

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

**COMPUTER SCIENCE AND ENGINEERING**  
(Effective for the batches admitted in 2019-20)

**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)

<b>PO 1: Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.		
<b>Competency</b>	<b>Indicators</b>	
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
<b>PO 2: Problem analysis:</b> Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.		
<b>Competency</b>	<b>Indicators</b>	
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.
<b>PO 3: Design/Development of Solutions:</b> 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.		
<b>Competency</b>	<b>Indicators</b>	
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.
3.3 Demonstrate an ability to select optimal design scheme for further development	3.2.3	Identify suitable non functional requirements for evaluation of alternate design solutions.
	3.3.1	Ability to perform systematic evaluation of the degree to which several design concepts meet the criteria.
3.4 Demonstrate an ability to advance an engineering design to defined end state	3.3.2	Consult with domain experts and stakeholders to select candidate engineering design solution for further development
	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.
<b>PO 4: Conduct investigations of complex problems:</b> 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.		
<b>Competency</b>		<b>Indicators</b>
4.1 Demonstrate 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
<b>PO 5: Modern tool usage:</b> 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.		
<b>Competency</b>		<b>Indicators</b>
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
<b>PO 6: The engineer and society:</b> 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.		
<b>Competency</b>		<b>Indicators</b>
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
<b>PO 7: Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.		
<b>Competency</b>		<b>Indicators</b>
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
<b>PO 8: Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.		
<b>Competency</b>		<b>Indicators</b>
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
<b>PO 9: Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.		
<b>Competency</b>		<b>Indicators</b>
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
<b>PO 10: Communication:</b> 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		
<b>Competency</b>		<b>Indicators</b>
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
<b>PO 11: Project management and finance:</b> 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.		
<b>Competency</b>		<b>Indicators</b>
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	11.2.1	Analyze and select the most appropriate proposal based on economic and financial considerations.

proposals for an engineering activity		
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
<b>PO 12: Life-long learning:</b> 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.		
<b>Competency</b>		<b>Indicators</b>
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.

**I B. Tech – I Semester (Theory – 3, Lab – 4)**

S.No	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
<b>THEORY</b>										
1	BS	19ABS9901	Algebra & Calculus	3	1	0	4	30	70	100
2	BS	19ABS9904	Chemistry	3	0	0	3	30	70	100
3	ES	19AES0501	Problem Solving and Programming	3	1	0	4	30	70	100
<b>PRACTICAL</b>										
4	ES	19AES0301	Engineering Graphics Lab	1	0	4	3	30	70	100
5	LC	19ALC0301	Engineering Workshop	0	0	2	1	30	70	100
6	BS	19ABS9909	Chemistry Lab	0	0	3	1.5	30	70	100
7	ES	19AES0503	Problem Solving and Programming Lab	0	0	4	2	30	70	100
<b>TOTAL</b>							<b>18.5</b>	<b>210</b>	<b>490</b>	<b>700</b>

**I B. Tech – II Semester (Theory – 5, Lab – 5)**

S.No	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
<b>THEORY</b>										
1	ES	19AES0202	Basics of Electrical and Electronics Engineering	3	0	0	3	30	70	100
2	BS	19ABS9911	Probability and Statistics	3	1	0	4	30	70	100
3	BS	19ABS9902	Applied Physics	3	0	0	3	30	70	100
4	ES	19AES0502	Data Structures	3	0	0	3	30	70	100
5	HS	19AHS9901	Communicative English - I	0	0	2	2	30	70	100
<b>PRACTICAL</b>										
5	LC	19ALC0501	Computer Science and Engineering Workshop Lab	0	0	2	1	30	70	100
6	HS	19AHS9902	Communicative English - I Lab	0	0	2	1	30	70	100
7	ES	19AES0204	Basics of Electrical and Electronics Engineering Lab	0	0	3	1.5	30	70	100
8	BS	19ABS9907	Applied Physics Lab	0	0	3	1.5	30	70	100
9	ES	19AES0504	Data Structures Lab	0	0	3	1.5	30	70	100
<b>TOTAL</b>							<b>21.5</b>	<b>300</b>	<b>700</b>	<b>1000</b>

**II B. Tech – I Semester (Theory – 7, Lab – 3)**

S. No	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
THEORY										
1	BS	19ABS9921	Numerical Methods	3	0	0	3	30	70	100
2	ES	19AES0509	Basics of Python Programming	2	0	0	2	30	70	100
3	ES	19AES0104	Basic Civil & Mechanical Engineering	3	0	0	3	30	70	100
4	PC	19APC0501	Discrete Mathematics	3	0	0	3	30	70	100
5	PC	19APC0502	Database Management Systems	3	0	0	3	30	70	100
6	PC	19APC0503	Digital Logic Design	3	0	0	3	30	70	100
7	MC	19AMC9901	Biology for Engineers	2	0	0	0	30	-	30
PRACTICAL										
8	ES	19AES0510	Basics of Python Programming Lab	0	0	2	1	30	70	100
9	ES	19AES0105	Basic Civil & Mechanical Engineering Lab	0	0	3	1.5	30	70	100
10	PC	19APC0505	Database Management Systems Lab	0	0	4	2	30	70	100
TOTAL							21.5	300	630	930

**II B. Tech – II Semester (Theory – 7, Lab – 5)**

S. No	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
THEORY										
1	PC	19APC0512	Object Oriented Programming through Java	3	0	0	3	30	70	100
2	HS	19AHS9903	Communicative English II	2	0	0	2	30	70	100
3	ES	19AES0302	Design Thinking & Product Innovation	2	0	0	2	30	70	100
4	PC	19APC0506	Computer Organization	3	0	0	3	30	70	100
5	PC	19APC0511	Design and Analysis of Algorithms	3	0	0	3	30	70	100
6	PC	19APC0509	Formal Languages and Automata Theory	3	0	0	3	30	70	100
7	MC	19AMC9903	Environmental Studies	2	0	0	0	30	-	30
PRACTICAL										
8	PR	19APR0501	Socially Relevant Project (15 Hrs / Sem)	0	0	0	0.5	50	-	50
9	HS	19AHS9904	Communicative English II Lab	0	0	2	1	30	70	100
10	ES	19AES0303	Design Thinking & Product Innovation Lab	0	0	2	1	30	70	100
11	PC	19APC0504	Computer Organization Lab	0	0	2	1	30	70	100
12	PC	19APC0514	Object Oriented Programming through Java Lab	0	0	4	2	30	70	100
TOTAL							21.5	380	700	1080

**III B. Tech – I Semester (Theory – 7, Lab – 4) – AK19**

S. No	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
<b>THEORY</b>										
1	PC	19APC0515	Operating Systems	3	0	0	3	30	70	100
2	PC	19APC0521	Artificial Intelligence	3	0	0	3	30	70	100
3	PC	19APC0520	Compiler Design	3	0	0	3	30	70	100
4	PC	19APC0507	Software Engineering	2	0	0	2	30	70	100
5	OE	19APE0417 19AOE0303 19APC0428	Open Elective I Sensors and IoT Optimization Techniques Microprocessor and Interfacing	3	0	0	3	30	70	100
6	PE	19APE0501 19APE0502 19APE0503	Professional Elective I Data Warehousing and Mining Design Patterns Computer Graphics	3	0	0	3	30	70	100
7	MC	19AMC9904	Professional Ethics and Human Values	3	0	0	0	30	-	30
<b>PRACTICAL</b>										
8	PR	19APR0502	Socially Relevant Projects (15 Hrs/Semester)	0	0	0	0.5	50	-	50
9	PC	19APC0517	Operating System Lab	0	0	3	1.5	30	70	100
10	PC	19APC0522	Artificial Intelligence Lab	0	0	3	1.5	30	70	100
11	PC	19APC0508	Compiler Design Lab	0	0	2	1	30	70	100
<b>TOTAL</b>							<b>21.5</b>	<b>350</b>	<b>630</b>	<b>980</b>

**III B. Tech – II Semester (Theory – 7, Lab – 4) – AK19**

S. No	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
<b>THEORY</b>										
1	PC	19APC0510	Computer Networks	3	0	0	3	30	70	100
2	PC	19APC0516	Grid and Cloud Computing	3	0	0	3	30	70	100
3	PC	19APC0513	Machine Learning	3	0	0	3	30	70	100
4	PC	19APC0523	Web Programming	3	0	0	3	30	70	100
5	PE	19APE0504 19APE0505 19APE0506	Professional Elective II Object Oriented Analysis and Design Cyber Security Big Data Analytics	3	0	0	3	30	70	100
6	OE	19AHEMB02 19APC0216 19APE0413	Open Elective II (Inter-Disciplinary Elective II) Entrepreneurship Development Neural Networks and Fuzzy Logic Cellular and Mobile Communications	3	0	0	3	30	70	100
7	MC	19AMC9902	Constitution of India	3	0	0	0	30	-	30
<b>PRACTICAL</b>										
8	PR	19APR0503	Socially Relevant Projects (15 Hrs / Sem)	0	0	0	0.5	50	-	50
9	PC	19APC0525	Computer Networks Lab	0	0	2	1	30	70	100
10	PC	19APC0518	Grid and Cloud Computing Lab	0	0	2	1	30	70	100
11	PC	19APC0524	Web Programming Lab	0	0	2	1	30	70	100
12	Internship has to be carried during Summer Break. Evaluation will be done in next semester.									
<b>TOTAL</b>							<b>21.5</b>	<b>350</b>	<b>630</b>	<b>980</b>



**IV B. Tech – I Semester (Theory – 6, Lab – 4) – AK19**

S. No	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
<b>THEORY</b>										
1	PC	19APC0519	Data Science	2	0	0	2	30	70	100
2	PC	19AES0527	Mobile Application Development	2	0	0	2	30	70	100
3	OE	19APE04 19APE0417 19APE03	Open Elective III (Inter Discipline Elective III) Image Processing Embedded Systems Fundamentals of Robotics	3	0	0	3	30	70	100
4	PE	19APE0507 19APE0508 19APE0509	Professional Elective III Cryptography and Network Security Real Time Systems Blockchain and Crypto currency Technologies	3	0	0	3	30	70	100
5	PE	19APE0510 19APE0511 19APE0512	Professional Elective IV Predictive Analytics Natural Language Processing Full Stack Development	3	0	0	3	30	70	100
6	HE	19AHE9903/ 19AOE9906/ 19AHSMB01	Humanities Elective I Professional Communication Mathematical Modeling Managerial Economics and Financial Analysis	2	0	0	2	30	70	100
<b>PRACTICAL</b>										
7	PC	19APC0528	Data Science Lab	0	0	2	1	30	70	100
8	PC	19APC0526	Mobile Application Development Lab	0	0	2	1	30	70	100
9	PR	19APR0505	Socially Relevant Projects (15 Hrs / Sem)	0	0	0	0.5	50	-	50
10	PR	19APR0504	Industrial Training / Internship / Research Projects in National Laboratories / Academic Institutions	0	0	3	1.5	50	-	50
<b>TOTAL</b>							<b>19</b>	<b>340</b>	<b>560</b>	<b>900</b>

**IV B. Tech – II Semester (Theory – 2, Lab – 2) – AK19**

S.No	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
<b>THEORY</b>										
1	OE		Open Elective IV (MOOCs) Introduction to Embedded System Design Pattern Recognition and Application E-commerce Systems	3	0	0	3	-	-	-
2	PE	19APE0513/ 19APE0514/ 19APE0515	Professional Elective v (MOOC's) Deep Learning Parameterized Algorithms Computer Vision	3	0	0	3	-	-	-
<b>PRACTICAL</b>										
3	PR	19APR0508	Project I	0	0	18	9	60	140	200
4	PR	19APR0509	Technical Paper Presentation/Seminar	-	-	-	0	50	0	50
<b>TOTAL</b>							<b>15</b>	<b>110</b>	<b>140</b>	<b>250</b>

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI  
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**B.Tech I Year I Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19ABS9901	Algebra and Calculus	3	1	0	4

**Course Outcomes:**

1. Develop the use of matrix algebra techniques that is needed by engineers for practical applications.
2. Utilize mean value theorems to real life problems.
3. Familiarize with functions of several variables which is useful in optimization.
4. Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems
5. Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions

**Unit I : Matrix Operations and Solving Systems of Linear Equations**

**12 hrs**

Rank of a matrix by echelon form, solving system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem,

**Unit II : Quadratic Forms and Mean Value Theorems**

**9 hrs**

Diagonalisation of a matrix, quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.

Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders (without proof);

**Unit III: Multivariable calculus**

**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**

**10hrs**

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

**Unit V: Special Functions**

**10 hrs**

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

**References:**

1. Dr.T.K.V Iyengar, B.Krishna Gandhi, S. Ranganatham and 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.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Apply the knowledge of mathematics	1.1	1.1.1
CO2	PO1:Apply the knowledge of mathematics	1.1	1.1.1
CO3	PO1: Apply the knowledge of mathematics	1.1	1.1.1
CO4	PO2 : analyze complex engineering problems	2.1	2.1.3
CO5	Po2 : analyze complex engineering problems	2.1	2.1.3

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI  
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**B.Tech I Year I Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19ABS9904	CHEMISTRY	3	0	0	3

**Course Outcomes:**

- Understand the behaviour of, and interactions between matter and energy at both the atomic and molecular levels
- Compare the materials of construction for battery and electrochemical sensors
- Understand the preparation, properties, and applications of thermoplastics & thermo settings, elastomers & conducting polymers.
- HPLC and GC methods used for separation of gaseous and liquid mixtures.
- Understand the disadvantages of using hard water and select suitable treatments domestically and industrially.

