		2									
CO2	2			2									2	1
CO3	2	2	2	2									2	1
CO4	2		3		2								2	1
CO5	2	2	3		3				2				2	1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Basics of Electrical & Electronics Engineering (common to CSE,CIC,CSE(DS))		L	T	P	C
20AES0205			3	0	0	3
Pre-requisite	NIL	Semester	II-I			

Course Outcomes (CO):

CO1: Apply concepts of KVL/KCL in solving DC circuits
CO2: Illustrate working principles of induction motor - DC Motor
CO3: Identify type of electrical machine based on their operation
CO4: Describe operation and characteristics of diodes and transistors.
CO5: Make use of diodes and transistors in simple, typical circuit applications.
CO6: 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:

1. D. P. Kothari and I. J. Nagrath - "Basic Electrical Engineering" - Tata McGraw Hill - 2010.
2. V.K. Mehta & Rohit Mehta, "Principles of Power System" – S.Chand – 2018.

References:

1. L. S. Bobrow - "Fundamentals of Electrical Engineering" - Oxford University Press - 2011.
2. E. Hughes - "Electrical and Electronics Technology" - Pearson - 2010.
3. C.L. Wadhwa – "Generation Distribution and Utilization of Electrical Energy", 3rd Edition, New Age International Publications.

PART-B (Electronics Engineering)

UNIT - I	Analog Electronics:	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.
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 - II	Digital Electronics:	10Hrs

Introduction, Switching and Logic Levels, Digital Waveform, characteristics of digital ICs, logic gates, number systems, combinational circuits - adders, multiplexers, decoders; introduction to sequential circuits, flip flops, shift register, binary counter.

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:

1. D.P. Kothari, I.J.Nagrath, Basic Electronics, 2nd edition, McGraw Hill Education(India)Private Limited
2. S.K. Bhattacharya, Basic Electrical and Electronics Engineering, 2nd edition, Pearson India Private Limited

Reference Books:

1. R. Muthu subramanian, S. Salivahanan, "Basic Electrical and Electronics Engineering", Tata McGraw-Hill Education, Reprint 2012.
2. David Bell, Electronic Devices and Circuits: Oxford University Press, 5th edition. 2008.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	2	1								2	
CO2	3	2	1	2									1	
CO3	3	1	1										1	
CO4	3	2	1	2									2	
CO5	3	1	1	2	1								2	
CO6	3	1											1	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Database Management Systems Laboratory (common to CSE,CIC,AIDS,AIML,CSE(DS))		L	T	P	C
20APC0505			0	0	3	1.5
Pre-requisite		Semester	II-I			

Course Objectives:

- 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
CO1: Write SQL Queries
CO2: Implement PL/SQL programs
CO3: Design database for any real world problem

List of Experiments:

Week-1: CREATION OF TABLES

1. Create a table called Employee with the following structure.

Name	Type
Empno	Number
Ename	Varchar2(20)
Job	Varchar2(20)
Mgr	Number
Sal	Number

- 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 is19.

2. Create department table with the following structure.

Name	Type
Deptno	Number
Deptname	Varchar2(20)
location	Varchar2(20)

a. Add column designation to the department table.
b. Insert values into the table.
c. List the records of emp table grouped by deptno.
d. Update the record where deptno is 9.
e. Delete any column data from the table

3. Create a table called Customer table

Name	Type
Cust name	Varchar2(20)
Cust street	Varchar2(20)
Cust city	Varchar2(20)

a. Insert records into the table.
b. Add salary column to the table.
c. Alter the table column domain.
d. Drop salary column of the customer table.
e. Delete the rows of customer table whose ust_city is 'hyd'.

4. Create a table called branch table.

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 thanor 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 assingle 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 o pint 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 fist 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 on 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 particularsubject 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 personaldetails 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 andinsurance details. It is the company policy not to keep any car for a period exceeding one year. Allmajor 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 detailssuch 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 ofstudy. 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 theycome 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. Studentsare 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 aboutstudents 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 primarykeys 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 aught.

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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1		2		1								1	
CO2	2		2		1								1	
CO3	3	2	2		2				2				2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Basics of Python Programming Lab (common to CSE,CIC)		L	T	P	C
20APC0527			0	0	3	1.5
Pre-requisite	NIL	Semester	II-I			

Course Objectives:

- To train the students in solving computational problems
- To elucidate solving mathematical problems using Python programming language
- To understand the fundamentals of Python programming concepts and its applications.
- To understand the object-oriented concepts using Python in problem solving.

Course Outcomes (CO):

CO1: Write, Test and Debug Python Programs
CO2: Implement Conditionals and Loops for Python Programs
CO3: Use functions and represent Compound data using Lists, Tuples and Dictionaries
CO4: Read and write data from & to files in Python and develop Application using Python
CO5: Implement the problem in terms of real world object using OOPs concepts

List of Experiments:

1. Install Python Interpreter and use it to perform different Mathematical Computations. Try to do all the operations present in a Scientific Calculator
2. Write a function that draws a grid like the following:

```
+ - - - - + - - - - +
|         |         |
|         |         |
|         |         |
|         |         |
+ - - - - + - - - - +
|         |         |
|         |         |
|         |         |
|         |         |
+ - - - - + - - - - +
```

3. Write a function that draws a Pyramid with # symbols

```
          #
        # # #
      # # # # #
    # # # # # # #
```

   Up to 15 hashes at the bottom
4. Using turtles concept draw a wheel of your choice
5. Write a program that draws Archimedean Spiral
6. The letters of the alphabet can be constructed from a moderate number of basic elements, like vertical and horizontal lines and a few curves. Design an alphabet that can be drawn with a minimal number of basic elements and then write functions that draw the letters. The alphabet can belong to any Natural language excluding English. You should consider at least Ten letters of the alphabet.
7. The time module provides a function, also named time that returns the current Greenwich Mean Time in "the epoch", which is an arbitrary time used as a reference point. On UNIX systems, the epoch is 1 January 1970.
   >>> import time
   >>>time.time()
   1437746094.5735958
   Write a script that reads the current time and converts it to a time of day in hours, minutes, and seconds, plus the number of days since the epoch.
8. Given n+r+1 <= 2r . n is the input and r is to be determined. Write a program which computes minimum value of r that satisfies the above.
9. Write a program that evaluates Ackermann function
10. The mathematician Srinivasa Ramanujan found an infinite series that can be used to generate a numerical approximation of 1/ π :
    Write a function called estimate_pi that uses this formula to compute and return an estimate of π.

$$\frac{1}{\pi} = \frac{2\sqrt{2}}{9801} \sum_{k=0}^{\infty} \frac{(4k)!(1103 + 26390k)}{(k!)^4 396^{4k}}$$

    It should use a while loop to compute terms of the summation until the last term is smaller than 1e-15 (which is Python notation for 10 -15). You can check the result by comparing it to math.pi.
11. Choose any five built-in string functions of C language. Implement them on your own in Python. You 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 latter (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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	2	2								1	1
CO2	2	1	3		2								1	2
CO3	2	1	3		2								2	2
CO4	2	1	3		2								2	2
CO5	3	2	2		2				2			3	2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Basics of Electrical & Electronics Engineering Lab (common to CSE,CIC,CSE(DS))		L	T	P	C
20AES0206			0	0	3	1.5
Pre-requisite	NIL	Semester	II-I			

Course Outcomes (CO):

CO1: Verify Kirchoff's Laws & Superposition theorem for dc supply
CO2: Analyze the performance of AC and DC Machines by testing.
CO3: Study I – V Characteristics of PV Cell & Perform speed control of dc shunt motor
CO4: Ability to operate diodes for finding V-I Characteristics.
CO5: Ability to construct and operate rectifiers without & with filters
CO6: Ability to construct and operate BJT & FET Characteristics.

List of Experiments:

Part A: Electrical Engineering Lab

1. Verification of Kirchhoff laws.
2. Verification of Superposition Theorem.
3. Open circuit characteristics of a DC Shunt Generator.
4. Speed control of DC Shunt Motor.
5. OC & SC test of 1 – Phase Transformer.
6. Brake test on 3 - Phase Induction Motor.
7. Brake test on DC Shunt Motor

Part B: Electronics Engineering Lab

1. PN Junction Diode Characteristics.
2. Zener Diode Characteristics.
3. Rectifiers (With and Without Filter).
4. BJT Characteristics (CB Configuration).
5. BJT Characteristics (CE Configuration).
6. FET Characteristics (CS Configuration).

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2										2	
CO2	3	2	2										2	
CO3	3	1	1										2	
CO4	3	2	2										2	
CO5	3	1	2										2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Client Side Scripting (common to CSE,CIC,AIDS,AIML)		L	T	P	C
20ASC0501			1	0	2	2
Pre-requisite	HTML	Semester	II-I			

Course Objectives:

- 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):

CO1: Analyze and understand the basic concepts of web programming.
CO2: Implement Arrays, Functions and Strings
CO3: Apply techniques of form validation using Java Script.
CO4: Describe important concepts related to client side Web Security.
CO5: Save client information in cookie by server

UNIT - I | **Basics of JavaScript Programming** | 3+6 Hrs

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.

- 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

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().

- 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

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.

- 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

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 and methods.

UNIT - V	**Cookies and Browser Data**	3+6 Hrs

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.

- 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:

1. Javascript Beginners Guide, John Pollock, TMH, 4th Edition
2. JavaScript. Demystified, JIM KEOGH , McGraw-Hill.

Reference Books:

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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2											2	
CO2	2	2	2										1	1
CO3	2	2												
CO4	2	2	2										1	
CO5	2	2			2									2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Constitution Of India		L	T	P	C
20AMC9902	(common to CSE,CIC,AIDS,AIML,CSE(DS))		3	0	0	0
Pre-requisite	NIL	Semester	II-I			

Course Outcomes (CO):

Students will be able to:

- **CO1:** Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- **CO2:** Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- **CO3:** 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.
- **CO4:** Discuss the Powers and functions of Governor, President, Judiciary.
- **CO5:** 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:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						3								
CO2						3								
CO3						2								
CO4						3								
CO5						3								

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)
COMPUTER SCIENCE AND ENGINEERING (CSE)
(Effective for the batches admitted in 2020-21)

Semester IV (Second year) – AK20

S.No	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P	C			
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**

Community service Project with credits

(To visit the selected community to conduct survey (Socio-economic & domain survey) and conduct sensitization/awareness program/activities at the end of IV- semester before commencement of V-semester and complete immersion programme also during V-Semester and submit report in V - semester. Assessment will be done at the end of V-Semester).

Course Code	Computer Organization (common to CSE,CIC,CSE(DS))		L	T	P	C
20APC0506			3	0	0	3
Pre-requisite	Digital Electronics	Semester	II-II			

Course Objectives:

- 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

CO1: Understand computer architecture concepts related to the design of modern processors, memories and I/Os
CO2: Design Arithmetic and control unit
CO3: Identify the hardware requirements of Primary and Secondary memory
CO4: Understand the importance of I/O devices and its interface circuits.
CO5: 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, ZvonkoVranesic, SafwatZaky, “Computer Organization”, 5th Edition, McGraw Hill Education, 2013.

Reference Books:

1. M.Morris Mano, “Computer System Architecture”, 3rd Edition, Pearson Education.
2. Themes and Variations, Alan Clements, “Computer Organization and Architecture”, CENGAGE Learning.
3. SmrutiRanjanSarangi, “Computer Organization and Architecture”, McGraw Hill Education.
4. John P.Hayes, “Computer Architecture and Organization”, McGraw Hill Education

Online Learning Resources:

https://nptel.ac.in/courses/106/103/106103068/

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2											
CO2	2	2	2										2	
CO3	1													
CO4	2													1
CO5	2	2	2										2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Design And Analysis Of Algorithms (common to CSE,CSE(DS))		L	T	P	C
20APC0511			3	0	0	3
Pre-requisite	**NIL**	**Semester**	**II-II**			

Course Objectives:

- 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):

CO1: Analyze the complexity of the algorithms
CO2: Use techniques of greedy and dynamic programming to solve the problems.
CO3: Implement traversal, backtracking and searching techniques.
CO4: choose the appropriate algorithm for solving minimization problem.
CO5: 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, Stressen'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 beingin P, Cook's Theorem, Reduction Source Problems, Reductions: Reductions for some known problems

Textbooks:

1. "Fundamentals of Computer Algorithms", Ellis Horowitz, S. Satraj Sahani and Rajasekhran, 2nd edition, University Press.2014,
2. "Design and Analysis of Algorithms", Parag Himanshu Dave, Himanshu Bhalchandra Dave, Pearson Education, Second Edition, 2009.

Reference Books:

1. "Introduction to Algorithms", second edition, T.H.Cormen, C.E.Leiserson, R.L.Rivest and C.Stein, PHI Pvt. Ltd./ Pearson Education.
2. "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.
3. "Design and Analysis of algorithms", Aho, Ullman and Hopcroft, Pearson education.

Online Learning Resources:

nptel videos

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2										3	
CO2	2	2	2										2	
CO3	2	2	2	2									2	
CO4	2	2	2	2									2	
CO5	2	1	2										2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Object Oriented Programming through Java (common to CSE,CIC,CSE(DS))		L	T	P	C
20APC0512			3	0	0	3
Pre-requisite	NIL	Semester	II-II			

Course Objectives:

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

- 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):

CO1: Understanding the Syntax, Semantics and features of Java Programming Language.
CO2: To gain knowledge on Object Oriented Programming concepts.
CO3: Raise Exceptions and handle exceptions.
CO4: Analyze the method of creating Multi-threading programs
CO5: 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:

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:

1. J.Nino and F.A. Hosch, An Introduction to programming and OO design using Java, John Wiley & sons.
2. Y. Daniel Liang, Introduction to Java programming, Pearson Education 6th Edition
3. R.A. Johnson- Thomson, An introduction to Java programming and object oriented application development.
4. P. Radha Krishna, Object Oriented Programming through Java, University Press.

Online Learning Resources:

www.javatpoint.com

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2			3								1	1
CO2	1	1	3										1	1
CO3	1		3	1									1	1
CO4	1	2	3										1	1
CO5	2	1	2		3								1	1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Operating Systems		L	T	P	C
20APC0515	(common to CSE,CIC,AIDS,AIML,CSE(DS))		3	0	0	3
Pre-requisite	Basics of CO and DBMS	Semester	II-II			

Course Objectives:

The course is designed to

- 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):

After completion of the course, students will be able to

CO1: Distinguish between the different types of operating system environments.
CO2: Apply the concepts of process synchronization & CPU scheduling
CO3: Develop solutions to deadlock and memory management
CO4: Analyze various disk scheduling algorithms and file system interfaces
CO5: Analyze the various security issues and goals of protection

UNIT - I 9 Hrs

Operating Systems Overview: Operating system functions, Operating system structure, operating systems Operations, protection and security, Computing Environments, Open- Source Operating Systems
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.
Processes: Process concept, process Scheduling, Operations on processes, Inter process Communication, Examples of IPC systems.

UNIT - II 10Hrs

Threads: overview, Multi-core Programming, Multithreading Models, Thread Libraries, Implicit Threading, Threading Issues.
Process Synchronization: The critical-section problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic problems of synchronization, Monitors, Synchronization examples, Alternative approaches.
CPU Scheduling: Scheduling-Criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling, Real-Time CPU Scheduling, Algorithm Evaluation.

UNIT - III 8Hrs

Memory Management: Swapping, contiguous memory allocation, segmentation, paging, structure of the page table.
Virtual memory: demand paging, page-replacement, Allocation of frames, Thrashing, Memory-Mapped Files, Allocating Kernel Memory
Deadlocks: System Model, deadlock characterization, Methods of handling Deadlocks, Deadlock prevention, Detection and Avoidance, Recovery from deadlock.

UNIT - IV 9Hrs

Mass-storage structure: Overview of Mass-storage structure, Disk structure, Disk attachment, Disk scheduling, Swap-space management, RAID structure, Stable-storage implementation.
File system Interface: The concept of a file, Access Methods, Directory and Disk structure, File system mounting, File sharing, Protection.
File system Implementation: File-system structure, File-system Implementation, Directory Implementation, Allocation Methods, Free-Space management.

UNIT - V 8Hrs

I/O systems: I/O Hardware, Application I/O interface, Kernel I/O subsystem, Transforming I/O requests to Hardware operations.
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
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.

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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**2**	**2**											**1**	**1**
CO2	**2**												**1**	**1**
CO3	**3**	**3**	**3**										**2**	**2**
CO4			**2**	**2**									**2**	**2**
CO5	**2**	**2**										**1**	**2**	**2**

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Managerial Economics And Financial Analysis (common to CSE,CIC,AIDS,AIML,CSE(DS))		L	T	P	C
20AHSMB01			3	0	0	3
Pre-requisite	**NIL**	**Semester**	**II-II**			

Course Outcomes (CO):

After completion of this course, the student will able,

CO1: Understand the fundamentals of Economics and Managerial economics viz., Demand, Production, cost, revenue and markets.

CO2: Apply the Concept of Production cost and revenues for effective Business decision

CO3: Analyze how to invest their capital and maximize returns.

CO4: Evaluate the capital budgeting techniques.

CO5: 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:

1. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019

Reference Books:

1. Ahuja Hl Managerial economics Schand,3/e,2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2013.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. 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.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3						1				1			
CO2	1	2												
CO3	2					1								
CO4											3			
CO5				2							2			

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Universal Human Values (common to CSE,CIC,AIDS,AIML,CSE(DS))		L	T	P	C
20AHS9905			2	1	0	3
Pre-requisite	NIL	Semester	II-II			

Course Objectives :

- 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

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

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

CO3: They would have better critical ability.

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

CO5: 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

- 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.

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.

UNIT - II	Understanding Harmony in the Human Being - Harmony in Myself!	10Hrs

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

UNIT -III	Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship.	8Hrs

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

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

UNIT –IV	Understanding Harmony in the Nature and Existence - Whole existence as Coexistence	9Hrs

- 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.

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.

UNIT – V	Implications of the above Holistic Understanding of Harmony on Professional Ethics.	8Hrs

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
- Sum up.

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

Textbooks:

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books:

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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								3						
CO2								3						
CO3								3						
CO4								3						
CO5								3						

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Computer Organization Lab		L	T	P	C
20APC0504			0	0	2	1
Pre-requisite	C programming	Semester	II-II			

Course Objectives:

- 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):

CO1: Represent numbers and perform arithmetic operations.
CO2: Minimize the Boolean expression using Boolean algebra and design it using logic gates
CO3: Analyze and design combinational circuit.
CO4: Design and develop sequential circuits
CO5: Understand and apply the working of different operations on binary numbers.

List of Experiments:

Exercises in Digital Electronics:

- 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)

- 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

- 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:

- 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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2										1	1
CO2	2	3	2										1	1
CO3	2	3	2										2	
CO4	2	2	2										2	2
CO5	3	2	2										2	1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Object Oriented Programming through Java Lab (common to CSE,CIC,CSE(DS))		L	T	P	C
20APC0514			0	0	4	2
Pre-requisite	NIL	Semester	II-II			

Course Objectives:

- 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):

CO1: Demonstrate java compiler and eclipse platform and learn how to use net beans IDE to create java application
CO2: Ability to create user friendly interfaces
CO3: Ability to solve the problem using object oriented approach and design solutions which are robust
CO4: Implement exception handling and Templates
CO5: Ability to create GUI components and implementations

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 ―Compute‖ 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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		1		3									
CO2	2	2	2											
CO3	1	2	2	1										
CO4		1	2	2										
CO5		1	2	2	3			3						

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Operating Systems Lab (common to CSE,CIC,AIDS,AIML,CSE(DS))		L	T	P	C
20APC0513			0	0	3	1.5
Pre-requisite	Basics of CO and DBMS	Semester	II-II			

Course Objectives:

- To understand the design aspects of operating system
- To solve various synchronization problems

Course Outcomes (CO):

CO1: Ensure the development of applied skills in operating systems related areas.
CO2: Able to write software routines modules or implementing various concepts of operating system.

List of Experiments to be implemented in C/Java

1. Practicing of Basic UNIX Commands.
2. Write programs using the following UNIX operating system calls Fork, exec, getpid, exit, wait, close, stat, opendir and readdir
3. Simulate UNIX commands like cp, ls, grep, etc.,
4. Simulate the following CPU scheduling algorithms: a) Round Robin b) SJF c) FCFS d) Priority
5. Simulate all file allocation strategies: a) Sequential b) Indexed c) Linked
6. Simulate MVT and MFT
7. Simulate all File Organization Techniques a) Single level directory b) Two level c) Hierarchical d) DAG
8. Simulate Bankers Algorithm for Deadlock Avoidance
9. Simulate Bankers Algorithm for Deadlock Prevention
10. Simulate all page replacement algorithms a) FIFO b) LRU c) LFU Etc. …
11. Simulate Paging Technique of memory management
12. Control the number of ports opened by the operating system with a) Semaphore b) monitors
13. Simulate how parent and child processes use shared memory and address space
14. Simulate sleeping barber problem
15. Simulate dining philosopher's problem
16. Simulate producer and consumer problem using threads (use java)
17. Simulate little's formula to predict next burst time of a process for SJF scheduling algorithm.
18. Develop a code to detect a cycle in wait-for graph
19. Develop a code to convert virtual address to physical address
20. Simulate how operating system allocates frame to process
21. Simulate the prediction of deadlock in operating system when all the processes announce their resource requirement in advance.