**Unit 1: Structure and Bonding Models**

**(10 hrs)**

Planck's quantum theory, Schrodinger wave equation, significance of  $\Psi^1$  and  $\Psi^2$ , 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 orbitals 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 2: Electrochemistry and Applications**

**(10 hrs)**

Electrodes – concepts, reference electrodes (Calomel electrode, Ag/AgCl electrode and glass electrode) electrochemical cell, Nernst equation, cell potential calculations, numerical problems, concept of pH, pH meter and applications of pH metry (acid-base titrations), potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations), photovoltaic cell – working and applications, photogalvanic cells with specific examples. Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.

Primary cells – Zinc-air battery, alkali metal sulphide batteries, Fuel cells, hydrogen-oxygen, methanol fuel cells – working of the cells.

Secondary cells – lead acid, nickel-metal hydride and lithium ion batteries- working of the batteries including cell reactions, button cells,

**Unit 3: 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 Thermosettings, 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 4: Instrumental Methods and Applications**

**(10 hrs)**

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

**Unit 5: 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 electro dialysis.

**Text books:**

- Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
- Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

**Reference books:**

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

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

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**B.Tech I Year I Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AES0501	Problem Solving and Programming	3	1	0	4

**Course Objectives:**

1. Introduce the internal parts of a computer, and peripherals.
2. Introduce the Concept of Algorithm and use it to solve computational problems
3. Identify the computational and non-computational problems
4. Teach the syntax and semantics of a C Programming language
5. Demonstrate the use of Control structures of C Programming language
6. Illustrate the methodology for solving Computational problems

**Unit 1:**

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 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 2:**

Introduction to computer problem solving: Introduction, the problem-solving aspect, top-down design, implementation of algorithms, the efficiency of algorithms, 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 3:**

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 4:**

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<sup>th</sup> smallest element

**Unit 5:**

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.

**Text Books:**

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", 2<sup>nd</sup> 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", 4<sup>th</sup> Edition, 2019, McGraw Hill Education.

**Course Outcomes:**

1. Construct his own computer using parts.
2. Recognize the importance of programming language independent constructs
3. Solve computational problems
4. Select the features of C language appropriate for solving a problem
5. Design computer programs for real world problems
6. Organize the data which is more appropriated for solving a problem

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering Knowledge	1.3	1.3.1
CO2	PO2: Problem analysis	2.1	2.1.1
CO3	PO2: Problem analysis	2..2	2.2.2
CO4	PO2: Problem analysis	2.1	2.1.1
CO5	PO2: Problem analysis	2.3	2.3.1
CO6	PO2: Problem analysis	2.2	2.2.3

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**B.Tech I Year I Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AES0301	Engineering Graphics Lab	1	0	4	3

**Course Outcomes:**

CO: 1	Draw various curves applied in engineering.
CO: 2	Show projections of solids and sections graphically.
CO: 3	Draw the development of surfaces of solids.
CO: 4	Use computers as a drafting tool.
CO: 5	Draw isometric and orthographic drawings using CAD packages.

**Manual Drawing**

**UNIT I**

**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
- c) Involutives

**Projection of points, lines:** Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line.

**UNIT II**

**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 III**

**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.

**Computer Aided Drafting:**

**UNIT IV**

**Introduction to AutoCAD:** Basic drawing and editing commands: line, circle, rectangle, erase, view, undo, redo, snap, object editing, moving, copying, rotating, scaling, mirroring, layers, templates, polylines, trimming, extending, stretching, fillets, arrays, dimensions.

Dimensioning principles and conventional representations.

**UNIT V**

**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.

**Text Books and Reference Books:**

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

**Additional Sources**

YouTube: [http://sewor,Carleton.ca/gkardos/88403/drawings.html](http://sewor.Carleton.ca/gkardos/88403/drawings.html) conic sections-online, red woods.edu

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



**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI  
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**B.Tech I Year I Semester**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19ABS9909</b>	<b>CHEMISTRY LAB</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**Course Outcomes:**

- To familiarize the students with the basic concepts of chemistry of materials
- Prepare advanced polymer materials
- Measure the strength of an acid present in secondary batteries
- To familiarize with digital and instrumental methods of analysis

**List of Experiments:**

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

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

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**B.Tech I Year I Semester**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19AES0503</b>	<b>Problem Solving and Programming Lab</b>	0	0	4	2

**Laboratory Experiments #**

- Assemble and disassemble parts of a Computer
- Design a C program which reverses the number
- Design a C program which finds the second maximum number among the given list of numbers.
- Construct a program which finds the kth smallest number among the given list of numbers.
- Design an algorithm and implement using C language the following exchanges  $a \leftarrow b \leftarrow c \leftarrow d \leftarrow a$
- Develop a C Program which counts the number of positive and negative numbers separately and also compute the sum of them.
- Implement the C program which computes the sum of the first n terms of the series  $Sum = 1 - 3 + 5 - 7 + 9$
- Design a C program which determines the numbers whose factorial values are between 5000 and 32565.
- Design an algorithm and implement using a C program which finds the sum of the infinite series  $1 - x^2/2! + x^4/4! - x^6/6! + \dots$
- 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.
- Implement a C program which converts a hexadecimal, octal and binary number to decimal number and vice versa.
- Develop an algorithm which computes the all the factors between 1 and 100 for a given number and implement it using C.
- Construct an algorithm which computes the sum of the factorials of numbers between m and n.
- Design a C program which reverses the elements of the array.
- Given a list of n numbers, Design an algorithm which prints the number of stars equivalent to the value of the number. The stars for each number should be printed horizontally.
- Implement the sorting algorithms a. Insertion sort b. Exchange sort c. Selection sort d. Partitioning sort.
- Illustrate the use of auto, static, register and external variables.
- Design algorithm and implement the operations creation, insertion, deletion, traversing on a singly linked list.
- Develop a C program which takes two numbers as command line arguments and finds all the common factors of those two numbers.
- 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.

**Course outcomes:**

- Construct a Computer given its parts (L6)
- Select the right control structure for solving the problem (L6)
- Analyze different sorting algorithms (L4)
- Design solutions for computational problems (L6)
- Develop C programs which utilize the memory efficiently using programming constructs like pointers.

**References:**

- B. Govindarajulu, "IBM PC and Clones Hardware Trouble shooting and Maintenance", Tata McGraw-Hill, 2<sup>nd</sup> edition, 2002.
- R.G. Dromey, "How to Solve it by Computer". 2014, Pearson.

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



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**B.Tech I Year II Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AES0202	Basics of Electrical and Electronics Engineering	3	0	0	3

**COURSE OUTCOMES:**

- CO 1: Apply concepts of KVL/KCL in solving DC circuits  
 CO 2: Illustrate working principles of induction motor - DC Motor  
 CO 3: Identify type of electrical machine based on their operation

**PART-A (Electrical Engineering)**

**UNIT-I**

**DC & AC Circuits:** 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:** 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:** 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:**

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

**References:**

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

CO No.	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO2	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO3	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1

**PART-B (Electronics Engineering)**

**UNIT-I: Analog Electronics**

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**

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).

**Text Books:**

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

**References:**

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

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

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**B.Tech I Year II Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19ABS9911	Probability and Statistics	3	1	0	4

**Course Outcomes:**

1. Interpret the association of characteristics and through correlation and regression tools.
2. Make use of the concepts of probability and their applications.
3. Apply discrete and continuous probability distributions.
4. Design the components of a classical hypothesis test for large sample.
5. Design the components of a classical hypothesis test for small samples.

**Unit 1: 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 2: 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 3: Probability distributions**

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

**Unit4: 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 5: Small sample tests**

Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test),  $\chi^2$  - test for goodness of fit.

**Textbooks:**

1. Miller and Friends, 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.

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

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**B.Tech I Year II Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19ABS9902	Applied Physics	3	0	0	3

**Course Outcomes**

1. Analyze the wave properties of light and the interaction of energy with the matter.
2. Apply electromagnetic wave propagation in different guided media.
3. Assess the electromagnetic wave propagation and its power in different media
4. Analyze the conductivity of semiconductors.
5. Interpret the difference between normal conductor and superconductor and apply the nanomaterials for engineering applications.

**Unit I : Optics and EM Theory**

Interference of light -principle of superposition-Conditions for sustained Interference-Interference in thin films (reflected light) - Newton's Rings -Determination of Wavelength. Diffraction-Fraunhofer diffraction- Single slit and double slit- Diffraction Grating. Divergence and Curl of Electric and Magnetic Fields - Gauss' theorem for divergence and Stokes' theorem for curl - Maxwell's Equations (Quantitative) – Electromagnetic wave - propagation in non-conducting medium - Poynting's Theorem.

**Unit II : Lasers and Fiber Optics**

Lasers – Introduction – Characteristics – Spontaneous and Stimulated Emission – Einstein Coefficients – Population Inversion – Excitation Mechanism and Optical Resonator - He-Ne Laser -Nd:YAG Laser – Semiconductor Diode Laser – Applications of Lasers and Holography.

Introduction to Optical Fibers – Total Internal Reflection – Critical angle of propagation –Acceptance angle – Numerical Aperture – Classification of fibers based on Refractive index profile – Propagation of electromagnetic wave through optical fiber – modes – importance of V-number-Attenuation, Block Diagram of Fiber optic Communication – Industrial Applications –Fiber optic Sensors.

**Unit III : 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: 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: Superconductors and Nanomaterials**

Superconductors-Properties-Meissner's effect-BCSTheory(Qualitative) - Josephson effect (AC&DC)-Types of Superconductors-Applications of superconductors. Nanomaterials–Significance of nanoscale–: Physical, Mechanical, Magnetic, Optical properties of nanomaterials –Synthesis of nanomaterials:Top-down-Ball Milling, Bottom-up-Chemical vapour deposition–Characterization of nanomaterials : X-Ray Diffraction (XRD), Scanning Electron Microscope (SEM)-Applications of Nanomaterials.

**Textbooks:**

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.

**References:**

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.

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

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

**B.Tech I Year II Semester**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19AES0502</b>	<b>Data Structures</b>	3	0	0	3

**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

**Unit 1: 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 – 2: 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 3: 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 – 4 : 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 – 5: 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.

**Text Books:**

1. Ellis Horowitz and Sartaj Sahni, “Fundamentals of Data Structures in C”, 2<sup>nd</sup> 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”, 2<sup>nd</sup> 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.

**Course Outcomes:**

1. Select Appropriate Data Structure for solving a real world problem
2. Select appropriate file organization technique depending on the processing to be done
3. Construct Indexes for Databases
4. Analyse the Algorithms
5. Develop Algorithm for Sorting large files of data

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

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI  
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**B.Tech I Year II Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AHS9901	Communicative English - I	2	0	0	2

**Course Outcomes:**

At the end of the course, the learners will be able to

1. Identify the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English
2. Formulate sentences using proper grammatical structures and correct word forms
3. Speak clearly on a specific topic using suitable discourse markers in informal discussions
4. Write summaries based on global comprehension of reading/listening texts
5. Produce a coherent paragraph interpreting a figure/graph/chart/table
6. Take notes while listening to a talk/lecture to answer questions

**Unit 1 :**

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions. Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.

Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.

Reading for Writing: Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph.

Grammar and Vocabulary: 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.

**Unit 2:**

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts.

Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks. Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Writing: Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters.

Grammar and Vocabulary: Cohesive devices -linkers, sign posts and transition signals; use of articles and zero article; prepositions.

**Unit 3:**

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; avoiding redundancies and repetitions.

Grammar and Vocabulary: Verbs -tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

**Unit 4:**

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: Information transfer; describe, compare, contrast, identify significance / trends based on information provided in figures/charts/graphs/tables.

Grammar and Vocabulary: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms.

**Unit 5:**

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 (articles, prepositions, tenses, subject- verb agreement)

**Text Book:** English all round: Communication Skills for Under graduation Learners Vol. I, Orient BlackSwan Publishers, First Edition 2019.

**Reference Books**

1. Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge,2014.
2. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking*. Heinley,ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.

**Sample Web Resources**

Grammar/Listening/Writing, 1-language.com, <http://www.5minuteenglish.com/>, <https://www.englishpractice.com/>, Grammar/Vocabulary, English Language Learning Online

<http://www.bbc.co.uk/learningenglish/>, <http://www.better-english.com/>, <http://www.nonstopenglish.com/>, <https://www.vocabulary.com/>, BBC Vocabulary Games

Free Rice Vocabulary Game

Reading

<https://www.usingenglish.com/comprehension/>, <https://www.englishclub.com/reading/short-stories.htm>,

<https://www.english-online.at/>

**Listening**

<https://learningenglish.voanews.com/z/3613>, <http://www.englishmedialab.com/listening.html>

**Speaking**

<https://www.talkenglish.com/>, BBC Learning English – Pronunciation tips, Merriam-Webster – Perfect pronunciation Exercises

**All Skills**

<https://www.englishclub.com/>, <http://www.world-english.org/>, <http://learnenglish.britishcouncil.org/>

Online Dictionaries, Cambridge dictionary online, MacMillan dictionary, Oxford learner's dictionaries

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

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**B.Tech I Year II Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19ALC0501	Computer science and Engineering Workshop Lab	0	0	2	1

**Course Objectives:**

- To provide Technical training to the students on Productivity tools like Word processors, Spreadsheets, Presentations
- To make the students know about the internal parts of a computer, assembling a computer from the parts, preparing computer for use by installing the operating system
- Teach them how to connect two or more computers
- Introduce to the Raspberry Pi board
- Explain storytelling by creating Graphics, Webpages and Videos

**Preparing your computer**

**Task 1: Learn about Computer:** Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.

**Task 2: Assembling a Computer:** Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods available (eg: beeps). Students should record the process of assembling and trouble shooting a computer.

**Task 3: Install Operating system:** Student should install Linux on the computer. Student may install another operating system (including proprietary software) and make the system dual boot or multi boot. Students should record the entire installation process.

**Task 4: Operating system features:** Students should record the various features that are supported by the operating system(s) installed. They have to submit a report on it. Students should be able to access CD/DVD drives, write CD/DVDs, access pen drives, print files, etc. Students should install new application software and record the installation process.

**Productivity tools**

**Task 5: 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 6: 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 7: 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.

**Networking**

**Task 8: Wired network:** Select a LAN cable, Identify the wires in the cable, Define the purpose of each wire, Study the RJ45 connector, Use crimping tool to fix the cable to the connector, Test the cable using LAN tester, Connect two or more computers using cross and straight cables, Configure the computers, share the data between the computers.

**Task 9: Wireless network** Connect the wireless LAN card or identify the built-in wireless LAN card, configure four computers using adhoc mode and share the data, connect four computers using infrastructure mode (Access point) and share the data.

**IoT**

**Task 10: 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 11: 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", IITL Education Solutions limited, Pearson Education.
4. Rusen, "Networking your computers and devices", PHI
5. Bigelows, "Trouble shooting, Maintaining & Repairing PCs", TMH.
6. <https://www.adobe.com>
7. <https://www.raspberrypi.org>

**Course Outcomes:**

1. Construct a computer from its parts and prepare it for use
2. Develop Documents using Word processors
3. Develop presentations using the presentation tool
4. Perform computations using spreadsheet tool



5. Connect computer using wired and wireless connections
6. Design Graphics, Videos and Web pages
7. Connect things to computers

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

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**B.Tech I Year II Semester**

**COURSE CODE  
19AHS9902**

**COURSE TITLE**

**Communicative English - I Lab**

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**CREDITS  
1**

**Course Outcomes**

- Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills
- Apply communication skills through various language learning activities
- Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
- Evaluate and exhibit acceptable etiquette essential in social and professional settings.
- Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.

**Syllabus**

**Unit 1**

- Phonetics for listening comprehension of various accents
- Reading comprehension
- Describing objects/places/persons

**Unit 2**

- JAM
- Small talks on general topics
- Debates

**Unit 3**

- Situational dialogues – Greeting and Introduction
- Summarizing and Note making
- Vocabulary Building

**Unit4**

- Asking for Information and Giving Directions
- Information Transfer
- Non-verbal Communication – Dumb Charade

**Unit 5**

- Oral Presentations
- Précis Writing and Paraphrasing
- Reading Comprehension and spotting errors

**Software Source:**

K-Van Solutions Software

**Reference:**

Teaching English - British Council

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

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**B.Tech I Year II Semester**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19AES0204</b>	<b>Basics of Electrical and Electronics Engineering Lab</b>	0	0	3	1.5

**Course Objectives**

- 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.

**Part A: Electrical Engineering Lab**

**List of Experiments:**

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. I – V Characteristics of Solar PV cell
8. Brake test on DC Shunt Motor.

**Part B: Electronics Engineering Lab**

**List of Experiments:**

1. Draw and study the characteristics of Semi-conductor diode and Zener Diode
2. Draw and study the input and output characteristics of Transistor in Common Emitter configuration
3. Draw and study the static and transfer characteristics of FET in Common Source Configuration
4. Construct half wave and full wave rectifier circuits. Find ripple factor and plot their output waveforms with and without filters
5. Study the application of Op-amp as an Inverting amplifier, Non-inverting amplifier, Voltage follower, Summer and Subtractor
6. Realization of logic gates, AND, OR, NOT, NAND, NOR, XOR
7. Realization of Adders, Multiplexers and Decoders using logic gates.
8. Realization of flip-flops using logic gates.
9. Conduct an experiment on AM & FM modulation & demodulation, Plot the corresponding modulated and demodulated signals

**Table: Course Outcomes (CO), Programme Outcomes (PO), Competency Indicator (CI) and Performance Indicator (PI) Mapping**

<b>CO</b>	<b>PO</b>	<b>CI</b>	<b>PI</b>
CO1	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO2	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO3	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO4	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO5	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1

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<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19ABS9907</b>	<b>Applied Physics Lab</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**Course Outcomes**

1. Analyze the wave properties of light and the interaction of energy with the matter.
2. Apply electromagnetic wave propagation in different guided media.
3. Assess the electromagnetic wave propagation and its power in different media
4. Analyze the conductivity of semiconductors.
5. 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.

**References:**

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.

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

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**B.Tech I Year II Semester**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19AES0504</b>	<b>Data Structures Lab</b>	0	0	3	1.5

**Course Objectives:**

1. To introduce to the different data structures
2. To elucidate how the data structure selection influences the algorithm complexity
3. To explain the different operations that can be performed on different data structures
4. To introduce to the different search and sorting algorithms.

**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.

**Course Outcomes:**

1. Select the data structure appropriate for solving the problem
2. Implement searching and sorting algorithms
3. Design new data types
4. Illustrate the working of stack and queue
5. Organize the data in the form of files

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

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**B.Tech II Year I Semester**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19ABS9921</b>	<b>Numerical Methods</b>	3	0	0	3

**Course Outcomes:**

1. Analyze the concepts of Errors, Relative and Percentage Errors
2. Analyze the concepts of Algebraic & Transcendental Equations to solve different Engineering problems
3. Analyze Interpolation using the concepts of the Numerical Methods
4. Apply the concepts of Integration in Numerical Methods
5. Apply the concepts of O.D.E on Numerical Methods

**Unit - I**

**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.

**UNIT - II**

**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 - III**

**Interpolation:** Newton’s forward and backward interpolation formulae – Lagrange’s formulae. Gauss forward and backward formula, Stirling’s formula, Bessel’s formula.

**UNIT - IV**

**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 -V**

**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.

**TEXT BOOKS:**

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Introductory Methods of Numerical Analysis, S.S. Sastry, PHI publisher.

**REFERENCES:**

1. Engineering Mathematics, Volume - II, E. Rukmangadachari Pearson Publisher.
2. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S.Chand publication.
3. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
4. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India

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

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<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19AES0509</b>	<b>Basics of Python Programming</b>	2	0	0	2

**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

**Unit – I**

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**

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**

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**

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**

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, Class diagrams, Data encapsulation.

The Goodies: Conditional expressions, List comprehensions, Generator expressions, any and all, Sets, Counters, defaultdict, Named tuples, Gathering keyword Args.

**Course Outcomes:**

Student should be able to

1. Apply the features of Python language in various real applications.
2. Select appropriate data structure of Python for solving a problem.
3. Design object oriented programs using Python for solving real-world problems.
4. Apply modularity to programs.

**Text books:**

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

<b>List of COs</b>	<b>PO no. and keyword</b>	<b>Competency Indicator</b>	<b>Performance Indicator</b>
CO1	PO1: Engineering Knowledge	1.4	1.4.1
CO2	PO2: Problem Analysis	2.3	2.3.1
CO3	PO2: Problem Analysis	2.4	2.4.2
CO4	PO2: Problem Analysis	2.2	2.2.3

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AES0101	Basics Civil & Mechanical Engineering	3	0	0	3

Course Outcomes:

**CO 1:** understand principles of Stress and Strain and able to draw SFD & BMD for simply supported beams and cantilever beams.

**CO 2:** understand basic principles of Strain Measurement and apply the concepts of Strain Rosettes for strain measurement.

**CO 3:** understand common building materials used in construction and analyze characteristics of common building materials.

**PART – A**

**UNIT – I:** Basic Definitions of Force – Stress – Strain – Elasticity. Shear force – Bending Moment – Torsion Simple problems on Shear force Diagram and Bending moment Diagram for cantilever and simply supported beams.

**UNIT – II:** Measurement of Strain - Electrical Capacitance and Resistance Strain gauges – multi channel strain indicators. Rosette analysis – Rectangular and Triangular strain rosettes – Wheatstone bridge.

**UNIT – III:** Characteristics of common building materials – Brick – Types – Testing; Timber – Classification – Seasoning – Defects in Timber ; Glass – Classification – uses; steel and its applications in construction industry.

**Text Books:**

1. Shanmugam G and Palanichamy M S, “Basic Civil and Mechanical Engineering”, Tata McGraw Hill Publishing Co., New Delhi.
2. Ramamrutham S., “Basic Civil Engineering”, Dhanpat Rai Publishing Co. (P) Ltd.

**References :**

1. S.Trymbaka Murthy., “Computer Aided Engineering Drawing” , Universities Press
2. Seetharaman S., “Basic Civil Engineering”, Anuradha Agencies.
3. Venugopal K. and Prahu Raja V., “Basic Mechanical Engineering”, Anuradha Publishers, Kumbakonam.
4. Er. R. Vaishnavi, Basic Civil and Mechanical Engineering, 2/e, S. Chand Publications.

List of COs	PO no. and keyword	Competency Indicator:	Performance Indicator:
CO1	PO1: Engineering knowledge	1.2	1.2.1
		1.3	1.3.1
		1.4	1.4.1
	PO2: Problem analysis	2.2	2.2.1
		2.3	2.3.1
CO2	PO1: Engineering knowledge	1.2	1.2.1
		1.3	1.3.1
		1.4	1.4.1
	PO2: Problem analysis	2.2	2.2
		2.3	2.3.1
CO3	PO1: Engineering knowledge	1.2	1.2.1
		1.3	1.3.1
		1.4	1.4.1
	PO2: Problem analysis	2.2	2.2.1
		2.3	2.3.1



**UNIT – IV: Transmission of Power**

Transmission of Power – Belt and Rope Drives – Types of Belts – Materials – Velocity ratio – Speed Ratio – Rope Drives – V-Belt – Flat Belt.

**UNIT – V: Computer Aided Design & Manufacturing**

Introduction to engineering applications of computer aided design – Computer Aided Drawing – Advantages of CAD – Computer Aided Manufacturing – Functions of Robots in manufacturing Applications – advantages of Robots – Computer integrated Manufacturing (CIM) .

Text Books:

1. Shanmugam G and Palanichamy M S, “Basic Civil and Mechanical Engineering”, Tata McGraw Hill Publishing Co., New Delhi.
2. Ramamrutham S., “Basic Civil Engineering”, Dhanpat Rai Publishing Co. (P) Ltd.

References :

1. S.Trymbaka Murthy., “Computer Aided Engineering Drawing” , Universities Press
2. Seetharaman S., “Basic Civil Engineering”, Anuradha Agencies.
3. Venugopal K. and Prahu Raja V., “Basic Mechanical Engineering”, Anuradha Publishers, Kumbakonam.
4. Er. R. Vaishnavi, Basic Civil and Mechanical Engineering, 2/e, S. Chand Publications.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.2	1.2.1
		1.3	1.3.1
		1.4	1.4.1
	PO2: Problem analysis	2.2	2.2.1
		2.3	2.3.1
CO2	PO1: Engineering knowledge	1.2	1.2.1
		1.3	1.3.1
		1.4	1.4.1
	PO2: Problem analysis	2.2	2.2
		2.3	2.3.1
CO3	PO1: Engineering knowledge	1.2	1.2.1
		1.3	1.3.1
		1.4	1.4.1
	PO2: Problem analysis	2.2	2.2.1
		2.3	2.3.1
CO 4	PO1: Engineering knowledge	1.2	1.2.1
		1.3	1.3.1
CO 5	PO1: Engineering knowledge	1.2	1.2.1
		1.3	1.3.1
		1.4	1.4.1

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<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19APC0501</b>	<b>Discrete Mathematics</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

Course Objectives

- Understand the methods of discrete mathematics such as proofs, counting principles, number theory, logic and set theory.
- Understand the concepts of graph theory, binomial theorem, and generating function in analysis of various computer science applications.

**UNIT I** : Mathematical Logic:

Introduction, Connectives, Normal Forms, The theory of Inference for the Statement Calculus, The Predicate Calculus, Inference Theory of Predicate Calculus.

**UNIT II**: SET Theory:

Basic concepts of Set Theory, Representation of Discrete structures, Relations and Ordering, Functions, Recursion.

**UNIT III**: Algebraic Structures:

Algebraic Systems: Examples and General Properties, Semi groups and Monoids, Polish expressions and their compilation, Groups: Definitions and Examples, Subgroups and Homomorphism's, Group Codes.  
Lattices and Boolean algebra: Lattices and Partially Ordered sets, Boolean algebra.

**UNIT IV**: An Introduction to Graph Theory:

Definitions and Examples, Sub graphs, complements, Graph Isomorphism, Vertex Degree: Euler Trails and Circuits, Planar Graphs, Hamilton Paths and Cycles, Graph Coloring and Chromatic Polynomials  
Trees: Definitions, Properties, Examples, Rooted Trees, Trees and Sorting, Weighted trees and Prefix Codes, Biconnected Components and Articulation Points.

**UNIT V**: Fundamental Principles of Counting:

The rules of Sum and Product, Permutations, Combinations: The Binomial Theorem, Combinations with Repetition.  
The Principle of Inclusion and Exclusion: The Principle of Inclusion and Exclusion, Generalizations of Principle, Derangements: Nothing is in Its Right Place, Rook Polynomials and arrangements with Forbidden Positions.  
Generating Functions: Introductory Examples, Definitions and Examples: Calculation Techniques, Partitions of Integers, the Exponential Generating Functions, The Summation Operator.

**TEXT BOOKS:**

1. Discrete Mathematics and Its Applications [7th Edition] Kenneth H. Rosen
2. "Discrete Mathematical Structures with Applications to Computer Science", J.P. Tremblay and R. Manohar, Mc Graw Hill Education, 2015.
3. "Discrete and Combinatorial Mathematics, an Applied Introduction", Ralph P. Grimaldi and B.V.Ramana, Pearson, 5<sup>th</sup> Edition, 2016.