References:

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

Online Learning Resources/Virtual Labs:

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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2									2	
CO2		3	3	3									2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Server Side Scripting (common to CSE,CIC,AIDS,AIML)		L	T	P	C
20ASC0502			1	0	2	2
Pre-requisite	**HTML, JavaScript**	**Semester**	**II-II**			

Course Objectives:

- 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):

CO1: Learn the installation guide of MYSQL,XAMPP5,APACHE and PHP
CO2: Able to design code for simple dynamic web pages
CO3: Design PHP and SQL/MySQL Integration.
CO4: Design Basic Projects
CO5: Able to provide protection to web server

UNIT - I 10 Hrs

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

1. Installation of XAMPP server
2. Write PHP code to print Hello World program
3. Demonstrate 8 basic data types in PHP.
4. Demonstrate the scope of variables declared in PHP code.
5. Demonstrate Arithmetic, Comparison, Logical (or Relational), Assignment and Conditional (or ternary) Operators.
6. Demonstrate if, elseif ...else and switch statements.
7. Demonstrate for, while, do – while, and for each loop.
8. Write code to create and access numeric arrays.
9. Demonstrate the usage of associative arrays.
10. Implement Multi-dimensional arrays
11. 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.
12. 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.
13. Create a class called baseCalc() that stores two numbers as properties. Next, create a calculate() method that prints the numbers to the browser.
14. 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

Working with Strings, Dates, and Time - Working with Forms - Working with Cookies and User Sessions - Working with Files and Directories - Working with Images

1. 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.
2. 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.
3. 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.
4. 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.
5. Use hidden fields with the script you created in activity 1 to store and display the number of requests that the user submitted.
6. Create a script that uses session functions to track which pages in your environment the user has visited.
7. Create a new script that will list for the user all the pages he/she has visited within your environment, and when.
8. Create a form that accepts a user's first and second name. Create a script that saves this data to a file.
9. 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.
10. Draw a New Image, shapes and lines.
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

Understanding the Database Design Process - Learning Basic SQL Commands - Using Transactions and Stored Procedures in MySQL - Interacting with MySQL Using PHP

Write PHP code

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

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

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

Apache Performance Tuning and Virtual Hosting - Setting Up a Secure Web Server - Optimizing and Tuning MySQL - Performing Software Upgrades - Using Application Frameworks

Textbooks:

1. Sams Teach Yourself PHP, MySQL and Apache All in One, by Julie C. Meloni, Pearson Education, Inc © 2012.

Reference Books:

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:

www.nptelvideos.com, https://www.tutorialspoint.com/php/

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1													
CO2	1													
CO3	1		2		2				2	1	2	3		2
CO4	1													
CO5	1													

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)
COMPUTER SCIENCE AND ENGINEERING (CSE)
(Effective for the batches admitted in 2020-21)

Semester V (Third year)

S.No	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P	C			
1	PC	20APC0516	Computer Networks	3	0	0	3	30	70	100
2	PC	20APC0518	Formal Languages & Automata Theory	3	0	0	3	30	70	100
3	PC	20APC0519	Software Engineering	3	0	0	3	30	70	100
4	OE-1	20APE0417 20AOE0303 20AOE9925	Sensors and IoT Optimization Techniques Deterministic & Stochastic Statistical Methods	3	0	0	3	30	70	100
5	PE-1	20APE0501 20APE0502 20APE0503	Data Warehousing and Mining Design Patterns Computer Graphics	3	0	0	3	30	70	100
6	PC Lab	20APC0520	Software Engineering Lab	0	0	3	1.5	30	70	100
7	PC Lab	20APC0517	Computer Networks Simulation Lab	0	0	3	1.5	30	70	100
8	SC	20ASA0503	Mobile Application Development	1	0	2	2	100	0	100
9	MC	20AMC9901	Biology for Engineers	3	0	0	0	30	0	30
10	CSP	20CSP0501	Community service project	0	0	0	1.5	100	0	100
Total credits							**21.5**	**440**	**490**	**930**

Course Code	Computer Networks		L	T	P	C
20APC0516			3	0	0	3
Pre-requisite	Digital Communications and Operating Systems	Semester	III-I			

Course Objectives:

The students will be able to
- Run and manage the Internet, part of the Internet, or an organization's network that is connected to the Internet.
- understand the basics of data communications and networking
- the protocols used in the Internet communication

Course Outcomes:

CO1: understand the basics of data communications and networking
CO2: classify the functionalities of two sub layers of Data link Layer
CO3: know briefly about Network Layer through algorithms and protocols
CO4: distinguish the services provided by Transport Layer
CO5: recognize the services offered by Application Layer to the user

UNIT - I 9 Hrs

Introduction: Data Communications, Networks, Network Types, Internet History, Standards and Administration.
Network Models: Protocol Layering, TCP/IP Protocol Suite, The OSI Model
Introduction to Physical Layer: Data and Signals, Transmission Impairment, Data Rate Limits, Performance.
Transmission Media: Introduction, Guided Media, Unguided Media, Switching: Introduction, Circuit Switched Networks, Packet Switching

UNIT - II 9Hrs

The Data Link Layer: Introduction, Link layer addressing, Error detection and Correction: Cyclic codes, Checksum, Forward error correction, Data link control: DLC Services, Data link layer protocols, HDLC, Point to Point Protocol.
Media Access control: Random Access, Controlled Access, Channelization, Connecting devices and virtual LANs: Connecting Devices.

UNIT - III 9 Hrs

The Network Layer: Network layer design issues, Routing algorithms, Congestion control algorithms, Quality of service, Internetworking.
The network layer in the Internet: IPV4 Addresses, IPV6, Internet Control protocol, OSPF, BGP, IP, ICMPv4, IGMP.

UNIT - IV 9 Hrs

The Transport Layer: The Transport Service, Elements of Transport Protocols, Congestion Control, The internet transport protocols: UDP, TCP, Performance problems in computer networks, Network performance measurement.

UNIT - V 9 Hrs

The Application Layer: Introduction, Client-Server Programming, WWW and HTTP, FTP, e-mail, TELNET, Secure Shell, Domain Name System, SNMP.

Textbooks:

1. "Data communications and networking", Behrouz A. Forouzan, Mc Graw Hill Education, 5th edition, 2012.
2. "Computer Networks", Andrew S. Tanenbaum, Wetherall, Pearson, 5th edition, 2010.

Reference Books:

1. Data Communication and Networks, Bhushan Trivedi, Oxford
2. "Internetworking with TCP/IP – Principles, protocols, and architecture - Volume 1, Douglas E. Comer, 5th edition, PHI
3. "Computer Networks", 5E, Peterson, Davie, Elsevier.
4. "Introduction to Computer Networks and Cyber Security", Chawan- Hwa Wu, Irwin, CRC Publications.
5. "Computer Networks and Internets with Internet Applications", Comer.

Online Learning Resources:

https://www.youtube.com/watch?v=O--rkQNKqls&list=PLbRMhDVUMngf-peFloB7kyiA40EptH1up

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3												2	
CO2	2	3											2	
CO3	2	2	3		1								2	
CO4	2	3	3		2								3	2
CO5	2	2											1	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Formal Languages and Automata Theory (common to CSE,AIML)		L	T	P	C
20APC0518			3	0	0	3
Pre-requisite	Discrete Mathematics and Data Structures	Semester	III-I			

Course Objectives:

- Understand formal definitions of machine models. Classify machines by their power to recognize languages. Understanding of formal grammars, analysis
- Understanding of hierarchical organization of problems depending on their complexity
- Understanding of the logical limits to computational capacity Understanding of undecidable problems

Course Outcomes:

CO1: Design finite state machines to recognize formal languages.
CO2: Identify different types of grammars in formal languages.
CO3: Construct context free grammars for context free languages
CO4: Find solutions to the problems using PDA.
CO5: Develop Turing machine for different computational problems.

UNIT - I Introduction to Finite Automata — 9 Hrs

Introduction: Alphabet, languages and grammars, productions and derivation, Chomsky hierarchy of languages.
Finite Automata: An Informal picture of Finite Automata, Deterministic Finite Automata (DFA), Non Deterministic Finite Automata (**NFA**), Finite Automata with Epsilon transitions (ϵ-NFA or NFA- ϵ), Finite Automata with output, Conversion of one machine to another, Minimization of Finite Automata, Myhill- Nerode Theorem.

UNIT - II Regular Language — 9Hrs

Regular Languages: Regular Expressions (RE), Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic laws for Regular Expressions, The Arden_s Theorem, Using Arden's theorem to construct RE from FA, Pumping Lemma for RLs, Applications of Pumping Lemma, Equivalenceof Two FAs, Equivalence of Two REs, Construction of Regular Grammar from RE, Constructing FA from Regular Grammar, Closure properties of RLs, Decision problems of RLS, Applications of REs and FAs

UNIT - III Context Free Grammars and Languages — 9 Hrs

Context Free Grammars and Languages: Definition of Context Free Grammars (CFG), Derivations and Parse trees, Ambiguity in CFGs, Removing ambiguity, Left recursion and Left factoring, Simplification of CFGs, Normal Forms, Linear grammars, Closure properties for CFLs, Pumping Lemma for CFLs, Decision problems for CFLs, CFG and Regular Language.

UNIT - IV Push Down Automata — 9 Hrs

Push Down Automata (PDA): Informal introduction, The Formal Definition, Graphical notation, Instantaneous description, The Languages of a PDA, Equivalence of PDAs and CFGs, Deterministic PushDown Automata, Two Stack PDA.

UNIT - V Turing Machines and Undecidability — 9 Hrs

Turing Machines and Undecidability: Basics of Turing Machine (TM), Transitional Representation of TMs, Instantaneous description, Non Deterministic TM, Conversion of Regular Expression to TM, Two stack PDA and TM, Variations of the TM, TM as an integer function, Universal TM, Linear Bounded Automata, TM Languages, Unrestricted grammar , Properties of Recursive and Recursively enumerable languages, Undecidability, Reducibility, Undecidable problems about TMs, Post's Correspondence Problem(PCP), Modified PCP

Textbooks:

1. Introduction to Automata Theory, Formal Languages and Computation, Shyamalendu Kandar, Pearson, 2013
2. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, Introduction to Automata Theory, Languages,and Computation, Pearson Education Asia.

Reference Books:

1. J.P. Trembley and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science,McGraw Hill Book Co.
2. Michael Sipser, Introduction to The Theory of Computation, Thomson Course Technology.
3. Harry R. Lewis and Christos H. Papadimitriou, Elements of the Theory of Computation, Pearson Education Asia.John E. Hopcroft and J.D.Ullman, Introduction to Automata Theory, Languages and Computation, Narosa Pub, 2021
4. Dexter C. Kozen, Automata and Computability, Undergraduate Texts in Computer Science, Springer.
5. Michael Sipser, Introduction to the Theory of Computation, PWS Publishing.
6. John Martin, Introduction to Languages and The Theory of Computation, Tata McGraw Hill.

Online Learning Resources:

https://www.youtube.com/channel/UCb8HLf1c_-m0MovWMWdg_bA

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2									2	
CO2	3	3												
CO3	3	3												
CO4	2	3	3										2	
CO5	3	3	3	3									2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Software Engineering		L	T	P	C
20APC0519			3	0	0	3
Pre-requisite	NIL	Semester	III-I			

Course Objectives:

To learn the basic concepts of software engineering and life cycle models

- To explore the issues in software requirements specification and enable to write SRS documents for software development problems
- To elucidate the basic concepts of software design and enable to carry out procedural and object oriented design of software development problems
- To understand the basic concepts of black box and white box software testing and enable to design test cases for unit, integration, and system testing
- To reveal the basic concepts in software project management

Course Outcomes:

CO1: Characterize software engineering models
CO2: Focus on analysis in software project management
CO3: Design important features of software project management
CO4: Test the software specifications
CO5: Measure the software quality

UNIT - I 9 Hrs

Introduction: Evolution, Software Development Projects, Exploratory style of Software Development, Emergence, Notable Changes in Software Development Practices, Computer Systems Engineering
Software Life Cycle Models: A few basic concepts, Waterfall Model and its extensions, RAD, Agile Development Models, Spiral Model, Comparison

UNIT - II 9Hrs

Software Project Management: SPM complexities, Responsibility of a software Development Manager, Project Planning, Metrics for Project Size Estimation, Project Estimation Techniques, Empirical Estimation Techniques, COCOMO, Halstead's Software Science, Staffing Level-Estimation, Scheduling, Organization and Team Structures, Risk Management, Software Configuration Management
Requirement Analysis and Specification: Requirements Gathering and Analysis, SRS, Formal System Specification, Axiomatic Specification, Algebraic Specification, Executable Specification and 4GL

UNIT - III 9 Hrs

Software Design: Overview of the Design Process, Characterize good design, Cohesion and Coupling, Layered Arrangement of Modules, Approaches to Software Design
Function-oriented Software Design: Overview, Structured Analysis, Developing the DFD model of a system, Structured Design, Detailed Design and Review
User Interface Design: Characteristics, Basic Concepts, Types, Fundamentals of Component-based GUI Development, A UI Design Methodology

UNIT - IV 9 Hrs

Object Modeling Using UML: Unified Modeling Language (UML), UML Diagrams, Use Case Model, Class Diagrams, Interaction Diagrams, Activity Diagram, State Chart Diagram, Package, Component, and Deployment Diagrams
Coding and Testing: Coding, Code Review, Software Documentation, Testing, Unit Testing, Black-Box Testing, White-box Testing, Debugging, Program Analysis Tools, Integration Testing, Testing Object-oriented Programs, System Testing, Issues associated with Testing

UNIT - V 9 Hrs

Software Reliability and Quality Management: Software Reliability, Statistical Testing, Software Quality, Software Quality Management System, ISO 9000, SEI Capability Maturity Model, Other Important Standards, Six Sigma
Software Reuse: What can be reused, Issues, A Reuse Approach, Reuse at Organization level
Emerging Trends: Client-Server Software, Architectures, CORBA, COM, DCOM, SOA, SAAS

Textbooks:

1. Fundamentals of Software Engineering, Rajib Mall, PHI Learning, 5th edition
2. Software Engineering: A Practitioner's Approach, R S Pressman, McGraw Hill Education, 7th edition

Reference Books:

1. Software Engineering, Ian Sommerville, Pearson Education, Tenth edition
2. Pankaj Jalote's Software Engineering: A Precise Approach, Wiley publications

Online Learning Resources:

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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3	3	2										3	
CO3	3	2	2	2									3	
CO4	2	2	2	1									2	2
CO5	2	2	2										2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Sensors and IoT		L	T	P	C
20APE0417			3	0	0	3
Pre-requisite	Nil	Semester	III-I			

Course Objectives:

- This Course focuses on hands-on IoT concepts such as sensing, actuation and communication. It covers the development of Internet of Things (IoT) prototypes—including devices for sensing, actuation, processing, and communication—to help you develop skills and experiences. The Internet of Things (IOT) is the next wave, world is going to witness. Today we live in an era of connected devices the future is of connected things.

Course Outcomes (CO):

Upon completion of the course, students will be able to

CO1: Understand the concepts of Converters and Sensor data acquisition systems.

CO2: Understand the concepts of various sensing technologies.

CO3: Acquire Knowledge in the basics of IoT and enabling technologies.

CO4: Design basic IoT applications using Arduino.

CO5: Design IoT applications using Raspberry pi.

UNIT - I	SENSOR DATA ACQUISITION SYSTEMS AND ARCHITECTURES:	9 Hrs

Introduction, General measurement system, Analog-to-digital converter architectures-Different types of ADCs – parallel comparator type ADC, Counter type ADC, successive approximation ADC and dual slope ADC Digital-to-Analog conversion-Basic DAC techniques, Weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC

UNIT - II	INTRODUCTION AND CLASSIFICATION OF SENSORS:	9Hrs

Introduction to sensors- Principles, Classifications, Parameters- Characteristics, Passive sensors- Introduction, Resistive Potentiometer, Strain Gauge, Inductive sensor, Capacitive senor, Recent trends in sensor technologies -Film sensors-Thin & Thick, MEMS-Micromachining, Nano sensors.

UNIT - III	INTRODUCTION TO INTERNET OF THINGS:	9 Hrs

Characteristics of IoT, Design principles of IoT, IoT Architecture and Protocols, Enabling Technologies for IoT, IoT levels and IoT vs M2M.IoT Design Methodology: Design methodology, Challenges in IoT Design, IoT System Management, IoT Servers

UNIT - IV	BASICS OF ARDUINO:	9 Hrs

Introduction to Arduino, Arduino IDE, Basic Commands for Arduino, Connecting LEDs with Arduino, Connecting LCD with Arduino. Arduino IDE Sketch examples – Blink LED, Control Actuator using Bluetooth, Read data from analog and digital sensor

UNIT - V	BASICS OF RASPBERRY PI:	9 Hrs

Introduction to Raspberry pi, Installation of NOOBS on SD Card, Installation of Raspbian on SD Card, Terminal Commands, Installation of Libraries on Raspberry Pi, Getting the static IP address of Raspberry Pi, Run a Program on Raspberry Pi, Installing the Remote Desktop Server, Pi Camera, Face Recognition using Raspberry Pi, Installation of I2C driver on Raspberry Pi, SPI (serial peripheral interface) with Raspberry Pi, Programming a Raspberry Pi, Play with LED and Raspberry Pi, Reading the digital input, Reading an edge triggered input, Interfacing of Relay with Raspberry Pi, Interfacing of Relay with Raspberry Pi, Interfacing of LCD with Raspberry, Pi, Interfacing of Relay with Raspberry Pi, Interfacing of LCD with Raspberry Pi, Interfacing LCD with Raspberry Pi in I2C mode, Interfacing of DHT11 sensor with Raspberry Pi, Interfacing of ultrasonic sensor with Raspberry Pi, Interfacing of camera with Raspberry pi.

Textbooks:

1. D.Patranabis, “Sensors & Transducers”, PHI, 2nd ed., 2018.
2. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014. (ISBN-13:978-0124076846)
3. Rajesh Singh, Anita Gehlot, Lovi Raj Gupta, Bhupendra Singh, Mahendra Swain, Internet of Things with Raspberry Pi and Arduino, CRC Press, 2019.

Reference Books:

1. H.S.Kalsi, "Electronic Instrumentation", 2nd ed., TataMcGrawHill 2004.
2. A.K. Sawhney,- A course in Electrical & Electronic Measurement and Instrumentation, Dhanpat Rai and Company Private Limited, Reprint: 2014.

Online Learning Resources:

https://www.youtube.com/results?search_query=Sensors+and+IoT+nptel+videos

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1											3	3
CO2	3		2										3	3
CO3	3												2	2
CO4	1		3										1	1
CO5	1		3										2	1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Optimization Techniques (common to CSE,CIC,AIDS,AIML)		L	T	P	C
20AOE0303			3	0	0	3
Pre-requisite	Problem Solving Skills	Semester	III-I			

Course Objectives:

- Operation research models using optimization techniques based upon the fundamentals of engineering mathematics (minimization and Maximization of objective function).
- The problem formulation by using linear, dynamic programming, game theory and queuing models.
- The stochastic models for discrete and continuous variables to control inventory and simulation of manufacturing models for the production decision making.
- Formulation of mathematical models for quantitative analysis of managerial problems in industry.

Course Outcomes (CO):

CO 1: Explain the need of optimization of engineering systems
CO 2: Understand optimization of electrical and electronics engineering problems
CO 3: Apply classical optimization techniques, linear programming, simplex algorithm, transportation problem
CO 4: Apply unconstrained optimization and constrained non-linear programming and dynamic programming
CO 5: Formulate optimization problems.

UNIT - I 9 Hrs

Introduction and Classical Optimization Techniques: Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of Optimization problems.
Classical Optimization Techniques: Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers – Multivariable Optimization with inequality constraints – Kuhn – Tucker conditions.

UNIT - II 9Hrs

Linear Programming: Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm.
Transportation Problem: Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems.

UNIT - III 9 Hrs

Unconstrained Nonlinear Programming: One dimensional minimization method, Classification, Fibonacci method and Quadratic interpolation method Unconstrained Optimization Techniques: Univariant method, Powell's method and steepest descent method.

UNIT - IV 9 Hrs

Constrained Nonlinear Programming: Characteristics of a constrained problem - classification – Basic approach of Penalty Function method - Basic approach of Penalty Function method - Basic approaches of Interior and Exterior penalty function methods - Introduction to convex programming problem.

UNIT - V 9 Hrs

Dynamic Programming: Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution - examples illustrating the tabular method of solution.

Textbooks:

1. Singiresu S. Rao, Engineering Optimization: Theory and Practice by John Wiley and Sons, 4th edition, 2009.
2. H. S. Kasene & K. D. Kumar, Introductory Operations Research, Springer (India), Pvt. Ltd., 2004

Reference Books:

1. George Bernard Dantzig, Mukund Narain Thapa, "Linear programming", Springer series in operations research 3rd edition, 2003.
2. H.A. Taha, "Operations Research: An Introduction", 8th Edition, Pearson/Prentice Hall, 2007.
3. Kalyanmoy Deb, "Optimization for Engineering Design – Algorithms and Examples", PHI Learning Pvt. Ltd, New Delhi, 2005.

Online Learning Resources:

https://www.youtube.com/watch?v=gw_ZEUjI9KM&list=PLYihddLF-CgZGDFVwB1v699kvl4FMeAr-

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2													
CO2		1												
CO3				3										
CO4		3												
CO5	2													

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Deterministic & Stochastic Statistical Methods (common to CSE,AIDS,AIML)		L	T	P	C
20AOE9925			3	0	0	3
Pre-requisite	Basic Mathematics	Semester	III-I			

Course Objectives:

- This course provides a study of various Mathematical Methods and Statistical Methods which is needed for Artificial Intelligence, Machine Learning, and Data Science and also for Computer Science and engineering problems.

Course Outcomes :

CO1: Identify logical thinking to problem-solving in context.
CO2: Make use of methods related to these concepts in a variety of data science applications.
CO3: Solve problems by using appropriate technology to aid problem-solving and data analysis.
CO4: Analyze Distribution Theory and Bayesian process of inference in probabilistic reasoning system.
CO5: Develop skills in solving unconstrained optimization problems.

UNIT - I **Data Representation** 9 Hrs

Distance measures, Projections, Notion of hyper planes, half-planes. Principal Component Analysis- Population Principal Components, sample principal coefficients, covariance, matrix of data set, Dimensionality reduction, Singular value decomposition, Gram Schmidt process.

UNIT - II **Single Variable Distribution** 9Hrs

Random variables (discrete and continuous), probability density functions, properties, mathematical expectation- Probability distribution - Binomial, Poisson approximation to the binomial distribution and normal distribution-their properties-Uniform distribution-exponential distribution.

UNIT - III **Stochastic Processes And Markov Chains:** 9 Hrs

Introduction to Stochastic processes- Markov process. Transition Probability, Transition Probability Matrix, First order and Higher order Markov process, step transition probabilities, Markov chain, Steady state condition, Markov analysis.

UNIT - IV **Multivariate Distribution Theory** 9 Hrs

Multivariate Normal distribution – Properties, Distributions of linear combinations, independence, marginal distributions, conditional distributions, Partial and Multiple correlation coefficient. Moment generating function.
BAYESIAN INFERENCE AND ITS APPLICATIONS: Statistical tests and Bayesian model comparison, Bit, Surprisal,Entropy, Source coding theorem, Joint entropy, Conditional entropy, Kullback-Leibler divergence.

UNIT - V **Optimization** 9 Hrs

Unconstrained optimization, Necessary and sufficiency conditions for optima, Gradient descent methods, Constrained optimization, KKT conditions, Introduction to non-gradient techniques, Introduction to least squares optimization, Optimization view of machine learning. Data Science Methods: Linear regression as an exemplar function approximation problem, linear classification problems.

Textbooks:

1. Mathematics for Machine Learning by A. Aldo Faisal, Cheng Soon Ong, and Marc Peter Deisenroth
2. Dr.B.S Grewal, Higher Engineering Mathematics, 45th Edition, Khanna Publishers.
3. Operations Research, S.D. Sharma

Reference Books:

1. Operations Research, An Introduction, Hamdy A. Taha, Pearson publishers.
2. A Probabilistic Theory of Pattern Recognition by Luc Devroye,. Laszlo Gyorfi, Gabor Lugosi.