**REFERENCE BOOKS:**

1. Graph Theory with Applications to Engineering by NARSINGH DEO, PHI.
2. Discrete Mathematics by R.K.Bisht and H.S. Dhami, Oxford Higher Education.
3. Discrete Mathematics theory and Applications by D.S.Malik and M.K.Sen, Cenegage Learning.
4. Elements of Discrete Mathematics, A computer Oriented approach by C L Liu and D P Mohapatra, MC GRAW HILL Education.
5. Discrete Mathematics for Computer scientists and Mathematicians by JOE L.Mott, Abraham Kandel and Theodore P.Baker, Pearson ,2<sup>nd</sup> Edition

**Course Outcomes**

1. Understand basics of Mathematical Logic
2. Understand the properties of Compatibility, Equivalence and Partial Ordering relations, Lattices
3. Understand the general properties of Algebraic Systems, Semi Groups, Monoids and Groups.
4. Design solutions for problems using Graphs
5. Understand the fundamental principles of counting

<b>List of COs</b>	<b>PO no. and keyword</b>	<b>Competency Indicator</b>	<b>Performance Indicator</b>
CO1	PO1: Engineering Knowledge	1.3	1.3.1
CO2	PO2: Problem Analysis	2.1	2.1.3
CO3	PO2: Problem Analysis	2.1	2.1.3
CO4	PO2: Problem Analysis	2.3	2.3.1
CO5	PO1: Engineering Knowledge	1.3	1.3.1

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<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19APC0502</b>	<b>DATABASE MANAGEMENT SYSTEMS</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Objectives:**

- To understand the basic concepts and the applications of database systems.
- To master the basics of SQL and construct queries using SQL.
- To understand the relational database design principles.
- To become familiar with the basic issues of transaction processing and concurrency control.
- To become familiar with database storage structures and access techniques.

**UNIT-I**

Introduction-Database System Applications, Purpose of Database Systems, View of Data - Data Abstraction, Instances and Schemas, Data Models, Database Languages - DDL, DML, Database Architecture, Database Users and Administrators, History of Data base Systems.

Introduction to Data base design , ER diagrams, Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises. Relational Model: Introduction to the Relational Model - Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views Destroying/ altering Tables and Views.

**UNIT-II**

Relational Algebra and Calculus: Relational Algebra - Selection and Projection, Set operations, Renaming, Joins, Division, Examples of Algebra Queries, Relational calculus - Tuple relational Calculus - Domain relational calculus - Expressive Power of Algebra and calculus.

Form of Basic SQL Query - Examples of Basic SQL Queries, Introduction to Nested Queries, Correlated Nested Queries, Set - Comparison Operators, Aggregate Operators, NULL values - Comparison using Null values - Logical connectives - AND, OR and NOT - Impact on SQL Constructs, Outer Joins, Disallowing NULL values, Complex Integrity Constraints in SQL Triggers and Active Data bases.

**UNIT-III**

Introduction to Schema Refinement - Problems Caused by redundancy, Decompositions - Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms - FIRST, SECOND, THIRD Normal forms - BCNF - Properties of Decompositions - Loss less join Decomposition, Dependency preserving Decomposition, Schema Refinement in Data base Design - Multi valued Dependencies - FOURTH Normal Form, Join Dependencies, FIFTH Normal form, Inclusion Dependencies.

**UNIT-IV**

Transaction Management - Transaction Concept - Transaction State - Implementation of Atomicity and Durability - Concurrent - Executions - Serializability - Recoverability - Implementation of Isolation - Testing for serializability.

Concurrency Control - Lock - Based Protocols - Timestamp Based Protocols - Validation - Based Protocols - Multiple Granularity. Recovery System-Failure Classification-Storage Structure-Recovery and Atomicity - Log - Based Recovery - Recovery with Concurrent Transactions - Buffer Management - Failure with loss of nonvolatile storage - Advance Recovery systems - Remote Backup systems.

**UNIT-V**

Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing - Clustered Indexes, Primary and Secondary Indexes, Index data Structures - Hash Based Indexing, Tree based Indexing, Comparison of File Organizations.

Tree Structured Indexing: Intuitions for tree indexes, Indexed Sequential Access Methods(ISAM) B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

Hash Based Indexing: Static Hashing, Extendable hashing, Linear Hashing, Extendible vs. Linear Hashing.

**TEXT BOOKS:**

1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, McGrawHill Education, 3rd Edition, 2003.
2. Data base System Concepts, A.Silberschatz, H.F. Korth, S.Sudarshan, McGraw Hill, VI edition, 2006.

**REFERENCES:**

1. Database Systems, 6th edition, Ramez Elmasri, Shamkat B. Navathe, Pearson Education, 2013.
2. Database Systems Concepts, Peter Rob & Carlos Coronel, Cengage Learning, 2008.
3. Introduction to Database Systems, C.J. Date, Pearson Education.
4. Database Management Systems, G.K. Gupta, McGrawHill Education.

**Course Outcomes:**

1. Demonstrate the basic elements of a relational database management system,
2. Ability to design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respective data.
3. Apply normalization for the development of application software.
4. Define Transactions which preserve the integrity of database
5. Ability to understand Storage and Indexing Techniques

<b>List of COs</b>	<b>PO no. and keyword</b>	<b>Competency Indicator</b>	<b>Performance Indicator</b>
CO1	PO3: Design of Solutions	3.1	3.1.3
CO2	PO3: Design of Solutions	3.1	3.1.3
CO3	PO3: Design of Solutions	3.3	3.3.1
CO4	PO4: Conduct investigations of complex problems	4.2	4.2.1
CO5	PO3: Design of Solutions	3.4	3.4.1

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<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19APC0503</b>	<b>Digital Logic Design</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives:**

1. To understand number representation and conversion between different representation in digital electronic circuits.
2. To analyze logic processes and implement logical operations using combinational logic circuits.
3. To understand characteristics of memory and their classification.
4. To understand concepts of sequential circuits and to analyze sequential systems in terms of state machines.
5. To understand concept of Programmable Devices and PLA

**UNIT I**

**BINARY SYSTEMS:** Digital Systems, Binary Numbers, Number Base Conversions, Octal and Hexadecimal Numbers, Compliments, Signed Binary Numbers, Binary Codes, Binary Storage and Registers, Binary Logic.

**BOOLEAN ALGEBRA AND LOGIC GATES:** Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates, Integrated Circuits.

**UNIT II**

**GATE – LEVEL MINIMIZATION:** The Map Method, Four Variable Map, Five-Variable Map, Product of Sums Simplification, Don't-Care Conditions, NAND and NOR Implementation, Other Two Level Implementations, EX-OR Function, Other Minimization Methods

**UNIT III**

**COMBINATIONAL LOGIC:** Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers.

**UNIT IV**

**SYNCHRONOUS SEQUENTIAL LOGIC:** Sequential Circuits, Latches, Flip-Flops, Analysis of Clocked Sequential Circuits, State Reduction and Assignment, Design Procedure, Registers, Shift Registers, Ripple Counters, Synchronous Counters, Other counters.

**UNIT V**

**MEMORY AND PROGRAMMABLE LOGIC:** Random access memory, memory decoding, Error Detection and Correction, Read-only Memory, Programmable Logic Array, Programmable Array Logic.

**DIGITAL LOGIC CIRCUITS:** RTL and DTL Circuits, Transistor-Transistor Logic (TTL), Emitter-Coupled Logic (ECL), MOS, CMOS Logic, Comparisons of Logic Families.

**TEXT BOOKS:**

1. Digital Design, M.Morris Mano & Michael D. Ciletti, Pearson, 6<sup>th</sup> Edition, 2018.
2. Digital Logic & State Machine Design, David J. Comer, Oxford University Press, 3<sup>rd</sup> Reprinted Indian Edition, 2012.

**REFERENCES:**

1. Digital Logic Design, R.D. Sudhakar Samuel, Elsevier
2. Fundamentals of Logic Design, 5/e, Roth, Cengage
3. Switching and Finite Automata Theory, 3/e, Kohavi, Jha, Cambridge.
4. Digital Logic Design, Leach, Malvino, Saha, TMH
5. Modern Digital Electronics, R.P. Jain, TMH

**Course Outcomes**

1. Develop a digital logic and apply it to solve real life problems.
2. Analyze, design and implement combinational logic circuits.
3. Classify different semiconductor memories.
4. Analyze, design and implement sequential logic circuits.
5. Analyze digital system design using PLA.

<b>List of COs</b>	<b>PO no. and keyword</b>	<b>Competency Indicator</b>	<b>Performance Indicator</b>
CO1	PO2: Problem Analysis	2.1	2.1.3
CO2	PO2: Problem Analysis	2.2	2.2.2
CO3	PO2: Problem Analysis	2.2	2.2.4
CO4	PO2: Problem Analysis	2.2	2.2.2
CO5	PO2: Problem Analysis	2.2	2.2.2

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<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19AMC9901</b>	<b>Biology for Engineers</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>

**Course Outcomes:**

- CO: 1 Explain about cells and their structure and function. Different types of cells and basics for classification of living Organisms.
- CO: 2 Explain about biomolecules, their structure, function and their role in the living organisms. How biomolecules are useful in Industry.
- CO: 3 Brief about human physiology.
- CO: 4 Explain about genetic material, DNA, genes and RNA how they replicate, pass and preserve vital information in living Organisms.
- CO: 5 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**

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**

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

**UNIT III**

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

**UNIT IV**

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

**UNIT V**

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, Definitions-Pandemic, Epidemic and outbreak, pandemic alert system ranges, Prevention of pandemic disease and pandemic preparation.

**TEXT BOOKS :**

1. P.K.Gupta, Cell and Molecular Biology, 5<sup>th</sup> 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 Fluid Mechanics and Machinery by D.RamaDurgaiah, New Age International.

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

**B.Tech II Year I Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
<b>19AES0510</b>	<b>Basics of Python Programming Lab</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**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.

Laboratory 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  $n+r+1 \leq 2r$  . 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  $1/\pi$  :

Write a function called estimate\_pi that uses this formula to compute and return an estimate of  $\pi$ .

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

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 letter (Assume case insensitivity and don’t consider special characters). Draw a histogram to represent the same

16. Write program which performs the following operations on list’s. Don’t use built-in functions

- a) Updating elements of a list
  - b) Concatenation of list’s
  - c) Check for member in the list
  - d) Insert into the list
  - e) Sum the elements of the list
  - f) Push and pop element of list
  - g) Sorting of list
  - h) Finding biggest and smallest elements in the list
  - i) Finding common elements in the list
17. Write a program to count the number of vowels in a word.

18. Write a program that reads a file, breaks each line into words, strips whitespace and punctuation from the words, and converts them to lowercase.
19. Go to Project Gutenberg (<http://gutenberg.org>) and download your favorite out-of-copyright book in plain text format. Read the book you downloaded, skip over the header information at the beginning of the file, and process the rest of the words as before. Then modify the program to count the total number of words in the book, and the number of times each word is used. Print the number of different words used in the book. Compare different books by different authors, written in different eras.
20. Go to Project Gutenberg (<http://gutenberg.org>) and download your favorite out-of-copyright book in plain text format. Write a program that allows you to replace words, insert words and delete words from the file.
21. Consider all the files on your PC. Write a program which checks for duplicate files in your PC and displays their location. Hint: If two files have the same checksum, they probably have the same contents.
22. Consider turtle object. Write functions to draw triangle, rectangle, polygon, circle and sphere. Use object oriented approach.
23. Write a program illustrating the object oriented features supported by Python.
24. Design a Python script using the Turtle graphics library to construct a turtle bar chart representing the grades obtained by N students read from a file categorizing them into distinction, first class, second class, third class and failed.
25. Design a Python script to determine the difference in date for given two dates in YYYY:MM:DD format(0 <= YYYY <= 9999, 1 <= MM <= 12, 1 <= DD <= 31) following the leap year rules.
26. Design a Python Script to determine the time difference between two given times in HH:MM:SS format.( 0 <= HH <= 23, 0 <= MM <= 59, 0 <= SS <= 59)

Reference Books:

1. Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers, “How to Think Like a Computer Scientist: Learning with Python 3”, 3rd edition,
2. Available at <http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf>
3. Paul Barry, “Head First Python a Brain Friendly Guide” 2nd Edition, O’Reilly, 2016
4. Dainel Y.Chen “Pandas for Everyone Python Data Analysis” Pearson Education, 2019

Lab Outcomes:

Student should be able to

1. Design solutions to mathematical problems.
2. Organize the data for solving the problem.
3. Develop Python programs for numerical and text based problems.
4. Select appropriate programming construct for solving the problem.
5. Illustrate object oriented concepts.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering Knowledge	1.4	1.4.1
CO2	PO3: Design/Development of Solutions	3.3	3.3.1
CO3	PO2: Problem analysis	2.3	2.3.1
CO4	PO2: Problem analysis	2.3	2.3.1
CO5	PO1: Engineering Knowledge	1.3	1.3.1

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

**B.Tech II Year I Semester**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19AES0102</b>	<b>Basic Civil &amp; Mechanical Engineering Lab</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**Course Outcomes:**

**CO 1:** understand principles of Bending Stress and Strain and

**CO 2:** understand basic principles of Strain Measurement

**CO 3:** understand common building materials used in construction and analyze characteristics of common building materials.

**PART – A**

**Laboratory Experiments:**

1. Bending test on (Steel/Wood) Cantilever beam.
2. Bending test on (Steel/Wood) simply supported beam.
3. Use of electrical resistance strain gauges.
4. Compression test on Bricks
5. Water absorption test on Bricks
6. Torsion test.
7. Tests on closed coiled and open coiled helical springs

List of COs	PO no. and keyword	Competency Indicator:	Performance Indicator:
CO1	PO1: Engineering knowledge	1.2	1.2.1
		1.3	1.3.1
		1.4	1.4.1
	PO2: Problem analysis	2.2	2.2.1
		2.3	2.3.1
CO2	PO1: Engineering knowledge	1.2	1.2.1
		1.3	1.3.1
		1.4	1.4.1
	PO2: Problem analysis	2.2	2.2
		2.3	2.3.1
CO3	PO1: Engineering knowledge	1.2	1.2.1
		1.3	1.3.1
		1.4	1.4.1
	PO2: Problem analysis	2.2	2.2.1
		2.3	2.3.1



**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI  
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**B.Tech II Year I Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0505	Database Management Systems Lab	0	0	4	2

**Course Objectives:**

To create a database and query it using SQL, design forms and generate reports.  
Understand the significance of integrity constraints, referential integrity constraints, triggers, assertions.

**List of Experiments:**

```
SQL> CREATE TABLE emp (
  empno decimal(4,0) NOT NULL,  ename varchar(10) default NULL,
  job varchar(9) default NULL,  mgr decimal(4,0) default NULL,
  hiredate date default NULL,  sal decimal(7,2) default NULL,
  comm decimal(7,2) default NULL,  deptno decimal(2,0) default NULL );
```

```
SQL> DESC emp;
```

```
SQL> CREATE TABLE dept (
  deptno decimal(2,0) default NULL,  dname varchar(14) default NULL,
  loc varchar(13) default NULL );
```

SQL>

```
INSERT INTO emp VALUES (7369,'SMITH','CLERK',7902,'17-DEC 1980',800.00,NULL,20);
INSERT INTO emp VALUES (7499,'ALLEN','SALESMAN',7698,'20-FEB-1981', 1600.00, 300.00, 30);
INSERT INTO emp VALUES (7521,'WARD','SALESMAN',7698,'22-FEB- 1981', 1250.00, 500.00, 30);
INSERT INTO emp VALUES (7566,'JONES','MANAGER',7839,'02-APR-1981',2975.00,NULL,20);
INSERT INTO emp VALUES (7654,'MARTIN','SALESMAN',7698,'1981-09-28',1250.00,1400.00, 30);
INSERT INTO emp VALUES (7698,'BLAKE','MANAGER',7839,'1981-05-01',2850.00,NULL,30);
INSERT INTO emp VALUES (7782,'CLARK','MANAGER',7839,'1981-06-09',2450.00,NULL,10);
INSERT INTO emp VALUES (7788,'SCOTT','ANALYST',7566,'1982-12-09',3000.00,NULL,20);
INSERT INTO emp VALUES (7839,'KING','PRESIDENT',NULL,'1981-11-17',5000.00,NULL,10);
INSERT INTO emp VALUES (7844,'TURNER','SALESMAN',7698,'1981-09-08',1500.00,0.00,30);
INSERT INTO emp VALUES (7876,'ADAMS','CLERK',7788, 'DEC-01-1983',1100.00,NULL,20);
INSERT INTO emp VALUES (7900,'JAMES','CLERK',7698, 'DEC-03-1981',950.00,NULL,30);
INSERT INTO emp VALUES (7902,'FORD','ANALYST',7566,'DEC-03-1981',3000.00,NULL,20);
INSERT INTO emp VALUES (7934,'MILLER','CLERK',7782,'JAN-23-1982',1300.00,NULL,10);
```

```
SQL> INSERT INTO dept VALUES ('10','ACCOUNTING','NEW YORK');
INSERT INTO dept VALUES ('20','RESEARCH','DALLAS');
INSERT INTO dept VALUES ('30','SALES','CHICAGO');
INSERT INTO dept VALUES ('40','OPERATIONS','BOSTON');
```

1. List all records from the emp table
2. List all records from the dept table
3. List all employee names along with their salaries from emp table
4. List all department numbers, employee numbers and their manager's numbers in that order from emp table.
5. List department names and locations from the dept table.
6. List the employees belonging to the department 20
7. List the name and salary of the employees whose salary is more than 1000
8. List employee number and name of managers
9. List the names of the clerks working in the department 20
10. List the names of analysts and salesmen
11. List the details of the employees who have joined before the end of September 1981
12. List the name of employees who are not managers
13. List the name of the employees whose employee numbers are 7369, 7521, 7839, 7934, 7788
14. List the employee details not belonging to the department 10, 30 and 40
15. List the employee name and salary, whose salary is between 1000 and 2000
16. List employee names who have joined before 30<sup>th</sup> June 1981 and after December 1981
17. List the different jobs (designations) available in emp table
18. List the employee names who are not eligible for commission
19. List the name of the employee and job of the employee who does not report to anybody (managers is NULL)
20. List the employees not assigned to any department
21. List the employees who are eligible for commission
22. List the details of employees whose salary is greater than 2000 and commission is null.
23. List the employees whose names start with an "S"
24. List the employees whose names ending with "S"
25. List the names of employees whose names have exactly 5 characters
26. List the employee names having 'I' as the second character
27. List the name, salary and PF amount of all the employees (PF is calculated as 10% of salary)
28. List the names of employees who are more than 25 years old in the organization
29. List the empno, ename, sal in ascending order of salary
30. List the empno, ename, sal, hiredate in descending order of hiredate.
31. List the employee name, Salary, job and department no. in ascending order of deptno and then on descending order of salary
32. List the employee details in ascending order of salary
33. List the employee name, salary, PF, HRA, DA and gross; order the result in ascending order of gross. HRA is 50% of salary and DA is 30% of salary
34. List the number of employees working with the company
35. List the number of jobs available in the emp table

36. List the total salaries payable to employees
37. List the maximum salary of employees working as a salesman
38. List the minimum salary from emp table
39. List the average salary and number of employees working in the department 20
40. List the deptno(s) and number of employees in each department
41. List the department number and the total salary payable in each department
42. List the jobs and the number of employees in each job. The result should be in descending order of the number of employees:
43. List the total salary, maximum, minimum and the average salary of employees job wise
44. List the average salary from each job excluding managers
45. List the total salary, maximum, minimum and the average salary of employees job-wise, for department number 20 only
46. List the average salary for each job type within department
47. List average salary for all departments employing more than five people
48. List jobs of all the employees where maximum salary is >= 5000
49. List the total salary, maximum, minimum and the average salary of employees jobwise, for department number 20 only and display only those rows having average salary greater than 1000
50. For the above query, the output should be arranged in the ascending order of SUM(sal)
51. List the deptno(s) and names in department name order.
52. List the details of employees in departments 10 and 20 in alphabetical order of name
53. List names and jobs of all clerks in department 20 in alphabetical order of name
54. List the names of all employees who have LL and LT in their names
55. List names and total remuneration for all employees
56. List name, annual salary and commission of all salespeople whose monthly salary is greater than their commission, the output should be ordered by salary, highest first. If two or more employees have the same salary sort by employee name within the highest salary order
57. List lowest paid employees working for each manager, sort the output by salary
58. List the employee numbers, names, department numbers and the department name
59. List all the employees who joined the company before their manager
60. Display the different designations in department 20 and 30
61. Display empno, ename from emp where deptno is 10 and 30 in ascending order of empno
62. List the jobs common to department 20 and 30
63. List the jobs unique to department 20
64. List the employees belonging to the department of MILLER
65. List the name of employee who draws the highest salary
66. List all employee details of an employee whose salary is greater than the average salary of employees whose hiredate is before '01-APR-1981'
67. List the job with highest average salary
68. Find the details of the department whose manager's empno is 7698
69. List the names of the employees who earn lowest salary in each department
70. List employee details who earn salary greater than the average salary
71. List all employees who have at least one person reporting to them
72. List the employee details iff more than 2 employees are present in deptno 10
73. List all the employee details who do not manage any one
74. List the employee names whose salary is greater than the lowest salary of an employee belonging to deptno 20
75. List the employee details of those employees whose salary is greater than any of the managers
76. List the employee names whose salary is greater than the highest salary of all employee belonging to dept 20
77. List the employee details of those employees whose salary is more than the highest paid manager
78. List all employees, their job and deptno, who are having same job as that of any employee of deptno 20
79. Using self join, list all the employees who have joined before their manager
80. List all employees who earn less than the average salary of all the employees
81. List all employees name along with their manager's name.
82. Also list the name of employee who has no manager
83. Display the dept that has no employee
84. List the employee details who earn minimum salary for their job
85. List the ename, sal, deptno for those employees who earn sal greater than the avg sal of their dept. Sort the output in deptno order
86. List the employee details who earn highest salary for their job
87. List the details of those employees who are among the five highest earners of the company
88. To increase everyone's salary by 40%
89. Change the department of King to 40
90. All employees who have more than 2 people reporting to them, are to directly report to the PRESIDENT
91. Delete all records from emp
92. Delete the records of clerks
93. To add a column "experience" to the employee table
94. To drop the column "location" from the employee table
95. To modify the column salary in the employee table WITH NUMBER (15,2)
96. Add a column to the existing table emp, which will hold the grades for each employee
97. Modify the emp table, add a Primary Key constraint 'emp\_c'
98. Modify the emp table, add constraint REFERENCES to deptno of table emp referring deptno of table dept
99. Modify the emp table, add constraint CHECK for sal of table emp where sal should be greater than 2500
100. Modify the sal column of the emp table to NOT NULL and increases its size to 10
101. Modify the ename column. Increase its width to varchar2(35)
102. To change the name of the table employee to my\_employee

## 2. SQL Queries on Sailors, Boats and Reserves

1. Create Table: Sailors

Field Name	Not Null	Datatype
Sid	primary key	integer
Sname		varchar2(20)
Rating		integer

Age decimal(4,1)

2. Create Table: Boats

Field Name	Not Null	Datatype
Bid	Primary Key	integer
Bname		varchar2(20)
Color		varchar2(20)

3. Create Table: Reserves

Field Name	Not Null	Datatype
Sid	primary key, Foreign key(Sailors)	integer
Bid	primary key, Foreign key(Boats)	integer
Day	primary key	date

4. Insert data in to sailors

Sid	Sname	Rating	Age
22	DUSTIN	7	45.0
29	BRUTUS	1	33.0
31	LUBBER	8	55.5
32	ANDY	8	25.5
58	RUSTY	10	35.0
64	HORATIO	7	35.0
71	ZORBA	10	16.0
74	HORATIO	9	35.0
85	ART	3	25.5
95	BOB	3	63.5

5. Insert records in to Boats

Bid	Bname	Color
101	INTERLAKE	BLUE
102	INTERLAKE	RED
103	CLIPPER	GREEN
104	MARINE	RED

6. Insert records in to Reserves

Sid	Bid	Day
22	101	10-OCT-98
22	102	10-OCT-98
22	103	8-OCT-98
22	104	7-OCT-98
31	102	10-NOV-98
31	103	6-NOV-98
31	104	12-NOV-98
64	101	5-SEP-98
64	102	8-SEP-98
74	103	8-SEP-98

insert into Sailors (sid,sname,rating,age) REM values(131,'Lubber',8,55.5);

insert into Reserves(sid,bid,day) values(131,101,'8-OCT-98');

- "Find the names of sailors who have reserved boat number 103"
- "Find the names of sailors who have never reserved boat number 103"
- "Find the names of sailors who have reserved a red boat"
- "Find the colors of boats reserved by Lubber"
- "Find the names of sailors who have reserved at least one boat"
- "Find the names of sailors who have reserved a red or a green boat"
- "Find the names of sailors who have reserved both a red and a green boat"
- "Find the names of sailors who have reserved a red but not a green boat"
- "Find the names of sailors who have reserved at least two different boats"
- "Find the names of sailors who have reserved at least n boats"
- "Find the sids of sailors with age over 20 who have not reserved a red boat"
- "Find the names of sailors who have reserved all boats"
- "Find the names of sailors who have reserved all boats called Interlake"
- "Find all sailors with a rating above 7"
- "Find the names and ages of sailors with a rating above 7"
- "Find the sailor name boat id and reservation date for each reservation"
- "Find sailors who have reserved all red boats"
- "Find the names and ages of all sailors"
- "Find the sids of sailors who have reserved a red boat"
- "Compute increments for the ratings of persons who have sailed two different boats on the same day"
- "Find the ages of sailors whose name begins and ends with B and has at least three characters"
- "Find the sids of all sailors who have reserved red boats but not green boats"
- "Find all sids of sailors who have a rating of 10 or have reserved boat 104"
- "Find the names of sailors who have not reserved a red boat"
- "Find sailors whose rating is better than some sailor called Horatio"
- "Find sailors whose rating is better than every sailor called Horatio"
- "Find the sailors with the highest rating"

- "Find the average of all sailors"
- "Find the average age of sailors with a rating of 10"
- "Find the name and age of the oldest sailor"
- "Count the number of sailors"
- "Count the number of different sailor names"
- "Find the names of sailors who are older than the oldest sailor with a rating of 10"
- "Find the age of the youngest sailor for each rating level"
- "Find the age of the youngest sailor who is eligible to vote(i.e., is at least 18 years old) for each rating level with at least two such sailors"
- "For each red boat, find the number of reservations for this boat"
- "Find the average age of sailors for each rating level that has at least two sailors"
- "Find the average age of sailors who are of voting age(i.e., at least 18 years old) for each rating level that has at least two sailors"
- "Find the average age of sailors who are of voting age(i.e., at least 18 years old) for each rating level that has at least two such sailors"
- "Find those ratings for which the average age of sailors in the minimum overall ratings"
- "Find the sailor ids with top 5 rating ranks."