Online Learning Resources:

https://www.math.brown.edu/swatson2/classes/data1010/pdf/data1010.pdf

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2		3												
CO3		3												
CO4		3												
CO5		3												

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Data Warehousing and Mining		L	T	P	C
20APE0501			3	0	0	3
Pre-requisite	Basic Mathematics and Database	Semester	III-I			

Course Objectives:

- To know the basic concepts and principles of data warehousing and data mining
- Learn pre-processing techniques and data mining functionalities
- Learn and create multidimensional models for data warehousing
- Study and evaluate performance of Frequent Item sets and Association Rules
- Understand and Compare different types of classification and clustering algorithms

Course Outcomes :

CO1: Understand the basic concepts of Data Warehouse and data Mining
CO2: Apply OLAP technology for Data Warehouse
CO3: Analyze and evaluate performance of Association Rules and classification algorithms
CO4: Evaluate various Clustering algorithms
CO5: Analyze advanced Data Mining techniques

UNIT - I 9 Hrs

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining. **Data Preprocessing:** Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

UNIT - II 9Hrs

Data Warehouse and OLAP Technology for Data Mining: Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Further Development of Data Cube Technology, From Data Warehousing to Data Mining. **Data Cube Computation and Data Generalization:** Efficient Methods for Data Cube Computation, Further Development of Data Cube and OLAP Technology, Attribute-Oriented Induction.

UNIT - III 9 Hrs

Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining, **Classification and Prediction:** Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back propagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods, Prediction, Accuracy and Error measures, Evaluating the accuracy of a Classifier or a Predictor, Ensemble Methods

UNIT - IV 9 Hrs

Cluster Analysis: Introduction, Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High- Dimensional Data, Constraint-Based Cluster Analysis, Outlier Analysis.

UNIT - V 9 Hrs

Mining Streams, Time Series and Sequence Data: Mining Data Streams, Mining Time- Series Data, Mining Sequence Patterns in Transactional Databases, Mining Sequence Patterns in Biological Data, Graph Mining, Social Network Analysis and Multi relational Data Mining, **Mining Object, Spatial, Multimedia, Text and Web Data**: Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web.

Textbooks:

1. Data Mining: Concepts and Techniques, Jiawei Han and Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, Second Edition, 2012.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson Education.

Reference Books:

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

Online Learning Resources:

https://www.youtube.com/watch?v=ykZ-_UGcYWg&list=PLLspfyoOYoQcI6Nno3gPkq0h5YSe81hsc

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3										1	1	1
CO2	2	3	2										1	
CO3	2	3	2	2	3	2								2
CO4	2	2	3	2	2	3						2	1	
CO5	2	2	3	2	2	3						2	1	1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	DESIGN PATTERNS		L	T	P	C
20APE0502			3	0	0	3
Pre-requisite	Object Oriented Programming basics	Semester	III-I			

Course Objectives:

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

Course Outcomes :

CO1: Know the underlying object oriented principles of design patterns.
CO2: Understand the context in which the pattern can be applied.
CO3: Understand how the application of a pattern affects the system quality and its tradeoffs.
CO4: Importance in behavioral pattern in terms of different types
CO5: Understanding about the importance of design patterns

UNIT - I — 9 Hrs

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

UNIT - II — 9Hrs

Designing A Document Editor: A Case Study Design problems, Document structure, Formatting, Embellishing the User Interface, Supporting Multiple Look and Feel standards, Supporting Multiple Window Systems, User Operations, Spelling Checking and Hyphenation.
Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

UNIT - III — 9 Hrs

Structural Patterns-1: Adapter, Bridge, Composite.
Structural Patterns-2: Decorator, Façade, Flyweight, Proxy, Discuss of Structural Patterns.

UNIT - IV — 9 Hrs

Behavioral Patterns-1: Chain of Responsibility, Command, Interpreter, Iterator.
Behavioral Patterns-2: Mediator, Memento, Observer.

UNIT - V — 9 Hrs

Behavioral Patterns-2(cont'd): State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns.
What to Expect from Design Patterns, A Brief History, The Pattern Community An Invitation, A Parting Thought.

Textbooks:

1. Design Patterns By Erich Gamma, Pearson Education

Reference Books:

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

Online Learning Resources:

https://www.youtube.com/watch?v=1xUz1fp23TQ

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1												
CO2	2	2	2	2	2								2	
CO3	2	2	2	2	2			1				1	2	1
CO4	2	2	2	2	2								2	1
CO5	2	2										1		

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	COMPUTER GRAPHICS (common to CSE,AIDS)		L	T	P	C
20APE0503			3	0	0	3
Pre-requisite	Data Structures and Algorithms	Semester	III-I			

Course Objectives:

This course is designed to:

- Introduce the use of the components of a graphics system and become familiar with the building approach of graphics system components and related algorithms.
- Understand the basic principles of 3- 3-dimensional computer graphics.
- Provide insights on how to scan, convert the basic geometrical primitives, how to transform the shapes to fit them as per the picture definition.
- Provide an understanding of mapping from world coordinates to device coordinates, clipping, and projections.
- Discuss the application of computer graphics concepts in the development of computer games, information visualization, and business applications.

Course Outcomes :

CO1: Explain the basic concepts used in computer graphics
CO2: Design algorithms based on output primitives.
CO3: Construct 2D graphics transformations
CO4: Construct 3D graphics transformations
CO5: Remove hidden surfaces from graphs and anime

UNIT - I	OVERVIEW OF COMPUTER GRAPHICS SYSTEM	9 Hrs

OverView of Computer Graphics System – Video display devices – Raster Scan and randomscan system – Input devices – Hard copy devices.

UNIT - II	OUTPUT PRIMITIVES AND ATTRIBUTES	9Hrs

Drawing line, circle and ellipse generating algorithms – Scan line algorithm – CharacterGeneration – attributes of lines, curves and characters – Antialiasing.

UNIT - III	TWO DIMENSIONAL GRAPHICS TRANSFORMATIONS AND VIEWING	9 Hrs

Two-dimensional Geometric Transformations – Windowing and Clipping – Clipping of lines andclipping of polygons.

UNIT - IV	THREE DIMENSIONAL GRAPHICS AND VIEWING	9 Hrs

Three-dimensional concepts – Object representations- Polygon table, Quadric surfaces, Splines, Bezier curves and surfaces – Geometric and Modelling transformations – Viewing -Parallel and perspective projections.

UNIT - V	REMOVAL OF HIDDEN SURFACES	9 Hrs

Visible Surface Detection Methods – Computer Animation.

Textbooks:

Hearn, D. and Pauline Baker,M., Computer Graphics (C-Version), 2nd Edition, Pearson Education, 2002.

Reference Books:

1. Neuman, W.M., and Sproull, R.F., Principles of Interactive Computer Graphics, Mc Graw Hill Book Co., 1979.
2. Roger, D.F., Procedural elements for Computer Graphics, Mc Graw Hill Book Co., 1985.
3. Asthana, R.G.S and Sinha, N.K., Computer Graphics, New Age Int. Pub. (P) Ltd., 1996.
4. Floey, J.D., Van Dam, A, Feiner, S.K. and Hughes, J.F, Computer Graphics, Pearson Education, 2001.

Online Learning Resources:

https://www.youtube.com/watch?v=fwzYuhduME4&list=PL338D19C40D6D1732

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2		3	2										2	
CO3	3	2												
CO4	3	2												
CO5		2	2											

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	SOFTWARE ENGINEERING LABORATORY		L	T	P	C
20APC0520			0	0	3	1.5
Pre-requisite	Mathematics and Programming	Semester	III-I			

Course Objectives:

This course is designed to:

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

Course Outcomes :

CO1: Understand precisely about functional and non functional requirements
CO2: Gain knowledge in project managements and its principles
CO3: Identify the relationship between requirements and usecase
CO4: Know the interface of modules such as cohesion and coupling
CO5: Able to deduct the bugs during testing

List of Experiments

1. a) Draw the Control Flow Graph of following using MS-Word:
   i. if-else
   ii. while
   iii. do-while
   iv. for

   b) Draw the Flow chart and CFG for the following Program by using MS Word:
   if A = 10 then
   if B > C
   A = B
   else
   A = C
   endif
   endif
   print A, B, C.
2. Define Functional and Non-Functional Requirements for Hospital Management System.
3. Draw the Deliverable and Phase based Work Breakdown Structure for House construction System using MS Word.
4. Schedule all the Task and sub-Task using the PERT/CPM charts using MS –Excel.
5. Identify and analyze all the possible risks and its risk mitigation plan for the system to be automated
6. Diagnose any risk using Ishikawa Diagram (Can be called as Fish Bone Diagram or Cause & Effect Diagram)
7. Define Complete Project plan for the system to be automated using Microsoft Project Tool
8. Define the Features, Vision, Business objectives, Business rules and stakeholders in the vision document
9. Define the functional and non-functional requirements of the system to be automated by using Usecases and document in SRS document
10. Define the following tracebility matrices:
    i. Usecase Vs. Features
    ii. Functional requirements Vs.Usecases
11. Estimate the effort using the following methods for the system to be automated:
    i. Function point metric
    ii. Usecase point metric
12. Develop a tool which can be used for quantification of all the non-functional requirements
13. Write C/C++/Java/Python program for classifying the various types of coupling.
14. Write a C/C++/Java/Python program for classifying the various types of cohesion.
15. Write a c program to demonstrate the working of the Following constructs:
    i) do…while
    ii) while…do
    ii) if-else
    iii) switch
    iv) for loop.
16. A program written in c language for matrix multiplication fails —Introspect the causes for its failure and write down the possible reasons for its failure.
17. Take ATM system and study its system specifications and report the various bugs.
18. Write the test cases for Banking application.
19. Create a test plan document for Library Management System.
20. Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Assume that the upper limit for the size of any side is 10. Derive test cases for your program based on boundary-value analysis, execute the test cases and discuss the results.
21. Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Derive test cases for your program based on decision table approach, execute the test cases and discuss the results.
22. Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Assume the upper limit for the size of any side is 10. Derive test cases for your program based on equivalence class partitioning, execute the test cases and discuss the results.
23. Draw standard UML diagrams using an UML modeling tool for a given case study and map design to code and implement a 3 layered architecture. Test the developed code and validate whether the SRS is satisfied.
    A. Identify a software system that needs to be developed.

B. Document the Software Requirements Specification (SRS) for the identified system.
C. Identify use cases and develop the Use Case model.
D. Identify the conceptual classes and develop a Domain Model and also derive a Class Diagram from that.
E. Using the identified scenarios, find the interaction between objects and represent them using UML Sequence and Collaboration Diagrams
F. Draw relevant State Chart and Activity Diagrams for the same system.
G. Implement the system as per the detailed design
H. Test the software system for all the scenarios identified as per the usecase diagram
I. Improve the reusability and maintainability of the software system by applying appropriate design patterns.
J. Implement the modified system and test it for various scenarios
Suggested domain for validate the following system:

i. Passport automation system.p
ii. Book bank
iii. Exam registration
iv. Stock maintenance system.
v. Online course reservation system

Reference Books:

1. Rajib Mall, "Fundamentals of Software Engineering", 5th Edition, PHI, 2018.
2. Pressman Roger, "Software Engineering- Practioner Approach", McGraw Hill, 7 th Edition, 2012.
3. Ian Somerville, "Software Engineering", Pearson 2, 10 th Edition, 2017.
4. Jalote Pankaj, "An integrated approach to Software Engineering", Narosa, 3 rd Edition, 2005.
5. Richard Fairley, "Software Engineering Concepts", Tata McGraw Hill, 1997.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2									2	
CO2	3	3	3					2		3	3		2	1
CO3	3	3											1	1
CO4	3	3	3	3	3								3	2
CO5	3	3	3	3	3								2	1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	COMPUTER NETWORKS SIMULATION LAB		L	T	P	C
20APC0517			0	0	3	1.5
Pre-requisite	Digital Communications and Operating Systems	Semester	III-I			

Course Objectives:

- Learn basic concepts of computer networking and acquire practical notions of protocols with the emphasis on TCP/IP. A lab provides a practical approach to Ethernet/Internet networking: networks are assembled, and experiments are made to understand the layered architecture and how do some important protocols work.

Course Outcomes :

CO1: Deal with Error detection/ correction techniques
CO2: Simulate Data link layer protocols
CO3: Simulate network layer protocols
CO4: Able to get knowledge about NS2 simulator
CO5: Able to develop network applications

List of Experiments

1. Study of basic network command and Network configuration commands.
2. Connect the computers in Local Area Network.
3. Performing an Initial Switch and Router Configuration
4. Connecting, Configuring and Troubleshooting a Switched Network
5. Implementation of Error Detection / Error Correction Techniques
6. Implementation of Stop and Wait Protocol and sliding window
7. Implementation and study of Goback-N and selective repeat protocols
8. Implementation of High Level Data Link Control
9. Implementation of Link state routing algorithm
10. Implement the data link layer framing methods such as character, character-stuffing and bitstuffing.
11. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP
12. Develop a simple data link layer that performs the flow control using the sliding window protocol,and loss recovery using the Go-Back-N mechanism.
13. Implement Dijsktra's algorithm to compute the shortest path through a network
14. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
15. Implement distance vector routing algorithm for obtaining routing tables at each node.
16. Write a program for congestion control using Leaky bucket algorithm.
17. Do the following using NS2 Simulator
    a. NS2 Simulator-Introduction
    b. Simulate to Find the Number of Packets Dropped
    c. Simulate to Find the Number of Packets Dropped by TCP/UDP
    d. Simulate to Find the Number of Packets Dropped due to Congestion
    e. Simulate to Compare Data Rate& Throughput.
    f. Simulate to Plot Congestion for Different Source/Destination
    g. Simulate to Determine the Performance with respect to Transmission of Packets
    h. To create scenario and study the performance of network with CSMA/CA protocol and CSMA/CD protocols.
18. Implement the following executing protocols of Internet in action using Wireshark Lab.
    a. Packet Capture and Observations using Packet Sniffer.
    b. Explore various aspects of HTTP Protocol.
    c. Tracing DNS with Wireshark.
    d. Analysis and Obtain various parameters-Values for TCP Protocol in action
19. Introduction to Network Simulator – Packet Tracer
    a. Configuration of a Router using Packet Tracer
    b. Network using Packet Tracer
    c. Implementation of Static Routing using Packet Tracer
    d. Implementation of RIP using Packet Tracer
20. Develop the network application using socket API
    a. Write a Socket program for echo
    b. Write a Socket program for Ping
    c. Write a Socket program for Chat applications.
    d. Write a Socket program for DNS(Domain Name System)
21. Planning Network-based Firewalls

Reference Books:

Shivendra S.Panwar, Shiwen Mao, Jeong-dong Ryoo, and Yihan Li, —TCP/IP Essentials A Lab-Based Approachl, Cambridge University Press, 2004.

Cisco Networking Academy, —CCNA1 and CCNA2 Companion Guidel, Cisco Networking Academy Program, 3rd edition, 2003.

Ns Manual, Available at: https://www.isi.edu/nsnam/ns/ns-documentation.html, 2011.

Elloitte Rusty Harold, —Java Network Programmingl, 3rd edition, O'REILLY, 2011.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2			3								2	2
CO2	3				2								2	2
CO3	3				2								2	2
CO4	3			2	2								2	2
CO5	3	2		2	2								2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Mobile Application Development		L	T	P	C
20ASA0503			1	0	2	2
Pre-requisite	Basic Mathematics and Programming	Semester	III-I			

Course Objectives:

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

Course Outcomes :

CO1: Demonstrate knowledge on mobile platforms, mobile user interface and user interface design requirements.
CO2: Design user interfaces by analyzing user requirements
CO3: Develop mobile applications for messaging, location based services and networking
CO4: Develop mobile applications and publish in different mobile platforms
CO5: Use android studio and IoS tools to develop mobile applications

UNIT - I 9 Hrs

Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation,Building you First Android application, Understanding Anatomy of Android Application, Android Manifest file.

1.Setting Up the Development Environment

1.1 Download/Install the SDK
1.2 Download/Install the Eclipse Plugin
1.3 Download/Install the SDK Platform Components

2. Test the android development environment by performing the following operations.

2.1. Add the sample application to a project in Android studio.
2.2. Create an Android Virtual Device (AVD) for sample project.
2.3. Create a launch configuration for sample project.
2.4. Run a sample application in Android Emulator.

UNIT - II 9Hrs

Android Application Design Essentials: Anatomy of an Android applications, Android terminologies,Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.

3.Create "Hello World" Application
4. Develop a program which will implement Sub menu in android application.
5. Develop a program to implement Context menu (Floating List of Menu Items) in android application.

UNIT - III 9 Hrs

ADVANCED USER INTERFACE AND DATA PERSISTENCE Basic views, Picker views, List view, Image view, Menus with views, Web view, saving and loading user preferences, Persisting data to files, Creating and using databases.

6. Develop a program to implement the List View in android application.
7. Creating the Application Choosing Options (i) CheckBox (ii) RadioButton
8. Develop application by using Linear Layout Views with different attributes.

UNIT - IV 9 Hrs

MESSAGING, LOCATION-BASED SERVICES, AND NETWORKING SMS messaging, sending e-mail, displaying maps, getting location data, monitoring a location, Consuming web services using HTTP

9. Develop a program to implement a Custom Button and handle the displayed message on button click
10. Develop a program to implement the Table layout in View Group that displays child View elements in rows and columns.

UNIT - V 9 Hrs

ANDROID SERVICES, PUBLISHING ANDROID APPLICATIONS: Services, Communication between a service and an activity, Binding activities to services, Threading, Preparing for publishing, Deploying APK files. Building the app in android debugging an android app.

11. Develop a program to show how to use Date picker control of ADK in android applications.
12. Develop a program to insert, delete, display, and update the employee details in Android APP

Textbooks:

1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)
2. J. F. DiMarzio, Beginning Android Programming with Android Studio, Wiley India, 4 thEdition, 2017.
3. Wei – Meng Lee, Beginning Android 4 Application Development, Wrox, 2017.
4. Jeff McWherter and Scott Gowell, Professional Mobile Application Development,Wiley India, 1 stEdition, 2012.

Reference Books:

1. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd
2. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd
3. Android Application Development All in one for Dummies by Barry Burd, Edition:
4. Neils Smyth, Android Stduio Development Essentials, Creative Space Independent publishing platform, 7 th Edition 2016.
5. Paul Deital and Harvey Deital, Android How to Program,Detial associates pu

Online Learning Resources:

https://www.youtube.com/watch?v=Bz0aw4_K8oc&list=PL49hKkxjHVqHilv8CUb-p9gMPFZtfqZTN5

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1		1								1	1
CO2	3	3	3										3	
CO3	2		2		1	2				2				2
CO4		2	2	2	1			2		2				2
CO5			2		1									2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	BIOLOGY FOR ENGINEERS		L	T	P	C
20AMC9901	(common to CSE,CIC,AIDS,AIML)		3	0	0	0
Pre-requisite		Semester	III-I			

Course Objectives:

This course is designed to:

- To provide basic understanding about life and life process animals and plant system
- To understand what bio-molecules are their structure are function application of certain bio-molecules in industry
- Brief introduction about human physiology and bio engineering
- To understand hereditary units
- Brief introduction to the production of transgenic microbes, plants and animals

Course Outcomes :

CO1: Explain about cells and their structure and function. Different types of cells and basics for classification of living Organisms.
CO2: Explain about biomolecules, their structure, function and their role in the living organisms. How biomolecules are useful in Industry.
CO3: Brief about human physiology.
CO4: Explain about genetic material, DNA, genes and RNA how they replicate, pass and preserve vital information in living Organisms.
CO5: Know about application of biological principles in different technologies for the production of medicines and pharmaceutical molecules through transgenic microbes, plants and animals.

UNIT - I	Introduction to Basic Biology	10 Hrs

Evolution: Different patterns of evolution, Darwin's theory of evolution, Cell as Basic unit of life, cell theory, Cell shapes, Cell structure, Cell cycle. Chromosomes. Prokaryotic and eukaryotic Cell. Plant Cell, Animal Cell, Plant tissues and Animal tissues, Brief introduction to five kingdoms of classification, Tissue Engineering.

UNIT - II	Introduction to Biomolecules	10 Hrs

Carbohydrates, lipids, proteins, Vitamins and minerals, Nucleic acids (DNA and RNA) and their types. Synthesis of Enzymes, Enzyme application in Industry. Large scale production of enzymes by Fermentation.

UNIT - III	Human Physiology	8 Hrs

Digestive system, Respiratory system, (aerobic and anaerobic Respiration). Respiratory organs, respiratory cycle, Central Nerves System and Excretory system.

UNIT - IV	Introduction to Molecular Biology and recombinant DNA Technology	8 Hrs

Prokaryotic gene and Eukaryotic gene structure. DNA replication, Transcription and Translation. DNA technology. Introduction to gene cloning.

UNIT - V	Application of Biology	10 Hrs

Brief introduction to industrial Production of Enzymes, Pharmaceutical and therapeutic Proteins, Vaccines and antibodies. Basics of biosensors, Properties and Classification of virus, Immune response to virus (COVID-2019), Definitions-Pandemic, Epidemic and outbreak, pandemic alert system ranges, Prevention of pandemic disease and pandemic preparation.