### 3. PROGRAMS ON PL/SQL

- Write a PL/SQL program to swap two numbers.
- Write a PL/SQL program to find the largest of three numbers.
- Write a PL/SQL program to find the total and average of 6 subjects and display the grade.
- Write a PL/SQL program to find the sum of digits in a given number.
- Write a PL/SQL program to display the number in reverse order.
- Write a PL/SQL program to check whether the given number is prime or not.
- Write a PL/SQL program to find the factorial of a given number.
- 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.
- 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 word Hello).
- Write a PL/SQL program to accept a number and a divisor. Make sure the divisor is less than or equal to Else display an error message. Otherwise Display the remainder in words.

### 4. PROCEDURES AND FUNCTIONS

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

### 5. TRIGGERS

- 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 be 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.
- Convert employee name into uppercase whenever an employee record is inserted or updated. Trigger to fire before the insert or update.
- Trigger before deleting a record from employee 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. PROCEDURES

- Create the procedure for palindrome of given number.
- 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.
- Write the PL/SQL programs to create the procedure for factorial of given number.
- Write the PL/SQL programs to create the procedure to find sum of N natural number.
- Write the PL/SQL programs to create the procedure to find Fibonacci series.
- Write the PL/SQL programs to create the procedure to check the given number is perfect or not

### 7. CURSORS

- 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.
- Write a PL/SQL block that will display the employee details along with salary using cursors.
- To write a Cursor to display the list of employees who are working as a Managers or Analyst.
- To write a Cursor to find employee with given job and dept no.
- 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

Reference Books:

1. Ramez Elmasri, Shamkant, B. Navathe, "Database Systems", Pearson Education, 6<sup>th</sup> Edition, 2013.

2. Peter Rob, Carles Coronel, "Database System Concepts", Cengage Learning, 7th Edition, 2008.

**Course Outcomes:**

- Design databases
- Retrieve information from data bases
- Use procedures to program the data access and manipulation
- Create user interfaces and generate reports

<b>List of COs</b>	<b>PO no. and keyword</b>	<b>Competency Indicator</b>	<b>Performance Indicator</b>
CO1	PO 3: Design/Development of Solutions	3.3	3.3.1
CO2	PO2: Problem analysis	2.3	2.3.1
CO3	PO 3: Design/Development of Solutions	3.1	3.1.3
CO4	PO 5: Modern tool usage	5.1	5.1.1

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

**B.Tech II Year II Semester**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19APC0512</b>	<b>Object Oriented Programming Through Java</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives:**

- To understand object oriented concepts and problem solving techniques
- To obtain knowledge about the principles of inheritance and polymorphism
- To implement the concept of packages, interfaces, exception handling and concurrency mechanism.
- To design the GUIs using applets and swing controls.
- To understand the Java Database Connectivity Architecture

**UNIT - I**

Introduction: Introduction to Object Oriented Programming, The History and Evolution of Java, Introduction to Classes, Objects, Methods, Constructors, this keyword, Garbage Collection, Data Types, Variables, Type Conversion and Casting, Arrays, Operators, Control Statements, Method Overloading, Constructor Overloading, Parameter Passing, Recursion, String Class and String handling methods.

**UNIT - II**

Inheritance: Basics, Using Super, Creating Multilevel hierarchy, Method overriding, Dynamic Method Dispatch, Using Abstract classes, Using final with inheritance, Object class. Packages: Basics, Finding packages and CLASSPATH, Access Protection, Importing packages. Interfaces: Definition, Implementing Interfaces, Extending Interfaces, Nested Interfaces, Applying Interfaces, Variables in Interfaces.

**UNIT - III**

Exception handling - Fundamentals, Exception types, Uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws and finally, built- in exceptions, creating own exception sub classes. Stream based I/O (java.io) – The Stream classes-Byte streams and Character streams, Reading console Input and Writing Console Output, File class, Reading and writing Files, Random access file operations, The Console class, Serialization, Enumerations, Autoboxing, Generics.

**UNIT - IV**

Multithreading: The Java thread model, Creating threads, Thread priorities, Synchronizing threads, Interthread communication. The Collections Framework (java.util): Collections overview, Collection Interfaces, The Collection classes- Array List, Linked List, Hash Set, Tree Set, Priority Queue, Array Deque. Hashtable, Properties, Stack, Vector, String Tokenizer, Bit Set, Date, Calendar, Random, Formatter, Scanner.

**UNIT - V**

Applet: Basics, Architecture, Applet Skeleton, requesting repainting, using the status window, passing parameters to applets. GUI Programming with Swings – The origin and design philosophy of swing, components and containers, layout managers, event handling, using a push button, jtextfield, jlabel and image icon, the swing buttons, jtext field, jscrollpane, jlist, jcombobox, trees, jtable, An overview of jmenubar, jmenu and jmenuItem, creating a main menu, showmessagedialog, showconfirmdialog, showinputdialog, showoptiondialog, jdialog, create a modeless dialog. Accessing Databases with JDBC: Types of Drivers, JDBC Architecture, JDBC classes and Interfaces, Basic steps in developing JDBC applications, Creating a new database and table with JDBC.

**Course Outcomes:**

After the completion of the course the student will be able

- To solve real world problems using OOP techniques.
- To apply code reusability through inheritance, packages and interfaces
- To solve problems using java collection framework and I/O classes.
- To develop applications by using parallel streams for better performance.
- To develop applets for web applications.
- To build GUIs and handle events generated by user interactions.
- To use the JDBC API to access database

<b>List of COs</b>	<b>PO no. and keyword</b>	<b>Competency Indicator</b>	<b>Performance Indicator</b>
CO1	PO1: Engineering knowledge	1.3	1.3.1
CO2	PO1: Engineering knowledge	1.4	1.4.1
CO3	PO2: Problem analysis	2.3	2.3.1
CO4	PO 3: Design/Development of Solutions	3.4	3.4.3
CO5	PO 4: Conduct investigations of complex problems	4.1	4.1.1
CO6	PO 5: Modern tool usage	5.1	5.1.1
CO7	PO 5: Modern tool usage	5.1	5.1.1

**Text Books:**

1. Herbert Schildt “Java The complete reference”, 9th edition, McGraw Hill Education (India) Pvt. Ltd.
2. Paul Dietel, Harvey Dietel “Java How to Program”, 10th Edition, Pearson Education.

**REFERENCE BOOKS:**

1. T. Budd “Understanding Object-Oriented Programming with Java”, updated edition, Pearson Education.
2. Cay S. Horstmann, “Core Java Volume – 1 Fundamentals”, Pearson Education.
3. Sagayaraj, Dennis, Karthik and Gajalakshmi, “Java Programming for core and advanced learners” University Press
4. Y. Daniel Liang, “Introduction to Java programming”, Pearson Education.
5. P. Radha Krishna, “Object Oriented Programming through Java”, University Press.
6. S. Malhotra, S. Chudhary, “Programming in Java”, 2nd edition, Oxford Univ. Press.
7. R.A. Johnson, “Java Programming and Object-oriented Application Development”, Cengage Learning.

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**B.Tech II Year II Semester**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19AHS9903</b>	<b>Communicative English II</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

**Course Outcomes**

At the end of the course, the learners will be able to

1. Prioritize information from reading texts after selecting relevant and useful points
2. Paraphrase short academic texts using suitable strategies and conventions
3. Make formal structured presentations on academic topics using PPT slides with relevant graphical elements
4. Participate in group discussions using appropriate conventions and language strategies
5. Prepare a CV with a cover letter to seek internship/ job
6. Collaborate with a partner to make presentations and Project Reports

**Unit 1**

**(10 hrs)**

Listening : Listening for presentation strategies and answering questions on the speaker, audience, and key points.

Speaking: Formal presentations using PPT slides without graphic elements.

Reading: Reading for presenting – strategies to select, compile and synthesize information for presentation; reading to recognize academic style.

Writing: Paraphrasing; using quotations in writing; using academic style - avoiding colloquial words and phrases.

Grammar and Vocabulary: Formal/academic words and phrases.

**Unit 2**

**(10 hrs)**

Listening: Following an argument/ logical flow of thought; answering questions on key concepts after listening to extended passages of spoken academic discourse.

Speaking: Formal presentations using PPT slides with graphic elements.

Reading: Understand formal and informal styles; recognize the difference between facts and opinions.

Writing: Formal letter writing and e-mail writing (enquiry, complaints, seeking permission, seeking internship); structure, conventions and etiquette.

Grammar and Vocabulary: Phrasal prepositions; phrasal verbs.

**Unit 3**

**10(hrs)**

Listening: Identifying views and opinions expressed by different speakers while listening to discussions.

Speaking: Group discussion on general topics; agreeing and disagreeing, using claims and examples/ evidences for presenting views, opinions and position.

Reading: Identifying claims, evidences, views, opinions and stance/ position.

Writing: Writing structured persuasive/argumentative essays on topics of general interest using suitable claims, examples and evidences.

Grammar and Vocabulary: Language for different functions such as stating a point, expressing opinion, agreeing/disagreeing, adding information to what someone has stated, and asking for clarification.

**Unit 4:**

**(8 hrs)**

Listening: Understanding inferences; processing of information using specific context clues from the text.

Speaking: Group discussion; reaching consensus in group work (academic context).

Reading: Reading for inferential comprehension.

Writing: Applying for internship/ job - Writing one's CV/Resume and cover letter.

Grammar and Vocabulary: Active and passive voice – use of passive verbs in academic writing.

**Unit 5:**

**(8hrs)**

Listening: Understanding inferences - processing of explicit information presented in the text and implicit information inferable from the text or from previous/background knowledge.

Speaking: Formal team presentations on academic/ general topics using PPT slides.

Reading for Writing: Structure and contents of a Project Report; identifying sections in project reports; understanding the purpose of each section; significance of references.

Grammar and Vocabulary: Reinforcing learning; editing short texts; correcting common errors in grammar and usage.

**\*Course Materials would be compiled and provided to learners and teachers**

**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; 2<sup>nd</sup> Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012. Sample Web Resources  
Grammar/Listening/Writing 1-language.com <http://www.5minuteenglish.com/>  
<https://www.englishpractice.com/>

**Grammar/Vocabulary**

English Language Learning Online, <http://www.bbc.co.uk/learningenglish/>, <http://www.better-english.com/>,  
<http://www.nonstopenglish.com/>, <https://www.vocabulary.com/>, BBC Vocabulary Games, Free Rice Vocabulary Game

**Reading**

<https://www.usingenglish.com/comprehension/>, <https://www.englishclub.com/reading/short-stories.htm>,  
<https://www.english-online.at/>

**Listening**

<https://learningenglish.voanews.com/z/3613>, <http://www.englishmedialab.com/listening.html>

**Speaking**

<https://www.talkenglish.com/>, BBC Learning English – Pronunciation tips, Merriam-Webster – Perfect pronunciation Exercises

**All Skills**

<https://www.englishclub.com/>, <http://www.world-english.org/>, <http://learnenglish.britishcouncil.org/>, Online Dictionaries, Cambridge dictionary online, MacMillan dictionary, Oxford learner's dictionaries

**References:**

1. [www.pointblank7.in](http://www.pointblank7.in) > News & Politics > Features dt. 15.05.2019
2. Learning English a Communication Approach by Orient Longman Pvt Ltd. Hyderabad , 2005.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator:
CO1	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.1	10.1.1 10.1.2
CO2	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.3	10.3.1 10.3.2
CO3	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.2.2
CO4	PO9- Function effectively as an individual, and as a member or leader in diverse teams, and in multi disciplinary settings.	9.2	9.2.1 9.2.2 9.2.3
CO5	PO10-Able to comprehend and write effective reports and design documentation.	10.3	10.3.1 10.3.2
CO6	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.3	10.3.1 10.3.2



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<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19AES0302</b>	Design Thinking and Product Innovation	<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

Course Objectives:

- To familiarize product design process
- To introduce the basics of design thinking
- To bring awareness on idea generation
- To familiarize the role of design thinking in services design

Unit – I

Introduction to design, characteristics of successful product development, product development process, identification of opportunities, product planning, Innovation in product development.

Unit – II

Design thinking: Introduction, Principles, the process, Innovation in design thinking, benefits of Design thinking, design thinking and innovation, case studies.

Unit - III

Idea generation: Introduction, techniques, Conventional methods, Intuitive methods, Brainstorming, Gallery method, Delphi method, Syntetics, etc., Select ideas from ideation methods, case studies.

Unit - IV

Design Thinking in Information Technology, Design thinking in Business process model, Design thinking for agile software development, virtual collaboration, multi user and multi account interaction, need for communication, TILES toolkit, Cloud implementation.

Unit - V

Design thinking for service design: How to design a service, Principles of service design, Benefits of service design, Service blueprint, Design strategy, organization, principles for information design, principles of technology for service design.

Course Outcomes: Student should be able to

1. Generate and develop different design ideas.
2. Appreciate the innovation and benefits of design thinking.
3. Experience the design thinking process in IT and agile software development.
4. Understand design techniques related to variety of software services

Reference Books:

1. Christoph Meinel and Larry Leifer, “Design Thinking”, Springer, 2011
2. Aders Riise Maehlum, “Extending the TILES Toolkit” from Ideation to Prototyping
3. <http://www.algarytm.com/it-executives-guide-to-design-thinking:e-book>.
4. Marc stickdorn and Jacob Schneider, “This is Service Design Thinking”, Wiley, 2011
5. Pahl and Vietz, “Engineering Design”, Springer, 2007

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO3: Design/development of solutions	3.1	3.1.1
CO: 2	PO 1: Engineering knowledge	1.3	1.3.1
CO: 3	PO 1: Engineering knowledge	1.3	1.3.1
CO: 4	PO3: Design/development of solutions	3.1	3.1.1
CO: 5	PO 1: Engineering knowledge	1.3	1.3.1

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<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19APC0506</b>	<b>Computer Organization</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives:**

- To learn the fundamentals of computer organization and its relevance to classical and modern problems of computer design
- To make the students understand the structure and behavior of various functional modules of a computer.
- To understand the techniques that computers use to communicate with I/O devices
- To study the concepts of pipelining and the way it can speed up processing.
- To understand the basic characteristics of multiprocessors

**Unit I:**

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: Addition and Subtraction of Signed Numbers, Design and 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, Multiprogrammed Control.