Textbooks:

1. P.K.Gupta, Cell and Molecular Biology, 5th Edition, Rastogi Publications
2. U. Satyanarayana. Biotechnology, Books & Allied Ltd 2017

Reference Books:

1. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A Global Approach", Pearson Education Ltd, 2018.
2. T Johnson, Biology for Engineers, CRC press, 2011
3. J.M. Walker and E.B. Gingold, Molecular Biology and Biotechnology 2nd ed.. Panima Publications. PP 434.
4. David Hames, Instant Notes in Biochemistry –2016
5. Phil Tunner, A. Mctennan, A. Bates & M. White, Instant Notes – Molecular Biology – 2014.
6. Richard Dawkins, River Out of Eden: A Darwinian View of Life

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2										1		
CO2	3	2										1		
CO3	3	2										1		
CO4	3	2										1		
CO5	3	2										1		

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)
COMPUTER SCIENCE AND ENGINEERING (CSE)
(Effective for the batches admitted in 2020-21)

Semester VI (Third year)

S.No	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P	C			
1	PC	20APC0521	Artificial Intelligence	3	1	0	3	30	70	100
2	PC	20APC0523	Compiler Design	3	0	0	3	30	70	100
3	PC	20APC0528	Cloud Computing	3	0	0	3	30	70	100
4	PE-2	20APE0504 20APE0505 20APE0506	Machine Learning Real Time Operating Systems Agile Methodologies	3	0	0	3	30	70	100
5	PC Lab	20APC0522	Artificial Intelligence Lab	0	0	3	1.5	30	70	100
6	PC Lab	20APC0524	Compiler Design Lab	0	0	3	1.5	30	70	100
7	PC Lab	20APC0529	Cloud Computing Lab	0	0	3	1.5	30	70	100
8	SC	20ASA0502	Soft Skills	1	0	2	2	100	0	100
9	MC	20AMC9904	Professional Ethics and Human Values	2	0	0	0	30	0	30
			Total credits				**18.5**	**340**	**490**	**830**
Industry Internship (Mandatory) for 6-8 Weeks duration during summer vacation										

Course Code	Artificial Intelligence		L	T	P	C
20APC0521			3	1	0	3
Pre-requisite	Mathematics and Programming	Semester	III-II			

Course Objectives:

- Define Artificial Intelligence and establish the cultural background for study
- Understand various learning algorithms
- Explore the searching and optimization techniques for problem solving
- Provide basic knowledge on Natural Language Processing and Robotics

Course Outcomes :

CO1: Understand the basic concepts of Artificial Intelligence
CO2: Apply searching techniques for solving a problem
CO3: Analyze the concepts of Reinforcement Learning
CO4: Develop Natural Language Interface for Machines
CO5: Understanding the concepts to design a robotics

UNIT - I 9 Hrs

Introduction: What is AI, Foundations of AI, History of AI, The State of Art.
Intelligent Agents: Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNIT - II 9Hrs

Solving Problems by searching: Problem Solving Agents, Example problems, Searching for Solutions, Uninformed Search Strategies, Informed search strategies, Heuristic Functions, Beyond Classical Search: Local Search Algorithms and Optimization Problems, Local Search in Continues Spaces, Searching with Nondeterministic Actions, Searching with partial observations, online search agents and unknown environments.

UNIT - III 9 Hrs

Reinforcement Learning: Introduction, Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, applications of RL
Natural Language Processing: Language Models, Text Classification, Information Retrieval, Information Extraction.

UNIT - IV 9 Hrs

Natural Language for Communication: Phrase structure grammars, Syntactic Analysis, Augmented Grammars and semantic Interpretation, Machine Translation, Speech Recognition
Perception: Image Formation, Early Image Processing Operations, Object Recognition by appearance, Reconstructing the 3D World, Object Recognition from Structural information, Using Vision.

UNIT - V 9 Hrs

Robotics: Introduction, Robot Hardware, Robotic Perception, Planning to move, planning uncertain movements, Moving, Robotic software architectures, application domains
Philosophical foundations: Weak AI, Strong AI, Ethics and Risks of AI, Agent Components, Agent Architectures, Are we going in the right direction, What if AI does succeed.

Textbooks:

Stuart J. Russell, Peter Norvig, "Artificial Intelligence A Modern Approach", 3rd Edition, Pearson Education, 2019.

Reference Books:

Nilsson, Nils J., and Nils Johan Nilsson. Artificial intelligence: a new synthesis. Morgan Kaufmann, 1998.
Johnson, Benny G., Fred Phillips, and Linda G. Chase. "An intelligent tutoring system forthe accounting cycle: Enhancing textbook homework with artificial intelligence." Journal of Accounting Education 27.1 (2009): 30-39.

Online Learning Resources:

http://peterindia.net/AILinks.html

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2											
CO2	3	3	3	2	3								2	2
CO3	2	2	2	2	2									3
CO4		3	3		3									3
CO5	3	2	1			1		1				1	1	1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	COMPILER DESIGN		L	T	P	C
20APC0523			3	0	0	3
Pre-requisite	FLAT and Programming Languages	Semester	III-II			

Course Objectives:

This course is a de facto capstone course in Computer Science, as it combines skills in software design, programming, data structures and algorithms, theory of computing, documentation, and machine architecture to produce a functional compiler.

- Realize that computing science theory can be used as the basis for real applications
- Introduce the major concept areas of language translation and compiler design.
- Learn how a compiler works
- Know about the powerful compiler generation tools and techniques, which are useful to the other non-compiler applications
- Know the importance of optimization and learn how to write programs that execute faster

Course Outcomes :

CO1: Understand the basic structure of a compiler
CO2: Use the tools related to compiler design effectively and efficiently
CO3: Generate intermediate code
CO4: Able to explain various data structures used in symbol tables
CO5: Construct optimized code

UNIT - I		9 Hrs

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

UNIT - II		9Hrs

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

UNIT - III		9 Hrs

Syntax Directed Translation: Syntax Directed Definitions, Evaluation orders for SDD's, Application of SDT, SDT schemes, Implementing L-attribute SDD's.
Intermediate Code Generation: Variants of syntax trees, three address code, Types and declarations, Translations of expressions, Type checking, control flow statements, backpatching, switch statements, intermediate code for procedure.

UNIT - IV		9 Hrs

Run Time Environment : storage organization, Stack allocation of space, Access to non-local data on stack , Heap management
Symbol Table: Introduction, symbol table entries, operations on the symbol table, symbol table organizations, non block structured language, block structured language.

UNIT - V		9 Hrs

Code Generation: Issues in the design of a code generator, The Target language, Basic blocks and flow graphs, optimization of basic blocks, a simple code generator, register allocation and assignment, optimal code generation for expressions, dynamic programming code generation.
Code Optimization: Introduction, where and how to optimize, principle source of optimization, function preserving transformations, loop optimizations, global flow analysis, machine dependent optimization

Textbooks:

"Compilers Principles, Techniques and Tools", Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman., Pearson, 2016.
"Compiler Construction", K.V.N Sunitha, Pearson, 2013

Reference Books:

1. Compiler Design", K. Muneeswaran., Oxford University Press, 2012
2. "Engineering A Compiler", Second Edition, Keith D. Cooper & Linda Torczon., MK(Morga Kaufmann) (ELSEVIER)
3. "Compilers Principles and Practice", Parag H. Dave, Himanshu B. Dave.,PEARSON
4. "Compiler Design", SandeepSaxena, Rajkumar Singh Rathore., S.Chand publications
5. "Compiler Design", SantanuChattopadhyay., PHI
6. "Principals of Compiler Design", Nadhni Prasad, Elsevier

Online Learning Resources:

https://www.youtube.com/watch?v=_ck1Lnm28hQ&list=PLbRMhDVUMngcseCW7wXDvtTDemCuH80fP

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3									3	3	3
CO2	2	2	2	2	2								2	2
CO3	3	3	2	2									2	2
CO4	2	2	2	2	2								2	2
CO5	2	2	2	2	2								2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	CLOUD COMPUTING (common to CSE,AIDS)		L	T	P	C
20APC0528			3	0	0	3
Pre-requisite	Operating systems and Networking	Semester	III-II			

Course Objectives:

- To Understand the concept of cloud computing.
- To understand the concept of Virtualization and familiar with the lead players in cloud.
- To understand the features of cloud and apply different cloud programming model as per need.
- To design of cloud Services and explore the trusted cloud Computing system computing.
- To learn Industry Cloud Platforms.

Course Outcomes :

CO1: Understand the concept of cloud computing
CO2: Ability to understand various service delivery models and Cloud Computing Architecture.
CO3: Analyze the need for virtualization in a cloud environment.
CO4: Demonstrate the map reducing programming model to process the Big Data along with Hadoop tools
CO5: Analyze authentication, confidentiality, privacy issues and disaster management

UNIT - I 9 Hrs

Introduction to Cloud: Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, Characteristics and Benefits, A Closer Look, Cloud Computing Reference Model, Challenges Ahead, Historical Developments, Applications of cloud computing: Healthcare, energy systems, transportation, manufacturing, education, government, mobile communication, application development.

UNIT - II 9Hrs

Cloud Computing Architecture: Introduction, NIST reference architecture, Cloud Reference Model, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Interoperability and Standards, Scalability and Fault Tolerance

UNIT - III 9 Hrs

Virtualization: Introduction to Virtualization concept & Hypervisors, Pros and Cons of Virtualization, Virtual Machine (VM), implementation Levels of Virtualization, Virtualization Structures/Tools and Mechanisms, Types of Hypervisors, Virtualization of CPU, Memory, and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation.

UNIT - IV 9 Hrs

Programming Model: Introduction to Hadoop Framework - Mapreduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job – Design of Hadoop file system, HDFS concepts, dataflow of File read & File write, map reduce applications
Cloud Platforms in Industry: Amazon Web Services- Compute Services, Storage Services.

UNIT - V 9 Hrs

Cloud Security & Disaster Recovery: Cloud Security: Risks, privacy and privacy impacts assessments; Multi-tenancy issues, security in VM, OS, virtualization system security issues and vulnerabilities; Virtualization system-specific attacks: Technologies for virtualization-based security enhancement, legal.
Disaster Recovery: Disasters in the Cloud, Disaster Management, Compromise Response Disaster Recovery

Textbooks:

1. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi from TMH 2013.
2. George Reese Cloud Application Architectures, First Edition, O" Reilly Media 2009.
3. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.

Reference Books:

1. Cloud Computing and SOA Convergence in Your Enterprise A Step-by-Step Guide by David S. Linthicum from Pearson 2010.
2. Cloud Computing 2 nd Edition by Dr. Kumar Saurabh from Wiley India 2012.
3. Cloud Computing – web based Applications that change the way you work and collaborate Online – Micheal Miller.Pearson Education.

Online Learning Resources:

https://www.youtube.com/playlist?list=PLmcndht8X48zKf-jqk9xY5Wg_AhXR8aHb

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1									2	1	
CO2	3	2	1		2								2	1
CO3	2	3	2										2	
CO4	2	1	2	1	2							1	2	2
CO5	2	2				2		2				1	2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	MACHINE LEARNING (common to CSE,AIDS)		L	T	P	C
20APE0504			3	0	0	3
Pre-requisite	Data Warehousing and Mining	Semester	III-II			

Course Objectives:

- To understand the basic theory underlying machine learning.
- To be able to formulate machine learning problems corresponding to different applications.
- To understand a range of machine learning algorithms along with their strengths and weaknesses.
- To be able to apply machine learning algorithms to solve problems of moderate complexity.

Course Outcomes :

CO1: Ability to understand what is learning and why it is essential to the design of intelligent machines.
CO2: Ability to design and implement various machine learning algorithms in a wide range of real-world applications.
CO3: Acquire knowledge deep learning and be able to implement deep learning models for language, vision, speech, decision making, and more
CO4: Ability to demonstrate feature selection and dimensionality reduction
CO5: Ability to solve decision making problems using SVM(Support Vector Machines) and graphical models

UNIT - I 9 Hrs

What is Machine Learning?, Examples of machine learning applications, **supervised Learning:** learning a class from examples, Vapnik- Chervonenkis dimension, probably approximately correct learning, noise, learning multiple classes, regression, model selection and generalization, dimensions of a supervised machine learning algorithm. **Decision Tree Learning:** Introduction, Decisions Tree representation, Appropriate problems for decision tree learning, the basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, issues in decision tree learning, **Artificial Neural Networks:** Introduction, Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithm, Remarks on the BACKPROPAGATION Algorithm, An illustrative Example: Face Recognition, Advanced Topics in Artificial Neural Networks.

UNIT - II 9Hrs

Evaluating Hypotheses: Motivation, Estimating hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, differences in error of two hypothesis, comparing learning algorithms, **Bayesian Learning:** Introduction, Bayes Theorem, Bayes Theorem and Concept Learning, Maximum Likelihood and least squared error hypothesis, Maximum Likelihood hypothesis for predicting probabilities, Minimum Description Length Principle, Bayes Optimal Classifier, Gibbs Algorithm , Naïve Bayes Classifier , Bayesian Belief Network, EM Algorithm

UNIT - III 9 Hrs

Dimensionality Reduction: Introduction, Subset selection, principle component analysis, feature embedding, factor analysis, singular value decomposition and matrix factorization, multidimensional scaling, linear discriminant analysis, canonical correlation analysis, Isomap, Locally linear embedding, laplacian eigenmaps, **Clustering:** Introduction, Mixture densities, K- Means clustering, Expectations- Maximization algorithm, Mixture of latent variable models, supervised learning after clustering, spectral clustering, Hierarchal clustering, Choosing the number of clusters

UNIT - IV 9 Hrs

Linear Discrimination: Introduction, Generalizing the linear model, geometry of the linear discrimination, pair wise separation, parametric discrimination revisited, gradient descent, logistic discrimination, discrimination by regression, learning to rank, **Multilayer Perceptrons:** Introduction, the perceptron, training a perceptron, learning Boolean functions, multilayer perceptrons, MLP as a universal approximator, Back propagation algorithm, Training procedures, Tuning the network size, Bayesian view of learning, dimensionality reduction, learning time, deep learning

UNIT - V 9 Hrs

Kernel Machines: Introduction, Optimal separating hyperplane, the non separable case: Soft Margin Hyperplane, ν-SVM, kernel Trick, Vectorial kernels, defining kernels, multiple kernel learning, multicast kernel machines, kernel machines for regression, kernel machines for ranking, one-class kernel machines, large margin nearest neighbor classifier, kernel dimensionality reduction, **Graphical models:** Introduction, Canonical cases for conditional independence, generative models, d separation, belief propagation, **undirected Graphs:** Markov Random files, Learning the structure of a graphical model, influence diagrams.

Textbooks:

1. Machine Learning – Tom M. Mitchell - McGraw Hill Education, 2017
2. Introduction to Machine learning, Ethem Alpaydin, PHI, 3rd Edition, 2014.

Reference Books:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis Chapman and Hall/CRC; 2nd edition, 2014
2. Machine Learning For Beginners: A Comprehensive Guide To Understand Machine Learning. How It Works And How Is Correlated To Artificial Intelligence And Deep Learning, Chris Neil, Alicex Ltd, 2020

Online Learning Resources:

https://www.youtube.com/watch?v=r4sgKrRL2Ys&list=PL1xHD4vteKYVpaIiy295pg6_SY5qznc77

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2							2	3	2
CO2	3	2	2	2	2							2	3	2
CO3	3	2	2	2								2	3	
CO4	2	3	2	2								2	2	
CO5	2	2	2											

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	REAL TIME OPERATING SYSTEMS (common to CSE,CIC)		L	T	P	C
20APE0505			3	0	0	3
Pre-requisite	Operating Systems	Semester	III-II			

Course Objectives:

To understand how to solve complex problems
- Acquire skills necessary to design and develop embedded applications by means of real-time operating systems
- Understand embedded real-time operating systems

Course Outcomes :

CO1: Characterize real-time systems and describe their functions
CO2: Design and implement a real-time system
CO3: Apply formal methods to the analysis and design of real-time systems
CO4: Apply formal methods for scheduling real-time systems
CO5: Characterize and describe reliability and fault tolerance issues and approaches.

UNIT - I 9 Hrs

Typical Real time Applications: Digital control, High-level control, Signal processing, other Real-time Applications.
Hard versus Soft Real-Time Systems: Jobs and processors, Release time, deadlines and Timing constraints, Hard and soft timing constraints, Hard Real time systems, Soft Real-time Systems.
A Reference Model of Real Time Systems: Processors and resources, Temporal parameters of Real time workload, periodic task model, precedence constraints and data dependency, Functional parameter, Resource Parameters of Jobs and Parameters of Resources, Scheduling Hierarchy.
Commonly used Approaches to real time Scheduling: Clock-Driven Approach, Weighted Round-Robin Approach, Priority driven Approach, Dynamic vs Static Systems, Effective release time and deadlines, Optimality of the EDF and LST algorithms, Nonoptimality of the EDF and LST algorithms, Challenges in validating timing constraints in priority driven System, Off line vs On line scheduling, summary.

UNIT - II 9Hrs

Clock-Driven Scheduling: Notations and Assumptions, static, Timer-Driven scheduler, General Structure of the Cyclic Scheduler, Improving the average response time of Aperiodic Jobs, Scheduling sporadic Jobs, Practical considerations and generalizations, Algorithm for generating Static Schedules, Pros and cons of Clock-driven scheduling, summary.

UNIT - III 9 Hrs

Priority-Driven Scheduling of periodic Tasks : Static Assumption, Fixed-priority vs Dynamic-priority Algorithms, Maximum Schedulable Utilization, Optimality of the RM and DM Algorithms, A Schedulability test for Fixed-priority tasks with Short Response time, A Schedulability test for Fixed-priority tasks with arbitrary Response time, Sufficient Schedulability conditions for the RM and DM Algorithms, summary.

UNIT - IV 9 Hrs

Scheduling Aperiodic and Sporadic Jobs in Priority Driven Systems: Assumptions and approaches, Diferrable servers, Sporadic Servers, Constant utilization, total bandwidth and weighted fair –Queueing servers, Slack stealing in Dead-line Driven System, Stack stealing in Fixed-priority systems, Scheduling of sporadic jobs, Real-time performance for jobs with soft timing constraints, A two-level scheme for Integrated scheduling.

UNIT - V 9 Hrs

Resources and Resource access control: Assumptions on Resources and their usage, Effects of Resource contention and resource access control, Non Preemptive critical section, Basic Priority inheritance protocol, Basic Priority ceiling protocol, Stack
–based, Priority ceiling protocol, Use of priority ceiling protocol in Dynamic priority systems, pre-emption ceiling protocol, Controlling accesses to Multiple unit Resources, Controlling concurrent accesses to data objects.

Multiprocessor Scheduling, Resource access control, and Synchronization: Model of Multiprocessor and Distributed Systems, Task assignment, Multiprocessor Priority ceiling protocol, Elements of Scheduling Algorithms for End-to-End Periodic Tasks, Schedulability of Fixed-priority End-to-End periodic Tasks, End to End tasks in heterogeneous Systems, Predictability and validation of Dynamic Multiprocessor Systems, Summary.

Textbooks:

1. "Real-Time Systems" by Jane W.S Liu, Pearson Edition, 2006.

Reference Books:

1. Real-Time Systems: Scheduling, Analysis, and Verification, Cheng, A. M. K.: Wiley, 2002.
2. Z.: Scheduling in Real-Time Systems, by Cottet, F., Delacroix, J., Kaiser, C., Mammeri John Wiley & Sons, 2002.
3. Real-Time Systems, C. M., Shin, K. G. McGraw-Hill, Krishna 1997.

Online Learning Resources:

https://www.youtube.com/watch?v=dHsHP9RrXBw&list=PLJ5C_6qdAvBH-JNRIlupFb44miyx9M8JD

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2													
CO2		3	2										3	3
CO3		2	3										2	2
CO4			3											2
CO5	2													

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	AGILE METHODOLOGIES		L	T	P	C
20APE0506			3	0	0	3
Pre-requisite	Software Engineering	Semester	III-II			

Course Objectives:

To understand how to solve complex problems

- Master the art of agile development.
- Understand how an iterative, incremental development process leads to faster delivery of more useful software.
- Elucidate the essence of agile development methods
- Explain the principles and practices of extreme programming

Course Outcomes :

CO1: Adopt Extreme Programming
CO2: Create own agile method by customizing XP to a particular situation
CO3: They must know about the way of correcting bug during build and code integration(L3)
CO4: Able to plan for developing the software and managing(L2)
CO5: known precisely about the different ways of software development(L6)

UNIT - I	Introduction	9 Hrs

Agile: Why Agile? - How to be Agile - Understanding XP - Values and Principles - Improve the Process - Eliminate Waste - Deliver Value.

UNIT - II	Extreme Programming	9Hrs

Practicing XP-Thinking, Pair Programming, Energized Work, Informative Workspace, Root Cause Analysis, Retrospectives, Collaborating, Sit Together, Real Customer Involvement, Ubiquitous Language, Stand-Up Meetings, Coding Standards, Iteration Demo, Reporting.

UNIT - III	Build and Integration	9 Hrs

Releasing-Done Done, No Bugs, Version Control, Ten-Minute Build, Continuous Integration, Collective Code Ownership, Documentation.

UNIT - IV	Planning	9 Hrs

Planning-Vision, Release Planning, Risk Management, Iteration Planning, Stories, Estimating.

UNIT - V	Development	9 Hrs

Developing-Incremental Requirements, Customer Tests, Test- Driven Development, Refactoring, Incremental Design and Architecture, Spike Solutions, Performance Optimization.

Textbooks:

1. James Shore and Shane Warden, " The Art of Agile Development", O'REILLY, 2007.

Reference Books:

1. Robert C. Martin, "Agile Software Development, Principles, Patterns, and Practices" , PHI, 2002.
2. Angel Medinilla, "Agile Management: Leadership in an Agile Environment", Springer, 2012.
3. Bhuvan Unhelkar, "The Art of Agile Practice: A Composite Approach for Projects and Organizations", CRC Press.
4. Jim Highsmith, "Agile Project Management", Pearson education, 2004.

Online Learning Resources:

https://elearn.nptel.ac.in/shop/iit-workshops/completed/agile-testing-methodology-and-project-management-test-automation/

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2				2				2	1
CO2	3	3	2	2	2				2				2	1
CO3	3	3	3	3									3	3
CO4		2	3										3	
CO5	3	3	2	2									2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	ARTIFICIAL INTELLIGENCE LABORATORY		L	T	P	C
20APC0522			0	0	3	1.5
Pre-requisite	Mathematics and Programming	Semester	III-II			

Course Objectives:

This course is designed to:

- Explore the methods of implementing algorithms using artificial intelligence techniques
- Illustrate search algorithms
- Demonstrate building of intelligent agents

Course Outcomes :

CO1: Implement search algorithms
CO2: Solve Artificial Intelligence Problems
CO3: Develop the solutions using Backtracking
CO4: Design Chatbot
CO5: Implement basic problems by using NLTK(Natural Language Tool Kit)

List of Experiments

1. Write a Program to Implement BFS and DFS.
2. Write a Program to find the solution for travelling sales person problem.
3. Write a program to implement simulated annealing Algorithm.
4. Write a Program to Implement Tic-Tac-Toe game.
5. Write a Program to Implement 8-Puzzle problem.
6. Write a program to implement Towers of Hanoi problem.
7. Write a program to implement A* Algorithm.
8. Write a Program to Implement Water-Jug problem.
9. Write a program to implement Hangman game.
10. Write a program to solve N Queen problem using backtracking.
11. Generate Calendar for the given month and year using a python program.
12. Write a program to implement simple Chatbot.
13. Write a program to remove stop words for a given passage from a text file using NLTK.
14. Write a program to implement stemming for a given sentence using NLTK.
15. Write a program to POS (Parts of Speech) tagging for the give sentence using NLTK.
16. Write a program to implement Lemmatization using NLTK.

Reference Books:

1. Tensorflow: https://www.tensorflow.org/
2. Pytorch: https://pytorch.org/,
3. https://github.com/pytorch
4. Theano: http://deeplearning.net/software/theano/ https://github.com/Theano/Theano
5. https://www.nltk.org/

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		3									3		3
CO2	3	3	2	2								3		3
CO3	3	2	3		3	3						3	2	3
CO4	3	2	3		3	3						3		3
CO5	3	3	3	3									3	3

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	COMPILER DESIGN LAB		L	T	P	C
20APC0524			0	0	3	1.5
Pre-requisite	FLAT and Programming Languages	Semester	III-II			

Course Objectives:

- To implement some of the functionality of the compiler
- To do programming using compiler related tools

Course Outcomes :

CO1: Develop compiler tools
CO2: Design simple compiler
CO3: Develop program for solving parser problems
CO4: Design lexical analyzer
CO5: Able to use Lex and YACC tools for developing a scanner and a parser

List of Experiments

1. Design a lexical analyzer for given language and the lexical analyzer should ignore redundant spaces, tabs and new lines. It should also ignore comments. Although the syntax specification states that identifiers can be arbitrarily long, you may restrict the length to some reasonable value. Simulate the same in C language.
2. Write a C program to identify whether a given line is a comment or not.
3. Write a C program to recognize strings under 'a', 'a*b+', 'abb'.
4. Write a C program to test whether a given identifier is valid or not.
5. Write a C program to simulate lexical analyzer for validating operators.
6. Implement the lexical analyzer using JLex, flex or other lexical analyzer generating tools.
7. Write a C program for implementing the functionalities of predictive parser for the mini language specified in Note 1.
8. a) Write a C program for constructing of LL (1) parsing.
   b) Write a C program for constructing recursive descent parsing.
9. Write a C program to implement LALR parsing.
10. a) Write a C program to implement operator precedence parsing.
    b) Write a C program to implement Program semantic rules to calculate the expression that takes an expression with digits, + and * and computes the value.
11. Convert the BNF rules into Yacc form and write code to generate abstract syntax tree for the mini language specified in Note 1.
12. Write a C program to generate machine code from abstract syntax tree generated by the parser. The instruction set specified in Note 2 may be considered as the target code.

Note 1:

A simple language written in this language is

```
{int a[3],t1,t2;
T1=2;
A[0]=1;a[1]=2;a[t]=3;
T2=-( a[2]+t1*6)/(a[2]-t1);
If t2>5then
Print(t2)
Else{
Int t3;
T3=99;
T2=25;
Print(-t1+t2*t3);/*this is a comment on 2 lines*/
}endif
}
```

Comments(zero or more characters enclosed between the standard C/JAVA Style comment brackets/*…*/)can be inserted .The language has rudimentary support for1-dimenstional array,the declaration int a[3] declares an array of three elements,referenced as a[0],a[1] and a[2].Note also you should worry about the scopping of names.

Note 2:

Consider the following mini language, a simple procedural high –level language, only operating on integer data, with a syntax looking vaguely like a simple C crossed with pascal. The syntax of the language is defined by the following grammar.

```
<program>::=<block>
<block>::={<variable definition><slist>}
|{<slist>}
<variabledefinition>::=int <vardeflist>
<vardec>::=<identifier>|<identifier>[<constant>]
<slist>::=<statement>|<statement>;<slist>
<statement>::=<assignment>|<ifstament>|<whilestatement>
|<block>|<printstament>|<empty>
<assignment>::=<identifier>=<expression>
|<identifier>[<expression>]=<expression>
<if statement>::=if<bexpression>then<slist>else<slist>endif
|if<bexpression>then<slisi>endif
<whilestatement>::=while<bexpreession>do<slisi>enddo
<printstatement>:;=print(<expression>)
<expression>::=<expression>::=<expression><addingop><term>|<term>|<addingop>
<term>
<bexprssion>::=<expression><relop><expression>
<relop>::=<|<=|==|>=|>|!=
```

<addingop>::=+|-
<term>::=<term><multop><factor>|<factor>
<Multop>::=*|/
<factor>::=<constant>|<identifier>|<identifier>[<expression>]
|(<expression>)
<constant>::=<digit>|<digit><constant>
<identifier>::=<identifier><letter or digit>|<letter>
<letter or digit>::=<letter>|<digit>
<letter>:;=a|b|c|d|e|f|g|h|I|j|k|l|m|n|o|p|q|r|s|t|u|v|w|x|y|z
<digit>::=0|1|2|3|4|5|^|7|8|9
<empty>::=has the obvious meaning

Reference Books:

1. Modern compiler implementation in C, Andrew w.Appel, Revised Edn, Cambridge University Press
2. Principles of Compiler Design. – A.V Aho, J.D Ullman ; Pearson Education.
3. lex&yacc , -John R Levine, Tony Mason, Doug Brown; O'reilly.
4. Compiler Construction,- LOUDEN, Thomson.
5. Engineering a compiler – Cooper& Linda, Elsevier
6. Modern Compiler Design – Dick Grune, Henry E.Bal, Cariel TH Jacobs, Wiley Dreatech

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		3		3									3
CO2	3	3	3		3								3	3
CO3	3		3										3	
CO4			3		3								3	3
CO5			2		2								2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	CLOUD COMPUTING LABORATORY (common to CSE,AIDS)		L	T	P	C
20APC0529			0	0	3	1.5
Pre-requisite	Operating systems and Networking	Semester	III-II			

Course Objectives:

The student should be made to:

- Be familiar with developing Applications in cloud.
- Be exposed to tool kits for cloud environment
- Install, configure and deploy applications using various cloud platforms
- Learn to run virtual machines of different configuration.

Course Outcomes :

CO1: Ability to understand various service delivery models of a cloud computing architecture.
CO2: Summarize the Services and Platform of cloud.
CO3: Configure various virtualization tools.
CO4: Explore the future trends of cloud computing.
CO5: Develop Hadoop Applications.

List of Experiments

1. To study in detail about cloud computing.
2. Working of Google Drive to make spreadsheet and notes.
3. Installation and Configuration of Justcloud.
4. Working in Cloud9 to demonstrate different language.
5. Install Google App Engine. Create hello world app and other simple web applications using python/java.
6. Deployment and Configuration options in Google Cloud
7. Install Virtual box/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
8. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
9. Install Hadoop single node setup
10. Develop hadoop application to count no of characters, no of words and each character frequency

Programs on SaaS

11. Create an word document of your class time table and store locally and on the cloud with doc,and pdf format . (use www.zoho.com anddocs.google.com).
12. Create a spread sheet which contains employee salary information and calculate gross and total sal using the formula DA=10% OF BASIC HRA=30% OF BASIC PF=10% OF BASIC IF BASIC<=3000 12% OF BASIC IF BASIC>3000 TAX=10% OF BASIC IF BASIC<=1500 =11% OF BASIC IF BASIC>1500 AND BASIC<=2500 =12% OF BASIC IF BASIC>2500 (use www.zoho.com and docs.google.com) NET_SALARY=BASIC_SALARY+DA+HRA-PF-TAX
13. Prepare a ppt on cloud computing –introduction , models, services ,andarchitecture Ppt should contain explanations, images and at least 20 pages (use www.zoho.com and docs.google.com).
14. Create your resume in a neat format using google and zoho cloud.

Programs on PaaS

15. Write a Google app engine program to generate n even numbers and deploy it to google cloud.
16. Google app engine program multiply two matrices.
17. Write a Google app engine program to display nth largest no from the given list of numbers and deploy it into google cloud.

Reference Books:

1. spoken-tutorial.org
2. Bart Jacob (Editor), ―Introduction to Grid Computing, IBM Red Books, Vervante, 2005
3. Ian Foster, Carl Kesselman, ―The Grid: Blueprint for a New Computing Infrastructure, 2nd Edition, Morgan Kaufmann

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3												2	
CO2	2				1									
CO3	2				3									1
CO4	2		2		1							1	1	
CO5	1				1									

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	SOFT SKILLS		L	T	P	C
20ASA0502	(common to CSE,AIDS,AIML)		1	0	2	2
Pre-requisite	Communicative English	Semester	III-II			

Course Objectives:

This course is designed to:

- To develop awareness in students of the relevance and importance of soft skills
- To provide students with interactive practice sessions to make them internalize soft skills
- To enable them to develop employability skills
- To provide knowledge of grammatical structures and vocabulary students and encourage their appropriate use in Speech and writing.

Course Outcomes :

CO1: Recognize the importance of verbal and non verbal skills
CO2: Develop the interpersonal and intrapersonal skills
CO3: Apply grammatical structures to formulate sentences and correct word forms.
CO4: Create trust among people and develop employability skills
CO5: Identify and apply communication skills effectively for professional

UNIT - I 9 Hrs

Grammar: Articles, Prepositions, Antonyms, Synonyms.

Vocabulary: Basics of Communication (Definition, Types of communication). Importance of body language in corporate culture, Body language (Facial expressions – eye contact – posture – gestures – Proxemics – Haptics – Dress Code – Paralanguage – Tone, pitch, pause & selection of words), Impromptu speeches.

Articles:
Web links: https://learnenglish.britishcouncil.org/grammar/a1-a2-grammar/articles-1
https://www.youtube.com/watch?v=ueEp6U8td1I
Prepositions:
Web links: https://www.grammarbook.com/grammar/probPrep.asp
Antonyms, Synonyms.
Web links: https://www.youtube.com/watch?v=-mLRoxWM8dI
https://www.youtube.com/watch?v=IEOrOPVMxiM
https://www.it.iitb.ac.in/~vijaya/ssrvm/worksheetscd/getWorksheets.com/Language%20Arts/syn_ant.pdf

Basics of Communication (Definition , Types of communication).
Web links: https://wikieducator.org/INTRODUCTION_TO_COMMUNICATION
Importance of body language in Corporate culture
Web links:
https://www.forwardfocusinc.com/consciously-communicate/the-importance-of-body-language-in-the-workplace/

Body language (Facial expressions – eye contact – posture – gestures – Proxemics – Haptics – Dress Code – Paralanguage –Tone, pitch, pause & selection of words)
Web links: https://open.lib.umn.edu/communication/chapter/4-2-types-of-nonverbal-communication/
https://en.wikipedia.org/wiki/Nonverbal_communication
Impromptu speeches.
Web links: https://www.write-out-loud.com/impromptu-public-speaking-topics.html;
https://faculty.washington.edu/mcgarrit/COM220/online%20readings/sample%20critique.pdf

UNIT - II 9Hrs

Grammar: Tenses, Idioms and Phrases, One word substitutes.
Vocabulary: Public speaking - *Oral presentations*, writing skills – *Short Essay writing and E- mail writing.*

Tenses
Web links: https://www.englisch-hilfen.de/en/grammar/english_tenses.htmj; https://onlymyenglish.com/tenses/;
https://www.englishpage.com/verbpage/verbtenseintro.html;
https://www.englishclub.com/grammar/verb-tenses.htm
Idioms and Phrases:
Web links: https://www.britannica.com/list/7-everyday-english-idioms-and-where-they-come-from
https://eslexpat.com/english-idioms-and-phrases/;
https://onlineteachersuk.com/english-idioms/;
One word substitutes:
Web links: https://www.careerpower.in/one-word-substitution.html;
https://www.hitbullseye.com/Vocab/One-Word-Substitute-List.php;
https://englishan.com/one-word-substitution-set-1/;

Public speaking - *Oral presentations*
Web links:https://egyankosh.ac.in/bitstream/123456789/26773/1/Unit-14.pdf;
https://www.skillsyouneed.com/rhubarb/preparing-oral-presentations.html;
https://courses.lumenlearning.com/publicspeakingprinciples/chapter/chapter-12-methods-of-delivery/

Writing skills – *Short Essay writing and E-mail writing.*
Web links: https://www.kibin.com/essay-writing-blog/important-essay-writing-skills/
https://www.scribendi.com/academy/articles/academic_essay_writing_skills.en.html ;
https://www.microsoft.com/en-us/microsoft-365/business-insights-ideas/resources/improve-email-writing-skills;

UNIT - III 9 Hrs

Grammar : Direct and Indirect speeches, Active and Passive voice, Drawing inferences (reading comprehensions and listening comprehensions)

Vocabulary: Leadership Skills – Negotiation skills - Team-building – *Debate.* Leadership Skills – Negotiation skills - Team-building

Direct and Indirect speeches:

Web links: https://onlymyenglish.com/direct-and-indirect-speech/
https://learnenglish.britishcouncil.org/grammar/b1-b2-grammar/reported-speech-1-statements
https://www.perfect-english-grammar.com/reported-speech.html

Active and Passive voice,

Web links: https://www.englishclub.com/grammar/passive-voice.htm
https://www.gingersoftware.com/content/grammar-rules/verbs/passive-voice/
https://nps.edu/web/gwc/revising-passive-voice-into-active-voice

Drawing inferences (reading comprehensions and listening comprehensions)

Web links: https://www.readingrockets.org/strategies/inference
https://www.thoughtco.com/making-inferences-3111201
https://www.comprehensionconnection.net/2019/03/exploring-difference-between-making.html

Vocabulary: Leadership Skills – Negotiation skills - Team-building – *Debate.*

Leadership Skills – Negotiation skills - Team-building

Web links: https://online.hbs.edu/blog/post/negotiation-skills
https://www.bumc.bu.edu/facdev-medicine/files/2014/08/BUSM-Leasership-training.pdf
https://in.indeed.com/career-advice/career-development/negotiation-skills
https://www.thebalancecareers.com/what-is-team-building-1918270

Debate:

Web links: https://noisyclassroom.com/debate-topics/
https://www.collegeessay.org/blog/debate-topics
https://www.edu.gov.mb.ca/k12/cur/socstud/frame_found_sr2/tns/tn-13.pdf

UNIT - IV		9 Hrs

Grammar: Common errors, Rearrangement of sentences.

Vocabulary: Resume writing, Pre-interview preparation , Group discussion.

Common errors, Rearrangement of sentences:

Web links:
https://www.letsstudytogether.co/sentence-arrangement-questions-pdf-for-banking-exams-ibps-sbi-po-and-clerk/
https://www.youtube.com/watch?v=e8nO3zZzkZs

Vocabulary: Resume writing, Pre-interview preparation , Group discussion.

Web links: https://www.youtube.com/watch?v=PfJg-67smf4
https://www.youtube.com/watch?v=-lXjbph22Fk

UNIT - V		9 Hrs

Grammar : Verbal ability tests.

Vocabulary: Mock interviews, Post interview Etiquette.

Verbal ability tests.

Web links: https://prepinsta.com/infosys-english-verbal-questions/
https://www.indiabix.com/online-test/verbal-ability-test/random
https://www.allindiaexams.in/online-test/online-general-english-test/61

Vocabulary: Mock interviews, Post interview Etiquette.

Web links: https://www.youtube.com/watch?v=ZOLCMa2QbdE
https://www.ziprecruiter.com/blog/the-right-way-to-follow-up-after-a-job-interview/
https://www.youtube.com/watch?v=KIoD19uoxt8

Textbooks:

1. Robert M Sheffield, "Developing Soft Skills", Pearson, 2010.

Reference Books:

1. Barun K. Mitra, "Personality Development and Soft Skills", OXFORD Higher Education 2018.
2. Alka Wadkar, "Life Skills for Success", Sage publications 2016.
3. Diana Booher, "Communicate with Confidence" Tata mcgraw hill, 1994.
4. B.N. Gosh, "Managing Soft skills for Personality development", Tata mcgraw hill 2012.
5. Michael Swan, "Practical English Usage", Oxford publications.
6. Raymond Murphy, "English Grammar in Use", Cambridge 5th Edition
7. Norman Lewis, "Word Power Made Easy", Penguin Publishers.
8. Advanced Grammar in Use A Self-Study Reference and Practice Book for Advanced Learners of English 3rd Edition , Cambridge

Online Learning Resources:

https://www.youtube.com/watch?v=DUlsNJtg2L8&list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1										2				
CO2										2				
CO3										2		2		
CO4										2				
CO5										2		2		

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Professional Ethics and Human Values (common to CSE,CIC,AIDS,AIML)		L	T	P	C
20AMC9904			3	0	0	0
Pre-requisite	Universal Human Values	Semester	III-II			

Course Objectives:

- To create an awareness on Engineering Ethics and Human Values.
- To study the moral issues and decisions confronting individuals and organizations engaged in engineering profession.
- To study the related issues about the moral ideals, character, policies, and relationships of people and corporations involved in technological activity.

Course Outcomes :

CO1: It ensures students sustained happiness through identifying the essentials of human values and skills.
CO2: The students will understand the importance of Values and Ethics in their personal lives and professional careers.
CO3: The students will learn the rights and responsibilities as an employee, team member and a global citizen.
CO4: Students understand practically the importance of trust, mutually satisfying human behavior and enriching interaction with nature.
CO5: Students can able to develop appropriate technologies and management patterns to create harmony in professional and personal life.

UNIT - I 9 Hrs

Introduction to Human Values: Need, basic Guidelines, Content and Process for Value Education, Self Exploration - 'Natural Acceptance' and Experiential Validation. Continuous Happiness and Prosperity - A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities. Understanding Happiness and Prosperity correctly.

UNIT - II 9Hrs

Understanding Harmony in the Family and Society: Harmony in Human - Human Relationship: Understanding harmony in the Family the basic unit of human interaction. Understanding values in human - human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. Understanding the harmony in the society (society being an extension of family). Visualizing a universal harmonious order in society - Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha) - from family to world family!

UNIT - III 9 Hrs

Introduction to Professional Ethics: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

UNIT - IV 9 Hrs

Professional Practices in Engineering: Work Place Rights & Responsibilities, Professions and Norms of Professional Conduct, Norms of Professional Conduct vs. Profession; Responsibilities, Obligations and Moral Values in Professional Ethics, Professional codes of ethics, the limits of predictability and responsibilities of the engineering profession. Central Responsibilities of Engineers – The Centrality of Responsibilities of Professional Ethics; lessons from 1979 American Airlines DC-10 Crash and Kansas City Hyatt Regency Walk away Collapse.

UNIT - V 9 Hrs

Global issues in Professional Ethics: Introduction – Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Depletion, Pollution, Ethics in Manufacturing and Marketing, Media Ethics, War Ethics, Bio Ethics, Intellectual Property Rights.

Textbooks:

1. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. Professional Ethics: R. Subramanian, Oxford University Press, 2015. 3.Ethics in Engineering Practice & Research, Caroline Whitbeck, 2e, Cambridge University Press 2015.

Reference Books:

1.Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition.
2.Ivan IIlich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
3.Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S PritchaMichael J Rabins, 4e , Cengage learning, 2015.
4.Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008.

Online Learning Resources:

https://www.youtube.com/watch?v=9LSEBK03CiY&list=PLysZquKdjuWSv87TaE7pByn5TE_e46O2C

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								3						
CO2								3						
CO3								3						
CO4								3						
CO5								3						

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)
COMPUTER SCIENCE AND ENGINEERING (CSE)
(Effective for the batches admitted in 2020-21)

Semester VII (Fourth year)

S.No	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P	C			
1	PE-3	20APE0507 20APE0508 20APE0509 20APE0510	Predictive Analytics Natural Language Processing Deep Learning Techniques Computer Vision	3	0	0	3	30	70	100
2	PE-4	20APE0511 20APE0512 20APE0513	Cryptography and Network Security Adhoc & Sensor Networks Distributed Systems	3	0	0	3	30	70	100
3	PE-5 CBCC	20APE0514 20APE0515 20APE0516	Data Analytics Software Project Management Linux Environment System	3	0	0	3	30	70	100
4	PE-6	20APE0517 20APE0518 20APE0519	Information Retrieval Techniques Soft Computing Principles of Data science	3	0	0	3	30	70	100
5	OE-3	20APE0407 20APE0411 20AOE3601 20APE0415	Digital Image Processing Embedded Systems Enabling Technologies for data science and analytics :IOT Wireless Communications	3	0	0	3	30	70	100
6	HE	20AOE0302 20AOE9901 20AHSMB02	Management Science English for Research Paper Writing Entrepreneurship Development	3	0	0	3	30	70	100
7	SA	20ASA0504	Devops	1	0	2	2	100	0	100
8	PR	20APR0501	Evaluation of Industry Internship(III-II Summer Internship)	0	0	0	3	100	0	100
			Total credits				**23**	**380**	**420**	**800**

Course Code	Predictive Analytics (Common to CSE, AIDS)		L	T	P	C
20APE0507			3	0	0	3
Pre-requisite	Machine Learning	Semester	IV-I			

Course Objectives:

- Understand Basics of Predictive Analytics, Understand Data types and Variable types, Understand Basic Modeling and work on Missing Data.
- Understand Logistic Regression and its components, Execute variable transformation and Understand Tableau visualization.
- Discuss the students objective segmentation CHAID and CART.
- Explain the Time series methods/ forecasting feature Extraction and various forecasting methods like Univariate stationary processes (ARMA) and Non- stationary , integrated processes(ARIMA), Extract features from the generated model as height, Average, Energy etc. and analyze prediction business capabilities and ETL Approach.

Course Outcomes :

- CO1: Understand how Predictive analytics can be used in the IT environment.
- CO2: Analyze various classification methods.
- CO3: Design multiple decision trees.
- CO4: Understand time series methods.
- CO5: Understand the Standard Operating Procedures for documentation and knowledge sharing.

UNIT - I	Introduction to Predictive Analytics & Linear Regression (NOS 2101)	10 Hrs

Introduction to Predictive Analytics & Linear Regression (NOS 2101): What and Why Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of data and variables, Data Modeling Techniques, Missing imputations etc. Need for Business Modeling, Regression — Concepts, Blue property-assumptions-Least Square Estimation, Variable Rationalization, and Model Building etc..

UNIT - II	Logistic Regression (NOS 2101)	10Hrs

Logistic Regression (NOS 2101): Model Theory, Model fit Statistics, Model Conclusion, Analytics applications to various Business Domains etc. Regression Vs Segmentation — Supervised and Unsupervised Learning, Tree Building — Regression, Classification, Over fitting, Pruning and complexity, Multiple Decision Trees etc.

UNIT - III	Objective Segmentation (NOS 2101)	9 Hrs

Objective Segmentation (NOS 2101): Regression Vs Segmentation — Supervised and Unsupervised Learning, Tree Building — Regression, Classification, Over fitting, Pruning and complexity, Multiple Decision Trees etc. Develop Knowledge, Skill and Competences (NOS 9005)
Introduction to Knowledge skills & competences, Training & Development, Learning & Development, Policies and Record keeping. etc.

UNIT - IV	Time Series Methods I Forecasting	8 Hrs

Time Series Methods I Forecasting, Feature Extraction (NOS 2101): Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height. Average, Energy etc and Analyze for prediction.

UNIT - V	Working with Documents (NOS 0703):	8 Hrs

Working with Documents (NOS 0703): Standard Operating Procedures for documentation and knowledge sharing, Defining purpose and scope documents, Understanding structure of documents — case studies, art ides, white papers, technical reports, minutes of meeting etc., Style and format, Intellectual Property and Copyright, Document preparation tools — Vision, PowerPoint, Word, Excel etc., Version Control, Accessing and updating corporate knowledge base, Peer review and feedback.