**Unit III:**

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: Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces.

**Unit V:**

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, Interconnection Networks.

**Textbook:**

1. "Computer Organization", Carl Hamacher, Zvonko Vranesic, Safwat Zaky, McGraw Hill Education, 5<sup>th</sup> Edition, 2013.

**Reference Textbooks:**

1. Computer System Architecture, M.Morris Mano, Pearson Education, 3<sup>rd</sup> Edition.
2. Computer Organization and Architecture, Themes and Variations, Alan Clements, CENGAGE Learning.
3. Computer Organization and Architecture, Smruti Ranjan Sarangi, McGraw Hill Education.
4. Computer Architecture and Organization, John P.Hayes, McGraw Hill Education.

**Course Outcomes:**

- Ability to use memory and I/O devices effectively
- Able to explore the hardware requirements for cache memory and virtual memory
- Ability to design algorithms to exploit pipelining and multiprocessors

<b>List of COs</b>	<b>PO no. and keyword</b>	<b>Competency Indicator</b>	<b>Performance Indicator</b>
CO1	PO2: Problem analysis	2.2	2.2.2
CO2	PO2: Problem analysis	2.2	2.2.2
CO3	PO2: Problem analysis	2.3	2.3.2

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<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19APC0511</b>	<b>Design and Analysis of Algorithms</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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.

**UNIT I**

Introduction: What is an Algorithm, Algorithm specification, Performance analysis

Divide and Conquer: General method, Binary Search, Finding the maximum and minimum, Merge sort, Quick Sort, Selection sort, Strassen's matrix multiplication.

**UNIT II**

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**

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**

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**

NP – Hard and NP – Complete Problems: NP Hardness, NP Completeness, Consequences of being in P, Cook's Theorem, Reduction Source Problems, Reductions: Reductions for some known problems

**Text Books:**

1. "Fundamentals of Computer Algorithms", Ellis Horowitz, S. Sartaj Sahni and Rajasekharan, 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. "Data structures and Algorithm Analysis in C++", Allen Weiss, Second edition, Pearson education.
4. "Design and Analysis of algorithms", Aho, Ullman and Hopcroft, Pearson education.
5. "Algorithms" – Richard Johnson baugh and Marcus Schaefer, Pearson Education

**Course Outcomes:**

1. Analyze the complexity of the algorithms
2. Use techniques divide and conquer, greedy, dynamic programming, backtracking, branch and bound to solve the problems.
3. Identify and analyze criteria and specifications appropriate to new problems, and choose the appropriate algorithmic design technique for their solution.
4. Able to prove that a certain problem is NP-Complete.

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

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0509	Formal Languages and Automata Theory	3	0	0	3

**Course Objective:**

- 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

**UNIT I**

**Introduction:** Basics of set theory, Relations on sets, Deductive proofs, Reduction to definitions, Other theorem forms, Proving equivalences about sets, The Contrapositive, Proof by contradiction, Counter examples, Inductive proofs, Alphabets, Strings, Languages, Problems, Grammar formalism, Chomsky Hierarchy

**Finite Automata:** An Informal picture of Finite Automata, Deterministic Finite Automata (DFA), Non Deterministic Finite Automata (NFA), Applying FA for Text search, Finite Automata with Epsilon transitions ( $\epsilon$ -NFA or NFA- $\epsilon$ ), Finite Automata with output, Conversion of one machine to another, Minimization of Finite Automata, Myhill-Nerode Theorem.

**UNIT II**

**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, Equivalence of Two FAs, Equivalence of Two REs, Construction of Regular Grammar from RE, Constructing FA from Regular Grammar, Closure properties of RLs, Decision problem's of RLS, Applications of REs and FAs

**UNIT III**

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

**UNIT V**

**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.

**Text Books:**

1. Introduction to Automata Theory, Formal Languages and Computation, Shyamalendu kandar, Pearson.
2. Introduction to Automata Theory, Languages, and Computation, Third Edition, John E.Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson.

**Reference Books:**

1. Introduction to Languages and the Theory of Computation, John C Martin, TMH, Third Edition.
2. Theory of Computation, Vivek Kulkarni, OXFORD.
3. Introduction to the Theory of Computation., Michel Sipser, 2nd Edition, Cengage Learning
4. Theory of computer Science Automata, Languages and Computation, K.L.P. Mishra, Chandrasekaran, PHI, Third Edition.
5. Fundamentals of the Theory of Computation, Principles and Practice, Raymond Greenlaw, H. James Hoover, Elsevier, Morgan Kaufmann.
6. Finite Automata and Formal Language A Simple Approach, A.M. Padma Reddy, Pearson

**Course Outcomes:**

- Construct finite state diagrams while solving problems of computer science.
- Design of new grammar and language.
- Find solutions to the problems using PDA.
- Find solutions to the problems using Turing machines.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO2: Problem analysis	2.4	2.4.1
CO2	PO 3: Design/Development of Solutions	3.2	3.2.2
CO3	PO 4: Conduct investigations of complex problems	4.1	4.1.1
CO4	PO 4: Conduct investigations of complex problems	4.1	4.1.1

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AMC9903	Environmental Studies	2	0	0	0

**Course Outcomes:**

- CO: 1 Students get sufficient information that clarifies modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.
- CO: 2 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.
- CO: 3 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.
- CO: 4 Interpretation of different types of environmental pollution problems and designing of new solid waste management techniques usage
- CO: 5 To get knowledge on various environmental acts and to engage all the students life - long learning of rain water harvesting

**UNIT I**

**Multidisciplinary Nature of 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**

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

**UNIT III**

**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**

**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**

**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.

**Text Books:**

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 - Prentice hall of India Private limited.
4. Environmental studies by A. Ravi Krishnan, G. Sujatha Sri Krishna Hitech publications.

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

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AMC9904	Communicative English II Lab	0	0	2	1

Course Outcomes:

- CO: 1 Prioritize information from reading texts after selecting relevant and useful points.
- CO: 2 Make formal structured presentations on academic topics using PPT slides with relevant graphical elements.
- CO: 3 Participate in Group discussions using appropriate conventions and language strategies.
- CO: 4 Paraphrase short academic text using suitable strategies and conventions.
- CO: 5 Collaborate with a partner to make presentations and Project

**UNIT I**

Oral Presentation: Reading for presenting – strategies to select, compile and synthesize information for presentation; reading to recognize academic style. Listening for presentation strategies and answering questions- Formal presentations using PPT slides without graphic elements

**UNIT II**

Power point Presentation/Poster Presentation: Understand formal and informal styles; recognize the difference between facts and opinions. Following an argument/ logical flow of thought; answering questions, formal presentations using PPT slides with graphic elements.

**UNIT III**

Group discussion on general topics; agreeing and disagreeing, using claims and examples/ evidences for presenting views, opinions and position. Identifying claims, evidences, views, opinions and stance/ position. Identifying views and opinions expressed by different speakers while listening to discussions.

**UNIT IV**

Reading for inferential comprehension. Group discussion; reaching consensus in group work(academic context). Understanding inferences; processing of information using specific context clues from the text.

**UNIT V**

Formal team presentations on academic/ general topics using PPT slides-identifying sections in project reports; understanding the purpose of each section; significance of references.

**Reference Books:**

1. Effective Technical Communication, Rizvi, Tata McGraw-Hill Education 2007.
2. A Practical Course in Effective English Speaking skills, J.K.Gangal, PHI Learning Pvt Ltd, 2012.
3. A Course in Communication Skills, P.Kiranmai Dutt, Geetha Rajeevan, C.L.N.Prakash, 2008.
4. Technical Communication, Meenakshi Raman, Oxford University Press.
5. Professional Communication Skills, Er.A.K.Jain, Pravin S.R.Bhatia, Dr.A.M.Sheikh, S.Chand & Company Ltd, 2001.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO10 Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.1	10.1.1 10.1.2
CO: 2	PO10 Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.3	10.3.1 10.3.2 .
CO: 3	PO9 Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	9.2.	9.2.1 9.2.2 9.2.3
CO: 4	PO10 Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions	10.3	10.3.1 10.3.2
CO: 5	PO10 Able to comprehend and write effective reports and design documentation.	10.3	10.3.1 10.3.2



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**B.Tech II Year II Semester**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19AES0303</b>	<b>Design Thinking and Product Innovation Lab</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

MIT App Inventor is an online platform designed to teach Computational Design thinking concepts through development of mobile applications. Students create applications by dragging and dropping components into a design view and using a visual blocks language to program application behavior.

Course Outcomes:

- (1) Identify objectives of the project
- (2) How they shape the design of the system
- (3) Using MIT to develop the platform
- (4) How they are informed by computational thinking literature.

Key takeaways include use of components as abstractions, alignment of blocks with student mental models, and the benefits of fast, iterative design on learning.

Note: Student can also go for generating his/her own product and upload in digital market.

References:

1. <http://kio4.com/appinventori/index.htm>
2. <https://appinventor.mit.edu/>

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO1: Engineering knowledge	1.3	1.3.1
CO: 2	PO2: Problem analysis	2.1	2.1.2
CO: 3	PO5: Modern tool usage	5.1	5.1.1
CO: 4	PO2: Problem analysis	2.2	2.2.2

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0504	Computer Organization Lab	0	0	2	1

**Course Objectives:**

1. Understanding the behavior of logic gates ,adders, decoders, multiplexers and flipflops.
2. Understanding the behavior of ALU, RAM,STACK and PROCESSOR from working modules and the modules designed by the student as part of the experiment.

**Exercises in Digital Logic Design:**

- 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

**Exercises in Micro Processor programming:**

Write assembly language programs for the following using GNU Assembler.

1. Write assembly language programs to evaluate the expressions:

i)  $a = b + c - d * e$

ii)  $z = x * y + w - v + u / k$

- a. Considering 8-bit, 16 bit and 32 bit binary numbers as b, c, d, e.

- b. Considering 2 digit, 4 digit and 8 digit BCD numbers.

Take the input in consecutive memory locations and also Display the results by using "int xx" of 8086. Validate program for the boundary conditions.

2. Write an ALP of 8086 to take N numbers as input. And do the following operations on them.

- a. Arrange in ascending and descending order.

3. Write an ALP of 8086 to take N numbers as input. And do the following operations on them.

- a. Find max and minimum

- b. Find average

Considering 8-bit, 16 bit binary numbers and 2 digit, 4digit and 8 digit BCD numbers. Display the results by using "int xx" of 8086. Validate program for the boundary conditions.

**REFERENCE BOOKS:**

- 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.

**Course Outcomes:**

- Represent numbers and perform arithmetic operations.
- Minimize the Boolean expression using Boolean algebra and design it using logic gates
- Analyse and design combinational circuit.
- Design and develop sequential circuits
- Understand and apply the fundamentals of assembly level programming of microprocessors and microcontroller.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.3	1.3.1
CO2	PO1: Engineering knowledge	1.4	1.4.1
CO3	PO2: Problem analysis	2.3	2.3.1
CO4	PO 3: Design/Development of Solutions	3.4	3.4.3
CO5	PO1: Engineering knowledge	1.4	1.4.1

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0514	Object Oriented Programming through Java Lab	0	0	4	2

**Course Objectives**

- To introduce the concepts of Java.
- To Practice object-oriented programs and build java applications.
- To implement java programs for establishing interfaces.
- To implement sample programs for developing reusable software components.
- To establish database connectivity in java and implement GUI applications.

**Week-1**

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

**Week-2**

- a. Write Java program on use of inheritance, preventing inheritance using final, abstract classes.
- b. Write Java program on dynamic binding, differentiating method overloading and overriding.
- c. Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen) using Interfaces.

**Week-3**

- a. Write Java program that inputs 5 numbers, each between 10 and 100 inclusive. As each number is read display it only if it's not a duplicate of any number already read display the complete set of unique values input after the user enters each new value.
- b. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.
- c. Write a Java program to read the time intervals (HH:MM) and to compare system time if the system Time between your time intervals print correct time and exit else try again to repute the same thing. By using String Tokenizer class.

**Week-4**

- a. Write a Java program to implement user defined exception handling.
- b. Write java program that inputs 5 numbers, each between 10 and 100 inclusive. As each number is read display it only if it's not a duplicate of any number already read. Display the complete set of unique values input after the user enters each new value.

**Week-5**

- a. Write a Java program that creates a user interface to perform integer division. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 and Num2 were not integers, the program would throw a Number Format Exception. If Num2 were zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box.
- b. Write a Java program that creates three threads. First thread displays —Good Morning! every one second, the second thread displays —Hello! every two seconds and the third thread displays —Welcome! every three seconds.

**Week-6**

- a. Write a java program to split a given text file into n parts. Name each part as the name of the original file followed by .part where n is the sequence number of the part file.
- b. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.

**Week-7**

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

**Week-8**

- a. Write a Java program that correctly implements producer consumer problem using the concept of interthread communication.
- b. Develop a Java application for stack operation using Buttons and JOptionPane input and Message dialog box.
- c. Develop a Java application to perform Addition, Division, Multiplication and subtraction using JOption Pane dialog Box and Text fields.

**Week-9**

- a. Develop a Java application for the blinking eyes and mouth should open while blinking.
- b. Develop a Java application that simulates a traffic light. The program lets the user select one of three lights: Red, Yellow or Green with radio buttons. On selecting a button an appropriate message with —STOP! or —READY! or !GO! should appear above the buttons in selected color. Initially, there is no message shown.