Textbooks:

Student's Handbook for Associate Analytics-Ill.

Reference Books:

1. Gareth James' Daniela Witten Trevor Hastie Robert Tibshirani. An Introduction to Statistical
2. Learning with Applications in R

Online Learning Resources:

https://www.youtube.com/watch?v=9LSEBK03CiY&list=PLysZquKdjuWSv87TaE7pByn5TE_e46O2C

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2										2	2
CO2		3	3										2	2
CO3		2	2										1	2
CO4	2	2				2								
CO5	2	2												2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Natural Language Processing (Common to CSE, AIDS)		L	T	P	C
20APE0508			3	0	0	3
Pre-requisite	Artificial intelligence	Semester	IV-I			

Course Objectives:

- Explain and apply fundamental algorithms and techniques in the area of natural language processing (NLP)
- Discuss approaches to syntax and semantics in NLP.
- Examine current methods for statistical approaches to machine translation.
- Explore machine learning techniques used in NLP.

Course Outcomes :

- CO1: Build NLP applications using Python.
- CO2: Apply various Parsing techniques, Bayes Rule, Shannon game, Entropy and Cross Entropy.
- CO3: Explain the fundamentals of CFG and parsers and mechanisms in ATN's.
- CO4: Apply Semantic Interpretation and Language Modeling.
- CO5:Interpret Machine Translation and multilingual Information Retrieval systems and Automatic Summarization.

UNIT - I	Introduction to Natural language	9 Hrs

Introduction to Natural language: The Study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different Levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English Syntax

UNIT - II	Grammars and Parsing	9Hrs

Grammars and Parsing: Grammars and Parsing- Top- Down and Bottom-Up Parsers, Transition Network Grammars, Feature Systems and Augmented Grammars, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks, Bayees Rule, Shannon game, Entropy and Cross Entropy.

UNIT - III	Grammars for Natural Language	9 Hrs

Grammars for Natural Language: Grammars for Natural Language, Movement Phenomenon in Language, Handling questions in Context Free Grammars, Hold Mechanisms in ATNs, Gap Threading, Human Preferences in Parsing, Shift Reduce Parsers, Deterministic Parsers.

UNIT - IV	Semantic Interpretation	9 Hrs

Semantic Interpretation: Semantic & Logical form, Word senses & ambiguity, The basic logical form language, Encoding ambiguity in the logical Form, Verbs & States in logical form, Thematic roles, Speech acts & embedded sentences, Defining semantics structure model theory.
Language Modeling: Introduction, n-Gram Models, Language model Evaluation, Parameter Estimation, Language Model Adaption, Types of Language Models, Language-Specific Modeling Problems, Multilingual and cross lingual language modeling.

UNIT - V	Machine Translation Survey	9 Hrs

Machine Translation Survey: Introduction, Problems of Machine Translation, Is Machine Translation Possible, Brief History, Possible Approaches, Current Status. Anusaraka or Language Accessor: Background, Cutting the Gordian Knot, The Problem, Structure of Anusaraka System, User Interface, Linguistic Area, Giving up Agreement in Anusarsaka Output, Language Bridges.
Multilingual Information Retrieval: Introduction, Document Preprocessing, Monolingual Information Retrieval, CLIR, MLIR, Evaluation in Information Retrieval, Tools, Software and Resources.
Multilingual Automatic Summarization: Introduction, Approaches to Summarization, Evaluation, How to Build a Summarizer, Competitions and Datasets.

Textbooks:

1.James Allen, Natural Language Understanding, 2nd Edition, 2003, Pearson Education.
2. Multilingual Natural Language Processing Applications : From Theory To PracticeDaniel M.Bikel and Imed Zitouni, Pearson Publications.
3. Natural Language Processing, A paninian perspective, Akshar Bharathi,Vineet chaitanya,Prentice –Hall of India.

Reference Books:

1.Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.
2. Jurafsky, Dan and Martin, James, Speech and Language Processing, 2nd Edition, Prentice Hall, 2008.
3. Manning, Christopher and Henrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2								3	2
CO2	3	3	2	2	2								3	2
CO3	2	3	2	2	2							2		3
CO4	3	2	3	2	1								2	
CO5	2	2											3	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Deep Learning Techniques (Common to CSE, AIDS)		L	T	P	C
20APE0509			3	0	0	3
Pre-requisite	Machine learning ,Artificial Intelligence	Semester	IV-I			

Course Objectives:

- Learn deep learning methods for working with sequential data.
- Learn deep recurrent and memory networks.
- Learn deep Turing machines.
- Apply such deep learning mechanisms to various learning problems.
- Know the open issues in deep learning, and have a grasp of the current research directions.

Course Outcomes :

- CO1: Demonstrate an understanding of statistics and machine learning concepts
- CO2: Demonstrate the basic concepts fundamental learning techniques and layers.
- CO3: Discuss the Neural Network training, various random models..
- CO4: Explain different types of deep learning network models.
- CO5: Classify the Probabilistic Neural Networks.

UNIT - I	A Review of Machine Learning	9 Hrs

A Review of Machine Learning: The Learning Machines, The Math Behind Machine Learning: Linear Algebra, The Math Behind Machine Learning: Statistics, How Does Machine Learning Work?, Logistic Regression, The Logistic Function, Evaluating Models, Building an Understanding of Machine Learning

UNIT - II	Foundations of Neural Networks and Deep Learning	9Hrs

Foundations of Neural Networks and Deep Learning : Neural Networks: Biological Neuron, Perceptron, Multi Layer Perceptron. **Training Neural Networks:** Back-propagation, Activation Functions, Loss Function, Hyper-parameters.

UNIT - III	Fundamentals of Deep Learning	9 Hrs

Fundamentals of Deep Learning: Definition of Deep Learning, Common Architecture Principles of Deep Networks, Building Blocks of Deep Learning.
Architectures of Deep Learning: Unsupervised Pre trained Networks, Convolution Neural Networks (CNN's), Recurrent Neural Networks, and Recursive Neural Networks

UNIT - IV	Deep Learning Research	9 Hrs

Deep Learning Research: **Linear factor models**: Probabilistic PCA And Factor Analysis, Independent Component Analysis, Sparse Coding, Manifold Interpretation of PCA, **Auto Encoders:** Regularized Autoencoders, Representational Power, Layer Size and Depth, Denoising Autoencoders, Applications of Autoencoders.

UNIT - V	Deep Generating Models	9 Hrs

Deep Generating Models: Boltzmann Machines, Restricted Boltzmann Machines, Deep Belief Networks, Deep Boltzmann Machines, Convolution Boltzmann Machines, Backpropagation through Random Operations, Directed Generative Nets, Generating Static Networks.
Applications: Large Scale Deep Learning, Image Recognition, Speech Recognition, Natural Language Processing, Other Applications.

Textbooks:

1. Deep Learning A practitioner's approach- josh Patterson and Adam Gibson, OREILLY.
2. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016.

Reference Books:

1. Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009.
2. Matrix Computations, Golub, G.,H., and Van Loan,C.,F, JHU Press,2013.
3. Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004.
4. Bishop, C. ,M., Pattern Recognition and Machine Learning, Springer, 2006.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2		3		2							3	
CO2	2		3	1										
CO3	3	3	3	1										
CO4	2	2	1	3		1		1						
CO5	1	3	2	2				1						

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Computer Vision		L	T	P	C
20APE0510			3	0	0	3
Pre-requisite	Artificial Intelligence	Semester	IV-I			

Course Objectives:

- Learn deep learning methods for working with sequential data.
- Learn deep recurrent and memory networks.
- Learn deep Turing machines.
- Apply such deep learning mechanisms to various learning problems.
- Know the open issues in deep learning, and have a grasp of the current research directions.

Course Outcomes :

- CO1: Understand theory and models in Image and Video Processing.
- CO2: Explain the need of spatial and frequency domain techniques for image compression.
- CO3: Understand the concept of Image Restoration & Multiresolution processing.
- CO4: Illustrate quantitative models of image and video segmentation.
- CO5: Apply the process of image enhancement for optimal use of resources.

UNIT - I	Digital image fundamentals	9 Hrs

Digital image fundamentals

A simple image formation model, Image sampling and quantization, Some basic relationships between pixels, Basic intensity transformation functions, Sampling and fourier transform of sampled functions, The discrete fourier transform of one variable, Extensions to functions of two variables(2-D discrete fourier transform, Properties of 2-D DFT and IDFT, 2-D Discrete Convolution Theorem.

UNIT - II	Image Enhancement (spatial domain)	9Hrs

Image Enhancement (spatial domain)

Histogram processing, Fundamentals of spatial filtering, Smoothing spatial filters, Sharpening spatial filters, The Laplacian-use of second order derivative for image sharpening, The Gradient-use of first order derivative for image sharpening.

Image Enhancement (frequency domain)

Basics of filtering in frequency domain, Image smoothing using lowpass frequency domain filters, Image sharpening using highpass filters.

UNIT - III	Image restoration	9 Hrs

Image restoration

Noise Models, Restoration in the presence of noise only – Spatial filters, Periodic noise reduction using Frequency domain filtering, Estimating the degradation function, inverse filtering, Minimum Least square error filtering, constrained least square filters.

Wavelet and Multiresolution processing

Matrix-based transform, Walsh-Hadamard Transform, Slant transform, Haar transform.

UNIT - IV	Image compression	9 Hrs

Image compression

Lossy and lossless compression schemes: Huffman coding, Run-length coding, Arithmetic coding, Block transform coding, JPEG.

Image Morphology: Fundamental operations, Morphological Algorithms.

Image segmentation: Point, Line and Edge detection, Canny edge detection, Hough Transform, Edge linking, Thresholding, Region-based segmentation, Pixel-based segmentation**.**

UNIT - V	Feature Extraction	9 Hrs

Feature Extraction

Boundary preprocessing, Boundary feature descriptor, Region feature descriptor, Principal components as feature descriptor, Whole image feature.

Video Processing: Video Formats, Video Enhancement and Restoration, Video Segmentation.

Textbooks:

1. Digital Image Processing, R. C. Gonzalez and R. E. woods, Pearson Education.
2. Handbook of Image and Video Processing, AL Bovik, Academic Press.

Reference Books:

1. Digital Image Processing and Analysis, B. Chanda and D. Dutta Mazumdar, PHI.
2. Digital Image Processing, W. K. Pratt, Wiley-Interscience.
3. Fundamentals of Digital Image Processing, A. K. Jain, Pearson India Education.
4. Pattern Classification and Scene Analysis, R. O. Duda and P. E. Hart, Wiley.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2			2								1	
CO2	2	2		2									1	1
CO3	2	2	1	2	2								1	
CO4	2	3	2	2	2								1	1
CO5	2	2		2	2								1	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	CRYPTOGRAPHY AND NETWORK SECURITY		L	T	P	C
20APE0511			3	0	0	3
Pre-requisite	**Computer Networks**	**Semester**	**IV - I**			

Course Objectives:

- Explain the objectives of information security
- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand various cryptographic algorithms.
- Understand the basic categories of threats to computers and networks
- Describe public-key cryptosystem.
- Describe the enhancements made to IPv4 by IPSec
- Understand Intrusions and intrusion detection
- Discuss the fundamental ideas of public-key cryptography.
- Generate and distribute a PGP key pair and use the PGP package to send an encrypted email message.
- Discuss Web security and Firewalls

Course Outcomes (CO):

CO1: Understand basic Cryptographic algorithm, Security issues
CO2: Identify various type of vulnerabilities of a computer network
CO3: Outline various Security algorithms.
CO4: Design secure system
CO5: Investigate the threads and identify the solution for the threats

UNIT – I	**Security Concepts and Cryptography Concepts and Techniques**	12 Hrs

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security.
Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks

UNIT – II	**Symmetric key Ciphers & Asymmetric key Ciphers**	10 Hrs

Symmetric key Ciphers: Block Cipher principles &Algorithms (DES, AES, Blowfish), Differential and Linear Cryptanalysis, Block cipher modes of operation, Stream ciphers, RC4,Location and placement of encryption function, **Key distribution Asymmetric key Ciphers:** Principles of public key cryptosystems, Algorithms(RSA, Diffie-Hellman,ECC), Key Distribution

UNIT – III	**Message Authentication Algorithms and Hash Functions**	8 Hrs

Message Authentication Algorithms and Hash Functions: Authentication requirements, Functions, Message authentication codes, Hash Functions, Secure hash algorithm, Whirlpool, HMAC, CMAC, Digital signatures, knapsack

UNIT – IV	**E-Mail Security & IP Security**	8 Hrs

E-Mail Security: Pretty Good Privacy, S/MIME.
IP Security: IP Security overview, IP Security architecture, Authentication Header, encapsulating security payload, combining security associations, key management.

UNIT – V	**Web Security, Virus and Firewalls, Case Studies on Cryptography and security**	10 Hrs

Web Security: Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction Intruders.
Virus and Firewalls: Intruders, Intrusion detection, password management, Virus and related threats, Countermeasures, Firewall design principles, Types of firewalls**.**
Case Studies on Cryptography and security: Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability, Virtual Elections.

Textbooks:

1. William Stallings, "Cryptography and Network Security", 5th Edition, Pearson Education, 2011.
2. Atul Kahate, "Cryptography and Network Security", 2nd Edition, Mc Graw Hill, 2010.
3. Bernard Menezes "Network Security and Cryptography", 1stEdition, CENGAGE Learning, 2010.

Reference Books:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition.
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH.
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning.
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2		2		2				1		
CO2	3	2		2	2									
CO3	2	3												2
CO4	3	2	2					2						
CO5	3	2	2	3	2	2		1					3	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	ADHOC & SENSOR NETWORKS		T	P	C
20APE0512			0	0	3
Pre-requisite	**Computer Networks**	**Semester**	**IV - I**		

Course Objectives:

- To understand the basics of Ad-hoc & Sensor Networks.
- To learn various fundamental and emerging protocols of all layers.
- To study about the issues pertaining to major obstacles in establishment and efficient management of Ad-hoc and sensor networks.
- To understand the nature and applications of Ad-hoc and sensor networks.
- To understand various security practices and protocols of Ad-hoc and Sensor Networks.

Course Outcomes (CO):

CO1: List the design issues for Adhoc and sensor networks
CO2: Analyze the use of TCP in Wireless networks.
CO3: Justify the need for new MAC Protocols for Adhoc networks.
CO4: Extend the existing protocols to make them suitable for Adhoc Networks.
CO5: Evaluate the performance of Protocols in Adhoc and sensor networks. Design new Protocols for Adhoc and Sensor networks.

UNIT – I	**IEEE 802 Networking Standard**	9 Hrs

IEEE 802 Networking Standard. Fundamentals of WLANs, IEEE 802.11 standard. What is Wireless Internet?, Mobile IP, Cellular and Adhoc Wireless Networks, Applications of Adhoc Networks, Issues in Ad Hoc Wireless Networks, Ad Hoc Wireless Internet.

UNIT – II	**Issues in Designing a MAC Protocol for Ad Hoc**	10 Hrs

Issues in Designing a MAC Protocol for Ad Hoc Wireless Networks, Design Goals of a MAC Protocol for Ad Hoc Wireless Networks, Classification of MAC Protocols, Contention-Based Protocols, Contention-Based Protocols with Reservation Mechanisms, Contention-Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that used Directional Antennas, Other MAC Protocols.

UNIT – III	**Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks**	8 Hrs

Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table-Driven Routing Protocols, On-Demand Routing Protocols, Hybrid Routing Protocols, Hierarchical Routing Protocols, Power-Aware Routing Protocols

UNIT – IV	**Multicast Routing in Ad hoc Wireless Networks**	8 Hrs

Multicast Routing in Ad hoc Wireless Networks- Issues in Designing a Multicast Routing Protocol, Operation of Multicast Routing Protocols, An architecture reference model for multicast routing protocols, Classifications of Multicast Routing Protocols, Tree-Based Multicast Routing Protocols, Mesh-Based Multicast Routing Protocols, Summary of Tree and Mesh-Based Protocols. Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions. TCP over Ad Hoc Wireless Networks, Other Transport Layer Protocols for Ad Hoc Wireless Networks.

UNIT – V	**Security in Ad Hoc Wireless Networks**	10 Hrs

Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad Hoc Wireless Networks. Wireless Sensor Networks- Introduction, Sensor Network Architecture, Data Dissemination, Data Gathering, MAC Protocols for Sensor Networks, Location Discovery, Quality of a Sensor Network, Evolving Standards, Other issues.

Textbooks:

1. Murthy, C. Siva Ram, and B. S. Manoj. Ad hoc wireless networks: Architectures and protocols. Pearson Education India, 2004.

Reference Books:

1. Carlos De Morais Cordeiro, Dharma Prakash Agrawal “Ad Hoc & Sensor Networks: Theory and Applications”, World Scientific Publishing Company, 2006.
2. Feng Zhao and Leonides Guibas, "Wireless Sensor Networks", Elsevier Publication -2002.
3. Holger Karl and Andreas Willig “Protocols and Architectures for Wireless Sensor Networks”,Wiley, 2005

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2		3											3	
CO3	3	2		3									3	
CO4	3	2	3											2
CO5	3	2	3	2	3									3

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	DISTRIBUTED SYSTEMS		L	T	P	C
20APE0513			3	0	0	3
Pre-requisite	**Operating Systems**	**Semester**	**IV - I**			

Course Objectives:

- Understand the issues involved in studying process and resource management.
- Understand in detail the system level and support required for distributed system.
- Introduce the idea of peer to peer services and file system.
- Understand foundations of Distributed Systems.

Course Outcomes (CO):

CO1: Understand trends in distributed systems.
CO2: Apply remote method invocation and objects.
CO3: Analyze the various distributed file system and file sharing methods.
CO4: Apply various synchronization techniques and distributed algorithms.
CO5: Design process and resources management systems.

UNIT – I	**Introduction to soft computing**	10 Hrs

INTRODUCTION: Examples of Distributed Systems – Trends in Distributed Systems – Focus on resource sharing – Challenges. Case study: World Wide Web.

UNIT – II	**Communication In Distributed System**	10 Hrs

COMMUNICATION IN DISTRIBUTED SYSTEM: System Model – Inter process Communication - the API for internet protocols – External data representation and Multicast communication. Network virtualization: Overlay networks. Case study: MPI Remote Method Invocation And Objects: Remote Invocation – Introduction - Request-reply protocols - Remote procedure call - Remote method invocation. Case study: Java RMI - Group communication - Publish-subscribe systems - Message queues - Shared memory approaches - Distributed objects - Case study: Enterprise Java Beans -from objects to components.

UNIT – III	**Peer To Peer Services And File System**	9 Hrs

PEER TO PEER SERVICES AND FILE SYSTEM: Peer-to-peer Systems – Introduction - Napster and its legacy - Peer-to-peer –Middleware - Routing overlays. Overlay case studies: Pastry, Tapestry- Distributed File Systems – Introduction - File service architecture – Andrew File system. File System: Features-File model -File accessing models - File sharing semantics Naming: Identifiers, Addresses, Name Resolution – Name Space Implementation – Name Caches – LDAP.

UNIT – IV	**Synchronization And Replication**	8 Hrs

SYNCHRONIZATION AND REPLICATION: Introduction - Clocks, events and process states - Synchronizing physical clocks- Logical time and logical clocks - Global states – Coordination and Agreement – Introduction - Distributed mutual exclusion – Elections – Transactions and Concurrency Control- Types Consistency Models: Linearizability- Sequential Consistency- Causal Consistency- Eventual Consistency – Transactions -Nested transactions – Locks – Optimistic concurrency control - Timestamp ordering – Atomic Commit protocols - Distributed deadlocks – Replication – Case study – Coda.

UNIT – V	**Process & Resource Management**	8 Hrs

PROCESS & RESOURCE MANAGEMENT: Process Management: Process Migration: Features, Mechanism - Threads: Models, Issues, Implementation. Resource Management: Introduction- Features of Scheduling Algorithms –Task Assignment Approach – Load Balancing Approach – Load Sharing Approach.

Textbooks:

1. George Coulouris, Jean Dollimore and Tim Kindberg, ―Distributed Systems Concepts and Design‖, Fifth Edition, Pearson Education, 2012.

Reference Books:

1. Distributed Systems, Principles and Paradigms, Andrew S. Tanenbaum, Maarten Van Steen, 2nd Edition, PHI.
2. Distributed Systems, An Algorithm Approach, Sukumar Ghosh, Chapman&Hall/CRC, Taylor & Fransis Group, 2007.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3	3	2	2	2								2	
CO3	3	3		2									3	
CO4	3	2	3	2	2								2	
CO5	3	2	3	2		1								3

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	DATA ANALYTICS (Common to CSE, CIC, AIDS)		L	T	P	C
20APE0514			3	0	0	3
Pre-requisite	**Data warehousing & Mining**	**Semester**	**IV - I**			

Course Objectives:

- To introduce the terminology, technology and its applications
- To introduce the concept of Analytics for Business
- To introduce the tools, technologies & programming languages which is used in day today analytics cycle

Course Outcomes (CO):

CO1: Distinguish Styles of data analysis
CO2: Classify approaches to generalize from data
CO3: Apply Generalized linear Models
CO4: Interpret the results of the model
CO5: Understand the data analytics role in real-time applications

UNIT – I	**An overview of R**	10 Hrs

An overview of R, Vectors, factors, univariate time series, Data frames, matrices, Functions, operators, loops, Graphics, Revealing views of the data, Data summary, Statistical analysis questions, aims, and strategies; Statistical models, Distributions: models for the random component, Simulation of random numbers and random samples, Model assumptions

UNIT – II	**Basic concepts of estimation**	9 Hrs

Basic concepts of estimation, Confidence intervals and tests of hypotheses, Contingency tables, One-way unstructured comparisons, Response curves, Data with a nested variation structure, Resampling methods for standard errors, tests, and confidence intervals, Theories of inference, Regression with a single predictor, multiple linear regressions.

UNIT – III	**Exploiting the linear model framework**	9 Hrs

Exploiting the linear model framework: Levels of a factor – using indicator variables, Fitting multiple lines, Polynomial regression, Methods for passing smooth curves through data, Smoothing with multiple explanatory variables, Generalized linear models, Logistic multiple regression, Logistic models for categorical data, Poisson regression, Additional notes on generalized linear models, Models with an ordered categorical or categorical response, Survival analysis, Transformations for count data, Time series models.

UNIT – IV	**Simulation**	8 Hrs

Simulation - Motivating Examples, Simulation Modeling Method, case study. Introduction to optimization – Introduction, Methods in Optimization- Linear Programming, Integer Programming—Enforcing Integrality Restrictions on Decision Variables, Nonlinear Optimization Models. Forecasting Analytics - Methods and Quantitative Approaches of Forecasting, Applied Forecasting Analytics Process, Applications, Evaluating Forecast Accuracy. Survival Analysis – Introduction, Motivating Business Problems, Methods of Survival Analysis, case study

UNIT – V	**Applications**	9 Hrs

Applications: Retail Analytics, Marketing Analytics, Financial Analytics, Social Media and Web Analytics, Healthcare Analytics

Textbooks:

1. Data Analysis and Graphics Using R – an Example-Based Approach, John Maindonald, W. John Braun, Third Edition, 2010
2. Essentials of Business Analytics An Introduction to the Methodology and its Applications, Bhimasankaram Pochiraju, Sridhar Seshadri, Springer, 2019, https://doi.org/10.1007/978-3-319-68837-4

Reference Books:

1. Data Analytics Using R Paperback, Seema Acharya, McGraw Hill Education, Apr 2018
2. R for Everyone: Advanced Analytics and Graphics Paperback, Jared P. Lander, Pearson Education, 2018
3. Fundamentals of Business Analytics, R N Prasad, Seema Acharya, Wiley Publications, 2ed Paperback, 2016
4. Business Analytics for Decision Making, Regi Mathew, First Edition, Pearson Paperback, 2020

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2												
CO2	2	2												
CO3	3	2	2										2	
CO4	3	2	2	2		2							2	
CO5	2				3							2		

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	SOFTWARE PROJECT MANAGEMENT (Common to CSE, CIC, AIDS)		L	T	P	C
20APE0515			3	0	0	3
Pre-requisite	**Software Engineering**	**Semester**	**IV - I**			

Course Objectives:

- Understanding the specific roles within a software organization as related to project and process management
- Describe the principles, techniques, methods & tools for model-based management of software projects, assurance of product quality and process adherence (quality assurance), as well as experience-based creation & improvement of models (process management).
- Understanding the basic infrastructure competences (e.g., process modeling and measurement)
- Understanding the basic steps of project planning, project management, quality assurance, and process management and their relationships

Course Outcomes (CO):

CO1: Describe the purpose and importance of project management.
CO2: Manage the size of software project.
CO3: Develop artifacts and model-based software.
CO4: Plan/monitor the activities in software development
CO5: Implement the process of project management and its applications

UNIT – I	Conventional Software Management	9 Hrs

Conventional Software Management: The waterfall model, conventional software Management performance. Evolution of Software Economics: Software Economics, pragmatic software cost estimation

UNIT – II	Improving Software Economics	9 Hrs

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.
The old way and the new: The principles of conventional software engineering, principles of modern software management, transitioning to an iterative process

UNIT – III	Life cycle phases	9 Hrs

Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases. **Artifacts of the process:** The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts. Model based software architectures: A Management perspective and technical perspective.

UNIT – IV	Work Flows of the process	9 Hrs

Work Flows of the process: Software process workflows, Inter Trans workflows. Checkpoints of the Process: Major Mile Stones, Minor Milestones, Periodic status assessments.
Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Interaction planning process, Pragmatic planning.
Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations. Process Automation: Automation Building Blocks, The Project Environment

UNIT – V	Project Control and Process instrumentation	9 Hrs

Project Control and Process instrumentation: The server care Metrics, Management indicators, quality indicators, life cycle expectations pragmatic Software Metrics, Metrics automation.
Tailoring the Process: Process discriminates, Example. Future Software Project Management: Modern Project Profiles Next generation Software economics, modern Process transitions.
Case Study: The Command Center Processing and Display System-Replacement (CCPDS-R)

Textbooks:

1. Software Project Management, Walker Royce, Pearson Education.
2. Software Project Management, Bob Hughes & Mike Cotterell, fourth edition,Tata Mc- Graw Hill

Reference Books:

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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3					2		2	2	2	2	2		
CO2	2	1	2		2				2	2	2		2	
CO3	2	2	2		2			1	2		2		2	2
CO4	3	2						2	2	2	2		2	
CO5	3	2	2	2	2	2		2	3	2	2	2	2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	LINUX ENVIRONMENT SYSTEM (Common to CSE, CIC, AIDS)		L	T	P	C
20APE0516			3	0	0	3
Pre-requisite	**Operating System**	**Semester**	**IV - I**			

Course Objectives:

- Understand the Multiuser, Multiprocessing, Multitasking, and multiprogramming environment.
- Learn the various flavors and installation types of Linux operating system.
- Experiences the installation and configuration status of Linux system.
- Learn the file system and various commands of Linux environment system.

Course Outcomes (CO):

CO1: Able to describe and use the LINUX operating system..
CO2: Able to describe and use the fundamental LINUX system tools and utilities.
CO3: Able to describe and write shell scripts in order to perform basic shell programming.
CO4: Able to describe and understand the LINUX file system.
CO5: Effectively use the Linux system to accomplish typical personal, office, technical, and software development tasks.

UNIT – I	INTRODUCTION TO LINUX OPERATING SYSTEM	9 Hrs

INTRODUCTION TO LINUX OPERATING SYSTEM: Introduction and Types of Operating Systems, Linux Operating System, Features, Architecture Of Linux OS and Shell Interface, Linux System Calls, Linux Shared Memory Management, Device and Disk Management in Linux, Swap space and its management. File System and Directory Structure in Linux. Multi-Processing, load sharing and Multi-Threading in Linux, Types of Users in Linux, Capabilities of Super Users and equivalents.

UNIT – II	INSTALLING LINUX AS A SERVER	9 Hrs

INSTALLING LINUX AS A SERVER : Linux and Linux Distributions ; Major differences between various Operating Systems (on the basis of: Single Users vs Multiusers vs Network Users; Separation of the GUI and the Kernel; Domains; Active Directory;).
INSTALLING LINUX IN A SERVER CONFIGUARTION : Before Installation; Hardware; Server Design ;Dual-Booting Issues; Modes of Installation; Installing Fedora Linux; Creating a Boot Disk; Starting the Installation; **GNOME AND KDE:** The History of X Windows; The Downside; Enter GNOME; About GNOME ; Starting X Windows and GNOME; GNOME Basics; The GNOME Configuration Tool.

UNIT – III	INSTALLING SOFTWARE	9 Hrs

INSTALLING SOFTWARE : The Fedora Package Manager; Installing a New Package using dpkg and RPM; Querying a Package; Uninstalling a Package using dpkg and RPM; Compiling Software; Getting and Unpacking the Package; Looking for Documentation; Configuring the Package; Compiling Your Package; Installing the Package, Driver Support for various devices in linux. MANAGING USERS: Home Directories ;Passwords; Shells; Stratup Scripts; Mail; User Databases; The / etc /passwd File; The / etc / shadow File; The / etc /group File; User Management Tools; Command-Line User Management; User LinuxConf to Manipulate Users and Groups; SetUID and SetGID Programs.

UNIT – IV	THE COMMAND LINE	9Hrs

THE COMMAND LINE : An Introduction to BASH, KORN, C, A Shell etc. ; BASH commands: Job Control; Environment Variables; Pipes; Redirection; Command-Line Shortcuts; Documentation Tools; The man Command; the text info System; File Listings; Owner ships and permissions; Listing Files; File and Directory Types; Change Ownership; Change Group; Change Mode ; File Management and Manipulation; Process Manipulation; Miscellaneous Tools; Various Editors Available like: Vi and its modes, Pico, Joe and emacs, Su Command. BOOTING AND SHUTTING DOWN: LILO and GRUB; Configuring LILO; Additional LILO options; Adding a New Kernel to Boot ; Running LILO; The Steps of Booting; Enabling and disabling Services.

UNIT – V	FILE SYSTEMS	9 Hrs

FILE SYSTEMS: The Makeup File Systems; Managing File Systems; Adding and Partitioning a Disk; Network File S ystems; Quota Management; CORE SYSTEM SERVICES: The init Service; The inetd and xinetd Processess; The syslogd Daemon; The cron Program. PRINTING : The Basic of lpd; Installing LPRng; Configuring /etc/printcap; The /ETC/lpd.perms File; Clients of lpd, Interfacing Printer through Operating System.

Textbooks:

1. Linux Administration: A Beginner's Guide by Steve Shah , Wale Soyinka, ISBN 0072262591 (0-07-226259-1), McGraw-Hill Education.
2. Unix Shell Programming, Yashavant P. Kanetkar, BPB Publications, 2003.
3. UNIX Concepts and Applications by Sumitabha Das Tata McGraw-Hill, 2006.
4. Operating System Concepts 8th edition, by Galvin Wiley Global Education, 2012.

Reference Books:

1. Unix operating system, by Grace Todino, John Strang, Jerry D. Peek Oreily publications 1993.
2. Operating System Concepts 8th edition, by Galvin Wiley Global Education, 2012.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		3												
CO2	2	2			2									
CO3			3	2										
CO4		3												
CO5										2			2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Information Retrieval Techniques (Common to CSE, CIC, AIDS)		L	T	P	C
20APE0517			3	0	0	3
Pre-requisite	**Artificial Intelligence**	**Semester**	**IV-I**			

Course Objectives:

- To understand the basics of Information Retrieval.
- To understand machine learning techniques for text classification and clustering.
- To understand various search engine system operations.
- To learn different techniques of recommender system.

Course Outcomes :

- CO1: Use an open source search engine framework and explore its capabilities
- CO2: Apply appropriate method of classification or clustering
- CO3: Design and implement innovative features in a search engine.
- CO4: Understand the web retrieval using search engines.
- CO5: Design and implement a recommender system.

UNIT - I	Information Retrieval	9 Hrs

Information Retrieval – Early Developments – The IR Problem – The User_s Task – Information versus Data Retrieval - The IR System – The Software Architecture of the IR System – The Retrieval and Ranking Processes - The Web – The e-Publishing Era – How the web changed Search – Practical Issues on the Web – How People Search – Search Interfaces Today – Visualization in Search Interfaces.

UNIT - II	MODELING AND RETRIEVAL EVALUATION	9Hrs

MODELING AND RETRIEVAL EVALUATION : Basic IR Models - Boolean Model - TF-IDF (Term Frequency/Inverse Document Frequency) Weighting - Vector Model – Probabilistic Model – Latent Semantic Indexing Model – Neural Network Model – Retrieval Evaluation – Retrieval Metrics – Precision and Recall – Reference Collection – User-based Evaluation – Relevance Feedback and Query Expansion – Explicit Relevance Feedback.

UNIT - III	TEXT CLASSIFICATION AND CLUSTERING	9 Hrs

TEXT CLASSIFICATION AND CLUSTERING: A Characterization of Text Classification – Unsupervised Algorithms: Clustering – Naïve Text Classification – Supervised Algorithms – Decision Tree – k-NN Classifier – SVM Classifier – Feature Selection or Dimensionality Reduction – Evaluation metrics – Accuracy and Error – Organizing the classes – Indexing and Searching – Inverted Indexes – Sequential Searching – Multi-dimensional Indexing.

UNIT - IV	WEB RETRIEVAL AND WEB CRAWLING	9 Hrs

WEB RETRIEVAL AND WEB CRAWLING: The Web – Search Engine Architectures – Cluster based Architecture – Distributed Architectures – Search Engine Ranking – Link based Ranking – Simple Ranking Functions – Learning to Rank – Evaluations -- Search Engine Ranking – Search Engine User Interaction – Browsing – Applications of a Web Crawler – Taxonomy – Architecture and Implementation – Scheduling Algorithms – Evaluation.

UNIT - V	RECOMMENDER SYSTEM	9 Hrs

RECOMMENDER SYSTEM : Recommender Systems Functions – Data and Knowledge Sources – Recommendation Techniques – Basics of Content-based Recommender Systems – High Level Architecture – Advantages and Drawbacks of Content-based Filtering – Collaborative Filtering – Matrix factorization models – Neighborhood models.

Textbooks:

1. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, —Modern Information Retrieval: The Concepts and Technology behind Search, Second Edition, ACM Press Books, 2011.
2. Ricci, F, Rokach, L. Shapira, B.Kantor, —Recommender Systems Handbookl, First Edition, 2011.

Reference Books:

1. C. Manning, P. Raghavan, and H. Schütze, —Introduction to Information Retrieval, Cambridge University Press, 2008.
2. Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, —Information Retrieval: Implementing and Evaluating Search Engines, The MIT Press, 2010.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2			2								2	2
CO2	2	2		2	2								2	2
CO3	2	1	3		1								1	2
CO4	2	2	2		2									3
CO5	1	2	3		2								2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Soft Computing (Common to CSE, CIC)		L	T	P	C
20APE0518			3	0	0	3
Pre-requisite	**Machine Learning**	**Semester**	**IV-I**			

Course Objectives:

- Understand Soft Computing concepts, technologies, and applications
- Introduce and use the concepts of Genetic algorithm and its applications to soft computing using
- some applications.
- familiarize with concepts of Fuzzy techniques , Hybrid and Soft computing techniques

Course Outcomes :

- CO1: Apply soft computing techniques and their roles in building intelligent machines
- CO2: Recognize the feasibility of applying a soft computing methodology for a particular problem.
- CO3: Implement basic Genetic algorithms
- CO4: Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.
- CO5: Effectively use Hybrid and Soft computing techniques to evaluate approaches of given problem.

UNIT - I	INTRODUCTIONTO SOFT COMPUTING AND SUPERVISED LEARNING NETWORKS	9 Hrs

Introduction to Soft Computing: Neural networks, Application scope of neural networks, Fuzzy logic, Genetic algorithm, Hybrid systems, Softcomputing.

Artificial Neural Networks: Fundamentals, Basic Models, Terminologies, Linear Separability, Hebb network.

Supervised Learning Networks: Perceptron Networks- Theory, Perceptron learning rule, Architecture, Flowchart for training process, Perceptron training algorithm for single and multiple output classes, Perceptron network testing algorithm; Back-Propagation Network - Theory, Architecture, Flow chart for training process, Training algorithm, Learning factors of back-propagation network, Testing algorithm for back-propagation network.

UNIT - II	UNSUPERVISED LEARNING NETWORKS	9Hrs

Fixed weight competitive nets – Maxnet, Mexican Hat Net, Hamming network; Kohonenself-organizing feature maps – Theory, Architecture, Flowchart, Training algorithm; Learning vector quantization – Theory, Architecture, Flowchart, Training algorithm, Variants; Counter propagation networks – Theory, Full counter propagation Net, Forward-only counter propagation Net; Adaptive resonance theory network – Fundamental architecture, Fundamental operating principle, Fundamental algorithm.

UNIT - III	GENETIC ALGORITHMS	9 Hrs

Genetic algorithms- Biological background, Traditional optimization and search techniques, Genetic algorithm and search space, Genetic algorithms vs. traditional algorithms, Basic terminologies in genetic algorithm, Simple GA, General genetic algorithm, Operators in genetic algorithm, Stopping condition for genetic algorithm flow, Constraints in genetic algorithm, Problem solving using genetic algorithm, Adaptive genetic algorithms, Hybrid genetic algorithms, Advantages and limitations of genetic algorithm, Applications of genetic algorithm.

UNIT - IV	FUZZY LOGIC	9 Hrs

Introduction to fuzzy logic, Classical sets, Fuzzy sets, Membership function – Features, Fuzzification, Methods of membership value assignments; Fuzzy arithmetic and measures–Fuzzy arithmetic, Extension principle, Fuzzy measures, Measures of fuzziness, Fuzzy integrals; Fuzzy rule base and approximation reasoning -Truth values and tables in fuzzy logic, Fuzzy propositions, Formation of rules, Compound rules, Aggregation of fuzzy rules, Fuzzy reasoning, Fuzzy inference systems, Overview of fuzzy expert system; Fuzzy decision making, Fuzzy logic control systems.

UNIT - V	HYBRID SOFT COMPUTING TECHNIQUES AND APPLICATIONS	9 Hrs

Hybrid Soft Computing Techniques: Genetic neuro hybrid systems, Genetic fuzzy hybrid and fuzzy genetic hybrid systems.

Applications of Soft Computing: Optimization of traveling salesman problem using genetic algorithm approach, Genetic algorithm-based internet search technique, Soft computing-based hybrid fuzzy controllers, Soft computing-based rocket engine control

Textbooks:

1. S. N. Sivanandam and S. N. Deepa, Principles of Soft Computing, Wiley, 3rd Edition, 2019.

Reference Books:

1. S. Rajasekaran and G. A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms:Synthesis and Applications, PHI Learning Private Ltd, 2011.
2. Udit Chakraborty, Samir Roy, Soft Computing: Neuro-Fuzzy and Genetic Algorithms, Pearson, 2013.
3. Saroj Kaushik, Sunita Tewari, Soft Computing: Fundamentals, Techniques and Applications, McGraw Hill, 2018.Engines, The MIT Press, 2010.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	3										3	3
CO2	2	3	3			2							1	2
CO3	2	2	3	3									2	3
CO4	1	1	1										1	
CO5	3	2	2		1									

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Principles of Data Science (Common to CSE, CIC)		L	T	P	C
20APE0519			3	0	0	3
Pre-requisite	**Data Warehousing & Mining**	**Semester**	**IV - I**			

Course Objectives

- Understand Quantitative and qualitative data, communicate and visualize the results.
- Familiarize with Arithmetic symbols, Graphs, Logarithms and probability concepts.
- Understand the Measuring Statistics, Point estimates and Hypothesis tests.
- Learn and visualize Scatter plots, Line graphs, Bar charts, Histograms.
- Understand the applications of data science.

Course Outcomes (CO):

CO1: Recognize the different levels of Data Science concepts.
CO2: Analyse the basics of probability models for data exploration.
CO3: Analyse the basics of statistics models for data exploration.
CO4: Demonstrate the data using visualization techniques.
CO5: Design the suitable model for real time applications.

UNIT – I	**Introduction to Data Science**	9 Hrs

Structured versus unstructured data, Quantitative and qualitative data, The four levels of data: Nominal level, Ordinal level, Interval level, and Ratio level, The five steps of Data Science: Ask an interesting question, obtain the data, explore the data, model the data, communicate and visualize the results, Explore the data.

UNIT – II	**Mathematics**	10 Hrs

Mathematics: Vectors and matrices, Arithmetic symbols, Graphs, Logarithms/exponents, Set theory, Linear algebra. Probability: Basic definitions, Probability, Bayesian versus Frequentist, Compound events, Conditional Probability, The rules of probability, Collectively exhaustive events, Bayes theorem, Random variables.

UNIT – III	**Statistics**	9 Hrs

Statistics: Obtaining data, Sampling data, Measuring Statistics, The Empirical rule, Point estimates, Sampling distributions, Confidence intervals, Hypothesis tests.

UNIT – IV	**Identifying effective and ineffective visualizations**	9 Hrs

Identifying effective and ineffective visualizations: Scatter plots, Line graphs, Bar charts, Histograms, Box plots. Graphs and Statistics lie: Correlation versus causation, Simpson's paradox, Verbal Communication, Thewhy/how/what strategy of presenting.

UNIT – V	**Applications of Data Science**	9 Hrs

Applications of Data Science- Technologies for visualisation, Bokeh (Python), recent trends in various data collection and analysis techniques, various visualization techniques, application development methods of used in data science.

Textbooks:

1. Sinan Ozdemir, "Principles of Data Science", Packt, 2016.
2. "Algorithms for Data Science", 1st edition, Steele, Brian, Chandler, John, Reddy, Swarna, springers Publications, 2016

Reference Books:

1. Cathy O'Neil and Rachel Schutt, "Doing Data Science, Straight Talk From The Frontline", O'Reilly, 2014.
2. G. Jay Kerns, "Introduction to Probability and Statistics Using R", First Edition.
3. Nina Zumel, John Mount, "Practical Data Science with R", Manning Publications, 1st Edition, 2014.
4. Doing Data Science: Straight Talk From The Frontline, 1st edition, Cathy O'Neil and Rachel Schutt, O'Reilly, 2013
5. Mining of Massive Datasets, 2nd edition, Jure Leskovek, Anand Rajaraman and Jeffrey Ullman, v2.1, Cambridge University Press, 2014

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2										2	
CO2	3	2	2	3									2	
CO3	3	2	2	3									2	
CO4		3	2	2	3								2	2
CO5		2	2	2	3								2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	DIGITAL IMAGE PROCESSING (Common to CSE, CIC, AIDS)		L	T	P	C
20APE0407			3	0	0	3
Pre-requisite	**Signals & Systems**	**Semester**	**IV - I**			

Course Objectives:

- Provide the student with the fundamentals of digital image processing.
- Give the students a taste of the applications of the theories taught in the subject. This will be achieved through the project and some selected lab sessions.
- Introduce the students to some advanced topics in digital image processing.
- Give the students a useful skill base that would allow them to carry out further study should they be interested and to work in the field.

Course Outcomes (CO):

CO1: Review the fundamental concepts of a digital image processing system.
CO2: Analyze images in the frequency domain using various transforms.
CO3: Learn different techniques employed for the enhancement of images.
CO4: Apply the techniques for image restoration and segmentation
CO5: Analyze and apply various spatial and frequency domain techniques of image compression.

UNIT – I	**Image Processing Fundamentals**	9 Hrs

Image Processing Fundamentals:
Introduction to Digital Image processing – Example fields of its usage- Fundamental steps in Image Processing, Components of general image processing system, Image sensing and Acquisition–image Modeling - Sampling, Quantization and Digital Image representation - Basic relationships between pixels, -Mathematicaltools/ operations applied on images-imaging geometry.

UNIT – II	**Image Transforms**	9 Hrs

Image Transforms:
Discrete Fourier Transform-Discrete Cosine Transforms-Discrete Sine Transform, Walsh-Hadamard Transforms-Haar Transform-Hotelling Transform, Comparison of properties of the above.

UNIT – III	**Image Enhancement Techniques**	9 Hrs

Image Enhancement Techniques:
Background enhancement by point processing Histogram processing, Spatial filtering, Enhancement in frequency Domain, Image smoothing, Image sharpening, Color image enhancement

UNIT – IV	**Image Restoration & Image segmentation**	9 Hrs

Image Restoration:
Degradation model, Algebraic approach to restoration–Inverse filtering–Least Mean Square filters, Constrained Least square restoration, Blind Deconvolution.
Image segmentation: Edge detection-,Edge linking, Threshold based segmentation methods–Region based Approaches –Template matching–use of motion in segmentation

UNIT – V	**Image Compression**	9 Hrs

Image Compression:
Redundancies in Images - Compression models, Information theoretic perspective- Fundamental coding theorem. Huffman Coding, Arithmetic coding, Bit plane coding, Run length coding, Transform coding, Image Formats and compression standards.

Textbooks:

1. R.C .Gonzalez & R.E. Woods, "Digital Image Processing", Addison Wesley/Pearson education, 3rd Edition, 2010.
2. A .K. Jain, "Fundamentals of Digital Image processing", PHI.

Reference Books:

1. Rafael C. Gonzalez, Richard E woods and Steven L.Eddins, "Digital Image processing using MATLAB", Tata McGraw Hill, 2010.
2. S jayaraman, S Esakkirajan, T Veerakumar, "Digital Image processing",Tata McGraw Hill
3. William K. Pratt, "Digital Image Processing", John Wilely, 3rd Edition, 2004.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													3
CO2	3	2	3											3
CO3	3	2				2								2
CO4	3	2	2			1								2
CO5	3	2	1			3								1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	EMBEDDED SYSTEMS (Common to CSE, CIC, AIDS)		L	T	P	C
20APE0411			3	0	0	3
Pre-requisite	**Computer Organization**	**Semester**	**IV - I**			

Course Objectives:

- This course emphasizes on comprehensive treatment of embedded hardware and real time operating systems along with case studies, in tune with the requirements of Industry.
- To enable the students to understand embedded-system programming and apply that knowledge to design and develop embedded solutions.

Course Outcomes (CO):

CO1: Understand the fundamental concepts of Embedded systems.
CO2: Analyze TM4C Architecture, Instruction Set, addressing modes to develop programs for various applications using Assembly and Embedded C.
CO3: Develop an embedded system by interfacing the microcontrollers and IDE tools.
CO4: Figure out problems using TM4C On chip Resources such as Timer, Clock System, Low Power Modes/techniques and Interrupt Structure.
CO5: Implement the protocols used by microcontroller to communicate with external sensors and actuators in real world.

UNIT – I	**Introduction To Embedded Systems**	10 Hrs

INTRODUCTION TO EMBEDDED SYSTEMS

Embedded system introduction, host and target concept, embedded applications, features and architecture considerations for embedded systems- ROM, RAM, timers; data and address bus concept, Embedded Processor and their types, Memory types, overview of design process of embedded systems, programming languages and tools for embedded design

UNIT – II	**Embedded Processor Architecture**	9 Hrs

EMBEDDED PROCESSOR ARCHITECTURE

CISC Vs RISC design philosophy, Von-Neumann Vs Harvard architecture. Introduction to ARM architecture and Cortex – M series, Introduction to the TM4C family viz. TM4C123x & TM4C129x and its targeted applications. TM4C block diagram, address space, on-chip peripherals (analog and digital) Register sets, addressing modes and instruction set basics.

UNIT – III	**Overview Of Microcontroller And Embedded Systems**	9 Hrs

OVERVIEW OF MICROCONTROLLER AND EMBEDDED SYSTEMS

Embedded hardware and various building blocks, Processor Selection for an Embedded System, Interfacing Processor, Memories and I/O Devices, I/O Devices and I/O interfacing concepts, Timer and Counting Devices, Serial Communication and Advanced I/O, Buses between the Networked Multiple Devices. Embedded System Design and Co-design Issues in System Development Process, Design Cycle in the Development Phase for an Embedded System, Uses of Target System or its Emulator and In-Circuit Emulator (ICE), Use of Software Tools for Development of an Embedded System Design metrics of embedded systems - low power, high performance, engineering cost, time-to-market.

UNIT – IV	**Microcontroller Fundamentals For Basic Programming**	9 Hrs

MICROCONTROLLER FUNDAMENTALS FOR BASIC PROGRAMMING

I/O pin multiplexing, pull up/down registers, GPIO control, Memory Mapped Peripherals, programming System registers, Watchdog Timer, need of low power for embedded systems, System Clocks and control, Hibernation Module on TM4C, Active vs Standby current consumption. Introduction to Interrupts, Interrupt vector table, interrupt programming. Basic Timer, Real Time Clock (RTC), Motion Control Peripherals: PWM Module & Quadrature Encoder Interface (QEI).

UNIT – V	**Embedded Communications Protocols And Internet Of Things**	9 Hrs

EMBEDDED COMMUNICATIONS PROTOCOLS AND INTERNET OF THINGS

Synchronous/Asynchronous interfaces (like UART, SPI, I2C, USB), serial communication basics, baud rate concepts, Interfacing digital and analog external device, Implementing and programming UART, SPI and I2C, SPI interface using TM4C.Case Study: Tiva based embedded system application using the interface protocols for communication with external devices “Sensor Hub Booster Pack” Embedded Networking fundamentals, IoT overview and architecture, Overview of wireless sensor networks and design examples. Adding Wi-Fi capability to the Microcontroller, Embedded Wi-Fi, User APIs for Wireless and Networking applications Building IoT applications using CC3100 user API. Case Study: Tiva based Embedded Networking Application: “Smart Plug with Remote Disconnect and Wi-Fi Connectivity”

Textbooks:

1. Embedded Systems: Real-Time Interfacing to ARM Cortex-M Microcontrollers, 2014, Create space publications ISBN: 978-1463590154.
2. Embedded Systems: Introduction to ARM Cortex - M Microcontrollers, 5th edition Jonathan W Valvano, Create space publications ISBN-13: 978-1477508992
3. Embedded Systems 2E Raj Kamal, Tata McGraw-Hill Education, 2011 ISBN-0070667640, 9780070667648

Reference Books:

1. http://processors.wiki.ti.com/index.php/HandsOn_Training_for_TI_Embedded_Processors
2. http://processors.wiki.ti.com/index.php/MCU_Day_Internet_of_Things_2013_Workshop
3. http://www.ti.com/ww/en/simplelink_embedded_wi-fi/home.html
4. CC3100/CC3200 SimpleLink™ Wi-Fi® Internet-on-a-Chip User Guide Texas Instruments Literature Number: SWRU368A April 2014–Revised August 2015

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2										1	2
CO2			3										2	2
CO3	1		3										1	3
CO4			2	3										2
CO5				2	3								1	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	Enabling Technologies for Data Science & Analytics: IoT (Common to CSE, AIDS)		L	T	P	C
20AOE3601			3	0	0	3
Pre-requisite	Computer Networks	Semester	IV - I			

Course objectives:

- Students will be explored to the interconnection and integration of the physical world and the cyber space. They are also able to design & develop IoT Devices.

Course Outcomes (CO):

CO1: Able to understand the applications of IOT
CO2: Able to understand build blocks of IOT.
CO3: Apply IOT design methodologies
CO4: Able to understand the HADOOP and IEEE standard protocol
CO5: Able to understand the Zigbee devices

UNIT – I	Introduction to Internet of Things	9 Hrs

Introduction to Internet of Things
Introduction, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies. Domain Specific IoTs Introduction, Home Automation, cities, Environment, Retail, Agriculture, Industry, Health & Lifestyle.

UNIT – II	IoT and M2M	9 Hrs

IoT and M2M
Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT. IoT System Management with NETCONF-YANG Need for IoT Systems Management, Simple Network Management Protocol (SNMP), Network Operator requirements, NETCONF, YANG, IoT System Management with NETCONF-YANG

UNIT – III	Developing Internet of Things	9 Hrs

Developing Internet of Things
Introduction, IoT Design Methodology, Case Study on IoT System for Weather Monitoring. Case Studies Illustrating IoT Design: Introduction, Home Automation, Cities, Environment, Agriculture, Productivity Applications.

UNIT – IV	Advanced Topics	9 Hrs

Advanced Topics:
Introduction, Apache Hadoop, Using Hadoop Map Reduce for Batch Data Analysis. IEEE 802.15.4: The IEEE 802 committee family of protocols, The physical layer, The Media Access control layer, Uses of 802.15.4, The Future of 802.15.4: 802.15.4e and 802.15.4g.

UNIT – V	ZigBee	9 Hrs

ZigBee:
Development of the standard, ZigBee Architecture, Association, The ZigBee network layer, The ZigBee APS Layer, The ZigBee Devices Object (ZDO) and the ZigBee Device Profile (ZDP), Zigbee Security, The ZigBee Cluster Library (ZCL), ZigBee Applications profiles, The ZigBee Gateway Specifications for network devices.

Textbooks:

1. Internet of Things a Hands-on Approach by Arshdeep Bahga and Vijay Madisetti. University Press.
2. The Internet of Things key applications and protocols by Oliver Hersent, David Boswarthick and Omar elloumi, Wiley Student Edition.

Reference Books:

1. Internet of Things: Architecture, Design Principles and Applications by Raj Kamal MCGraw Hill Edition.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3			2					2			1	
CO2	3	3			2					2			1	
CO3	3	3	2			2	2							1
CO4	3	3	2	2										1
CO5	3				2	2				2			1	1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	WIRELESS COMMUNICATIONS (Common to CSE, CIC, AIDS)		L	T	P	C
20APE0415			3	0	0	3
Pre-requisite	COMPUTER NETWORKS	Semester	IV - I			

Course Outcomes (CO):

CO1: Understand the effective bandwidth utilization to accommodate large number of mobile users by using various accessing techniques
CO2: Analyze networking considerations, practical networking approaches with mobile data services.
CO3: Understand WAP Architecture and services, WML scripts.
CO4: Analyze the protocols used in wireless LAN technologies.
CO5: Identify mobile data and advanced wireless networks

UNIT – I	INTRODUCTION TO WIRELESS COMMUNICATIONS AND MULTIPLE ACCESS TECHNIQUES	9 Hrs

INTRODUCTION TO WIRELESS COMMUNICATIONS AND MULTIPLE ACCESS TECHNIQUES:
Evolution of mobile radio communications, examples of Wireless Communication systems, comparison of common Wireless Communication systems, Multiple access techniques: Introduction, FDMA, TDMA, Spread Spectrum, Multiple Access, SDMA, Packet radio, Packet radio protocols, CSMA protocols, Reservation protocols.

UNIT – II	WIRELESS NETWORKING AND DATA SERVICES	9 Hrs

WIRELESS NETWORKING AND DATA SERVICES:
Wireless Networking: Difference between wireless and fixed telephone networks, Development of wireless networks, Traffic routing in wireless networks. Data Services: Data services, CCS, BISDN and ATM, Signalling System No7

UNIT – III	MOBILE IP AND WIRELESS ACCESS PROTOCOL	9 Hrs

MOBILE IP AND WIRELESS ACCESS PROTOCOL:
Mobile IP: Mobile IP Operation of mobile IP, Co-located address, Registration, Tunneling. WAP: WAP Architecture, overview, WML scripts, WAP service, WAP session protocol.

UNIT – IV	WIRELESS LAN TECHNOLOGY AND BLUETOOTH	9 Hrs

WIRELESS LAN TECHNOLOGY AND BLUETOOTH:
Wireless LAN: Infrared LANs, Spread spectrum LANs, Narrow bank microwave LANs, IEEE802.11 Protocol architecture and services. Bluetooth: Overview, Radio specification, Base band specification, Links manager specification, Logical link control and adaptation protocol.

UNIT – V	MOBILE DATA NETWORKS AND HIPER LAN	9 Hrs

MOBILE DATA NETWORKS AND HIPER LAN:
Mobile Data Networks: GPRS and higher data rates, Short messaging service in GSM, HIPER LAN: HIPERLAN-1.

Textbooks:

1. Wireless Communications, Principles, Practice –Theodore S. Rappaport, PHI, 2nd Ed., 2002. 2. Wireless Communication and Networking
2. Wireless Communication and Networking – William Stallings, PHI, 2003.
3. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, Pearson Education, 2002.

Reference Books:

1. Wireless Digital Communications – Kamilo Feher, PHI, 1999.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3												3	1
CO2	3	2											2	2
CO3	3												3	1
CO4	1			3									2	1
CO5	1				3								2	1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	MANAGEMENT SCIENCE (Common to CSE, CIC, AIDS)		L	T	P	C
20AOE0302			3	0	0	3
Pre-requisite	**Managerial economics and financial analysis**	**Semester**	**IV - I**			

Course Outcomes (CO):

CO1: Exercise critical thinking to propose, communicate, and implement, action plan that address opportunities and issues
CO2: Identify and utilize ethical and legal standards in psychology while taking into account all relevant stakeholders.
CO3: Observe and recognize behaviours in organizational settings to aid in predicting outcomes.
CO4: Appreciate the importance of time management, planning, and communication in completing a group project.
CO5: Integrate knowledge of the key theories across the disciplines of public administration.

UNIT – I	**CONCEPTS OF MANAGEMENT AND ORGANISATION**	12 Hrs

CONCEPTS OF MANAGEMENT AND ORGANISATION: Functions of management, evolution of management thought, Taylor's scientific management, fayol's principles of management, Hertzberg's Maslow's hierarchy of human needs, theory x and y, Hawthorne experiment, morale, motivation, working environmental conditions, systems approach to management**.**

UNIT – II	**PLANT LOCATION & WORK STUDY**	10 Hrs

PLANT LOCATION: Definition, factors affecting the plant location, comparison of rural and urban sites, methods for selection of plant- matrix approach. Plant layout - definition, objectives, types of plant layout, various data analysing forms travel chart.
WORK STUDY: Definition, objectives, method study - definition, objectives, steps involved- various types of associated charts, difference between micro motion and memo motion studies. Work measurement- definition, time study, steps involved, equipment, different methods of performance rating, allowances, standard time calculation. Work Sampling - definition, steps involved, standard time calculations, and differences with time study

UNIT – III	**INTRODUCTION TO PERT / CPM**	8 Hrs

INTRODUCTION TO PERT / CPM: Project management, network modelling-probabilistic model, various types of activity times estimation, programme evaluation review techniques, critical path, probability of completing the project, deterministic model, critical path method (CPM), critical path calculation, crashing of simple of networks.
INSPECTION AND QUALITY CONTROL: Types of inspections, statistical quality control, techniques, variables and attributes, assignable and non-assignable causes, variable control charts, and R charts, attributes control charts, p charts and c charts. Acceptance sampling plan, single sampling and double sampling plans, OC curves. Introduction to TQM - quality circles, ISO 9000 series procedures.

UNIT – IV	**MATERIALS MANAGEMENT**	8 Hrs

MATERIALS MANAGEMENT: Objectives, inventory functions, types, associated costs, inventory classification techniques-ABC and VED analysis. Inventory control systems, continuous review system, periodical review system. Stores management and stores records. Purchase management, duties of purchase of manager, associated forms.

UNIT – V	**INTRODUCTION TO HUMAN RESOURCE MANAGEMENT**	10 Hrs

INTRODUCTION TO HUMAN RESOURCE MANAGEMENT: Functions of HRM, job evaluation, different types of evaluation methods. Job description, merit rating, different methods of merit ratings, wage incentives, different types of wage incentive schemes. Marketing, selling, marketing mix, product life cycle.

Textbooks:

1. O. P. Khanna (2004), Industrial Engineering and Management, Dhanpat Rai, New Delhi

Reference Books:

1. Stoner, Freeman (2005), Gilbert, Management, 6th edition, Pearson Education, New Delhi.
2. Panner Selvam (2004), Production and Operations Management, Prentice Hall of India, New Delhi.
3. Ralph M. Barnes (2004), Motion and Time Studies, John Wiley and Sons.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1								2				
CO2						2		2		1				
CO3	2				2									
CO4								1		2	3			
CO5						3				3				

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	ENGLISH FOR RESEARCH PAPER WRITING (Common to CSE, CIC, AIDS)		L	T	P	C
20AOE9901			3	0	0	3
Pre-requisite	**Communicative English**	**Semester**	**IV - I**			

Course Outcomes (CO):

CO1: Improve writing skills and level of readability.
CO2: Learn what to write in each section, avoiding plagiarism.
CO3: Understand the review of research literature
CO4: Apply skills in writing a Title, abstract and literature
CO5: Learn the skills of drafting Summations

UNIT – I	**Planning and Preparation**	12 Hrs

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.

UNIT – II	**Paraphrasing and Plagiarism**	10 Hrs

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction.

UNIT – III	**Review of the Literature**	8 Hrs

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT – IV	**Key skills for writing a title**	8 Hrs

Key skills for writing a title – an abstract – an introduction – review of literature

UNIT – V	**Key skills for writing methodology**	10 Hrs

Key skills for writing methodology – results – discussions – conclusions.

Reference Books:

1.Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3.Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook.
4.Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1										3				
CO2				3										
CO3				3										
CO4										3				
CO5										3				

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	ENTREPRENEURSHIP DEVELOPMENT (Common to CSE, CIC, AIDS)		L	T	P	C
20AHSMB02			3	0	0	3
Pre-requisite		Semester	IV - I			

Course Outcomes (CO):

CO1: Understand the concept of Entrepreneurship and challenges in the world of Competition.
CO2: Apply the Knowledge in generating ideas for New Ventures and design business plan structure.
CO3: Analyze various sources of finance and subsidies to entrepreneurs.
CO4: Evaluate the role of central government and state government in promoting women Entrepreneurship.
CO5: Study the role of incubations in fostering startups.

UNIT – I	Introduction to Entrepreneurship	12 Hrs

Entrepreneurship - Concept, knowledge and skills requirement - Characteristics of successful entrepreneurs - Entrepreneurship process - Factors impacting emergence of entrepreneurship - Differences between Entrepreneur and Intrapreneur - Understanding individual entrepreneurial mindset and personality - Recent trends in Entrepreneurship.

UNIT – II	Formulation of Business Idea	10 Hrs

Starting the New Venture - Generating business idea – Sources of new ideas & methods of generating ideas - Opportunity recognition - Feasibility study - Market feasibility, technical/operational feasibility - Financial feasibility - Drawing business plan - Preparing project report - Presenting business plan to investors.

UNIT – III	Financial Aspects of Promotion	8 Hrs

Sources of finance - Various sources of Finance available - Long term sources - Short term sources - Institutional Finance – Commercial Banks, SFC's in India - NBFC's in India - their way of financing in India for small and medium business - Entrepreneurship development programs in India - The entrepreneurial journey- Institutions in aid of entrepreneurship development.

UNIT – IV	Women Entrepreneurship	8 Hrs

Women Entrepreneurship - Entrepreneurship Development and Government - Role of Central Government and State Government in promoting women Entrepreneurship - Introduction to various incentives, subsidies and grants – Export- oriented Units - Fiscal and Tax concessions available - Women entrepreneurship - Role and importance - Growth of women entrepreneurship in India - Issues & Challenges - Entrepreneurial motivations.

UNIT – V	Startups and Incubation	10 Hrs

Startups – Definition, Role of startups in India, Governmental initiatives to foster entrepreneurship across sectors. Funding opportunities for startups. Business Incubation and its benefits, Pre-Incubation and Post - Incubation process.

Textbooks:

1. D F Kuratko and T V Rao, "Entrepreneurship" - A South-Asian Perspective – Cengage Learning, 2012. (For PPT, Case Solutions Faculty may visit : login.cengage.com)
2 . Nandan H, " Fundamentals of Entrepreneurship", PHI, 2013.

Reference Books:

1. Vasant Desai, "Small Scale Industries and Entrepreneurship", Himalaya Publishing 2012.
2. Rajeev Roy "Entrepreneurship", 2nd Edition, Oxford, 2012.
3. B.Janakiram and M.Rizwanal "Entrepreneurship Development: Text & Cases", Excel Books, 2011.
4. Stuart Read, Effectual "Entrepreneurship", Routledge, 2013.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3							1						
CO2			3								1			
CO3										2	3			
CO4						3				1				
CO5			3							2				

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Course Code	DEVOPS		L	T	P	C
20ASA0504			1	0	2	2
Pre-requisite	HTML, OOPS, CLOUD COMPUTING	Semester	IV - I			

Course Outcomes (CO):

CO1: Understand different actions performed through Version control tools like Git.
CO2: Perform Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven & Gradle.
CO3: Understand Automated Continuous Deployment
CO4: Apply configuration management using Ansible
CO5: Understand to leverage Cloud-based DevOps tools using Azure DevOps

UNIT – I	INTRODUCTION TO DEVOPS	12 Hrs

Devops Essentials - Introduction To AWS, GCP, Azure - Version control systems: Git and Github.

UNIT – II	COMPILE AND BUILD USING MAVEN & GRADLE	10 Hrs

Introduction, Installation of Maven, POM files, Maven Build lifecycle, Build phases(compile build, test, package) Maven Profiles, Maven repositories(local, central, global),Maven plugins, Maven create and build Artificats, Dependency management, Installation of Gradle, Understand build using Gradle

UNIT – III	CONTINUOUS INTEGRATION USING JENKINS	8 Hrs

Install & Configure Jenkins, Jenkins Architecture Overview, Creating a Jenkins Job, Configuring a Jenkins job, Introduction to Plugins, Adding Plugins to Jenkins, Commonly used plugins (Git Plugin, Parameter Plugin, HTML Publisher, Copy Artifact and Extended choice parameters). Configuring Jenkins to work with java, Git and Maven, Creating a Jenkins Build and Jenkins workspace.

UNIT – IV	CONFIGURATION MANAGEMENT USING ANSIBLE	8 Hrs

Ansible Introduction, Installation, Ansible master/slave configuration, YAML basics, Ansible modules, Ansible Inventory files, Ansible playbooks, Ansible Roles, adhoc commands in ansible

UNIT – V	BUILDING DEVOPS PIPELINES USING AZURE	10 Hrs

Create Github Account, Create Repository, Create Azure Organization, Create a new pipeline, Build a sample code, Modify azure-pipelines.yaml file

PRACTICAL EXERCISES:

1. Create Maven Build pipeline in Azure
2. Run regression tests using Maven Build pipeline in Azure
3. Install Jenkins in Cloud
4. Create CI pipeline using Jenkins
5. Create a CD pipeline in Jenkins and deploy in Cloud
6. Create an Ansible playbook for a simple web application infrastructure
7. Build a simple application using Gradle
8. Install Ansible and configure ansible roles and to write playbooks

Textbooks:

1.Roberto Vormittag, "A Practical Guide to Git and GitHub for Windows Users: From Beginner to Expert in Easy Step-By-Step Exercises", Second Edition, Kindle Edition, 2016.
2. Jason Cannon, "Linux for Beginners: An Introduction to the Linux Operating System and Command Line", Kindle Edition, 2014

Reference Books:

1. Hands-On Azure Devops: Cicd Implementation For Mobile, Hybrid, And Web Applications Using Azure Devops And Microsoft Azure: CICD Implementation for ... DevOps and Microsoft Azure (English Edition) Paperback – 1 January 2020 by Mitesh Soni
2. Jeff Geerling, "Ansible for DevOps: Server and configuration management for humans", First Edition, 2015.
3. David Johnson, "Ansible for DevOps: Everything You Need to Know to Use Ansible for DevOps", Second Edition, 2016.
4. Mariot Tsitoara, "Ansible 6. Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer", Second Edition, 2019.
5. https://www.jenkins.io/user-handbook.pdf
6. https://maven.apache.org/guides/getting-started/

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	3								2	2
CO2	3	3	3	2	3								2	2
CO3	3	3	3	2	3								2	2
CO4	3	3	3	2	3								2	2
CO5	3	3	3	2	3								2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)