**Week-10**

- a. Develop a Java application to implement the opening of a door while opening man should present before hut and closing man should disappear.
- b. Develop a Java application by using JTextField to read decimal value and converting a decimal number into binary number then print the binary value in another JTextField.

**Week-11**

a. Develop a Java application that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. Use adapter classes.

b. Develop a Java application to demonstrate the key event handlers.

**Week-12**

a. Develop a Java application to find the maximum value from the given type of elements using a generic function.

b. Develop a Java application that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -, \*, % operations. Add a text field to display the result.

c. Develop a Java application for handling mouse events.

**Week-13**

a. Develop a Java application to establish a JDBC connection, create a table student with properties name, register number, mark1, mark2, mark3. Insert the values into the table by using the java and display the information of the students at front end.

Lab Outcomes:

On successful completion of this laboratory students will be able to:

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

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering knowledge	1.4	1.4.1
CO2	PO1: Engineering knowledge	1.4	1.4.1
CO3	PO1: Engineering knowledge	1.4	1.4.1
CO4	PO1: Engineering knowledge	1.4	1.4.1

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0515	OPERATING SYSTEMS	3	0	0	3

**Course Objectives:**

- To make the students understand the basic operating system concepts such as processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection.
- To get acquaintance with the class of abstractions afford by general purpose operating systems that aid the development of user applications.

**Course Outcomes:**

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

**UNIT - 1:**

**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 - 2:**

**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 - 3:**

**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 - 4:**

**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 - 5:**

**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.

**Text Books:**

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. Modern Operating Systems, Andrew S Tanenbaum, Second Edition, PHI.

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

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**B.Tech III Year I Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0521	ARTIFICIAL INTELLIGENCE	3	0	0	3

**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:**

- Apply searching techniques for solving a problem
- Design Intelligent Agents
- Develop Natural Language Interface for Machines
- Design mini robots
- Summarize past, present and future of Artificial Intelligence

**UNIT I**

**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**

**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 Continuous Spaces, Searching with Nondeterministic Actions, Searching with partial observations, online search agents and unknown environments.

**UNIT III**

**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**

**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**

**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.

**Textbook:**

1. Stuart J. Russell, Peter Norvig, "Artificial Intelligence A Modern Approach", 3<sup>rd</sup> Edition, Pearson Education, 2019.

**References:**

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

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO2. Problem Analysis	2.2	2.2.3
CO2	PO3. Design/development of solutions	3.3	3.3.1
CO3	PO5. Modern tool usage	5.1	5.1.1
CO4	PO3. Design/development of solutions	3.4	3.4.1
CO5	PO12. Life-long learning	12.3	12.3.2

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<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19APC0520</b>	<b>COMPILER DESIGN</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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**

- Able to design a compiler for a simple programming language
- Able to use the tools related to compiler design effectively and efficiently
- Ability to write optimized code

**Unit - I**

**Introduction:** Language processors, The Structure of a Compiler, the science of building a compiler.

**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**

**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**

**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**

**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**

**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

**Text Books :**

1. "Compilers Principles, Techniques and Tools", Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman., Pearson, 2016.
2. "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

<b>List of COs</b>	<b>PO no. and keyword</b>	<b>Competency Indicator</b>	<b>Performance Indicator</b>
CO1	PO3. Design/development of solutions	3.3	3.3.1
CO2	PO5. Modern tool usage	5.1	5.1.2
CO3	PO4. Conduct investigations of complex problems	4.2	4.2.1

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0507	Software Engineering	2	0	0	2

**Course Objectives:**

A student should be able to develop a software product that

- should be feasible for the software to evolve to meet changing requirements.
- is correct if the different requirements as specified in the SRS document have been correctly implemented.
- has good reusability if the different modules of the product can easily be reused to develop new products.
- facilitates both the establishment of test criteria and the evaluation of the software with respect to those criteria.
- can be expected to perform its desired function, over an arbitrary time period.

**Course Outcomes:**

- Introduce SE and Models
- Discusses Techniques on SPM
- Focus on Requirements analysis and Specification
- Highlights some important facets of Software Design
- Testing Techniques and Quality Control Activities
- Discusses on Software Quality Assurance and Trends

**Unit 1:**

**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 2:**

**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 3:**

**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 4:**

**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

**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

**Unit 5:**

**CASE:** Scope, Environment, Support, Characteristics, Towards 2G CASE Tools. Software Maintenance: Characteristics.

**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

**Text Books:**

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

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1. Engineering knowledge	1.3	1.3.1
CO2	PO2. Problem Analysis	2.2	2.2.2
CO3	PO2. Problem Analysis	2.3	2.3.2
CO4	PO3. Design/development of solutions	3.3	3.3.2
CO5	PO4. Conduct investigations of complex problems	4.3	4.3.4
CO6	PO12. Life-long learning	12.2	12.2.2



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**Branch: CSE**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19APE0417</b>	<b>Sensors &amp; Internet of Things</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Outcomes:**

Upon completion of the course students will be able to:

- Understand the characteristics of sensors and Transducers.
- Identify the different types of sensors and recent trends.
- Determine the Market perspective of IoT.
- Compare and Contrast the use of Devices, Gateways and Data Management in IoT.
- To design IoT applications using Arduino

**UNIT I:**

Sensors: Introduction to sensors- Principles, Classifications, Parameters- Characteristics, sensor Types- Resistive Potentiometer, Inductive sensor, Capacitive sensor, Thermal sensors, Magnetic sensors, Radiation sensors, Smart sensors, Sensor Classification, criteria to choose a sensor, Generation of sensors, Transducers: Active & Passive Transducers- Measurement of Displacement(Resistance, Capacitance, Inductance, LVDT), Force (Strain Gauges), Pressure(Piezoelectric transducers).

**UNIT II:**

Recent Trends in Sensor Technologies: Film Sensors, Semiconductor IC Technology, MEMS, Nano Sensors.

Applications of sensors: Temperature sensors, Home appliance sensors, Medical diagnostic sensor, Sensors for Environmental Monitoring-Pollution Hazards, Sensing Environmental Pollution.

**UNIT III:**

IoT: Characteristics of IoT, Design principles of IoT, IoT Architecture and Protocols, Enabling Technologies for IoT, IoT levels and IoT vs M2M, A Use case example.

M2M to IoT - A Market Perspective- Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT.

**UNIT IV:**

M2M to IoT-An Architectural Overview- Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Knowledge management.

**UNIT V:**

IoT Design Methodology: Design methodology, Challenges in IoT Design, IoT System Management. IoT Servers.

Basics of Arduino: Introduction to Arduino, Arduino IDE, Basic Commands for Arduino, Connecting LEDs with Arduino, Connecting LCD with Arduino.

**Text Books:**

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.

<b>List of COs</b>	<b>PO no. and keyword</b>	<b>Competency Indicator</b>	<b>Performance Indicator</b>
CO1	PO1. Engineering knowledge	1.3	1.3.1
CO2	PO1. Engineering knowledge	1.3	1.3.1
CO3	PO5. Modern tool usage	5.1	5.1.1
CO4	PO5. Modern tool usage	5.1	5.1.1
CO5	PO5. Modern tool usage	5.2	5.2.2

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**B.Tech III Year I Semester**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19AOE0303</b>	<b>OPTIMIZATION TECHNIQUES</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Outcomes**

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

**UNIT – I**

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**

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**

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

**UNIT – IV**

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**

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.

**TEXT BOOKS:**

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.

<b>List of COs</b>	<b>PO no. and keyword</b>	<b>Competency Indicator</b>	<b>Performance Indicator</b>
CO1	PO1. Engineering knowledge	1.4	1.4.1
CO2	PO2. Problem Analysis	2.1	2.1.3
CO3	PO4. Conduct investigations of Complex Problems	4.1	4.1.2
CO4	PO2. Problem Analysis	2.1	2.1.2
CO5	PO1. Engineering knowledge	1.4	1.4.1

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<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19APC0428</b>	<b>MICROPROCESSORS AND INTERFACING</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Outcomes:**

After completion of this subject the students will be able to:

- Understand concepts of Intel x85 and 8086 series of processors
- Develop various programming using 8086 instruction set.
- Understand concepts of 8086 interrupts and Memory, I/O interfacing
- Understand concepts of Interfacing programmable devices for 8086
- Understand concepts of Intel 8051 series of microcontrollers

**UNIT I**

Microprocessors-Evolution and Introduction: Microprocessors and Micro Controllers, Microprocessor based system, Origin of Microprocessor, Classification of Microprocessors, Types of Memory, I/O Devices, Technology Improvements Adapted to Microprocessors and Computers, Introduction to 8085 processor, Architecture of 8085, Microprocessor instructions, classification of instructions, Instruction set of 8085.

Intel 8086 Microprocessor architecture, Features, and Signals: Architecture of 8086, Accessing memory locations, PIN details of 8086.

**UNIT II**

Addressing Modes, Instruction Set and Programming of 8086: Addressing modes in 8086, Instruction set of 8086, 8086 Assembly Language Programming, Modular Programming.

**UNIT III**

8086 Interrupts: Interrupt types in 8086, Processing of Interrupts by 8086, Dedicated interrupt types in 8086, Software interrupts-types 00H-FFH, Priority among 8086 interrupts, Interrupt service routines, BIOS interrupts or functional calls, Interrupt handlers, DOS services-INT 21H, System calls-BIOS services.

Memory and I/O Interfacing: Physical memory organization in 8086, Formation of system bus, Interfacing RAM and EPROM chips using only logic gates, Interfacing RAM/ EPROM chips using decoder IC and logic gates, I/O interfacing, Interfacing 8-bit input device with 8086, Interfacing output device using 8086, Interfacing printer with 8086, Interfacing 8-bit and 16-bit I/O devices or ports with 8086, Interfacing CRT terminal with 8086.

**UNIT IV**

Features and Interfacing of programmable devices for 8086 systems: Intel 8255 programmable peripheral interface, Interfacing switches and LEDs, Interfacing seven segment displays, Traffic light control, Interfacing analog to digital converters, Intel Timer IC 8253, Introduction to serial communication, 8259 programmable controller, 8237 DMA controller.

**UNIT V**

Introduction to 8051 Micro controllers: Intel's MCS-51 series micro controllers, Intel 8051 architecture, Memory organization, Internal RAM structure, Power control in 8051, Stack operation. 8051 Instruction Set and Programming: Introduction, Addressing modes of 8051, Instruction set of 8051, Hardware features of 8051: Introduction, Parallel ports in 8051, External memory interfacing in 8051, Timers, Interrupts, Serial ports.

Interfacing Examples: Interfacing 8255 with 8051, Interfacing of push button switches and LEDs, Interfacing of seven segment displays.

**Text Books:**

1. "Microprocessor and Interfacing 8086, 8051, 8096 and advanced processors", Senthil Kumar, Saravanan, Jeevanathan, Shah, 1st edition, 2nd impression, 2012, Oxford University Press.
2. "The X86 Microprocessors", Lyla B. Das. , 2010, Pearson.

**Reference Books:**

1. "Microprocessor and Interfacing: Programming and Hardware", Douglas V.Hall, McGrawHill
2. "8086 microprocessor: Programming and Interfacing the PC", Kenneth Ayala, Cengage Learning
3. "ARM system-on-chip architecture", Steve Furber, Addison-Wesley Professional
4. "The Intel Microprocessors", Barry B. Brey, Prentice Hall

<b>List of COs</b>	<b>PO no. and keyword</b>	<b>Competency Indicator</b>	<b>Performance Indicator</b>
CO1	PO2:Problem analysis	2.2	2.2.1
CO2	PO3: design/development solutions	2.3	2.3.1
CO3	PO4: Conduct Investigation of complex problems	4.2	4.2.2
CO4	PO4: Conduct Investigation of complex problems	4.3	4.3.2
CO5	PO5: conduct Modern tool usage	5.2	5.2.3

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**B.Tech III Year I Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0501	DATA WAREHOUSING & MINING	3	0	0	3

**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:**

- Understand the basic concepts of data warehouse and data Mining
- Apply pre-processing techniques for data cleansing
- Analyze and evaluate performance of algorithms for Association Rules
- Analyze Classification and Clustering algorithms

**UNIT I**

**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**

**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**

**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**

**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**

**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.

**TEXT BOOKS:**

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.

**REFERENCES:**

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.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO2:Problem Analysis	2.2	2.2.3
CO2	PO3:Design/development of Solutions	3.3	3.3.2
CO3	PO4:Conduct Investigations of Complex Problems	4.3	4.3.2
CO4	PO2:Problem Analysis	2.2	2.2.3

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<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19APE0502</b>	<b>DESIGN PATTERNS</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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:**

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

**UNIT-I**

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**

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**

Structural Patterns-1: Adapter, Bridge, Composite.

Structural Patterns-2: Decorator, Façade, Flyweight, Proxy, Discuss of Structural Patterns.

**UNIT-IV**

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

Behavioral Patterns-2: Mediator, Memento, Observer.

**UNIT-V**

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.

**TEXT BOOK :**

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.

<b>List of COs</b>	<b>PO no. and keyword</b>	<b>Competency Indicator</b>	<b>Performance Indicator</b>
CO1	PO1. Engineering knowledge	1.1	1.1.1
CO2	PO2. Problem Analysis	2.2	2.2.3
CO3	PO3. Design/development of solutions	3.3	3.3.1

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0503	COMPUTER GRAPHICS	3	0	0	3

**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:**

Upon completion of the course, the students should be able to:

- Explain the basic concepts used in computer graphics.
- Inspect various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.
- Assess the importance of viewing and projections.
- Define the fundamentals of animation, virtual reality and its related technologies.
- Analyze the typical graphics pipeline

**UNIT I**

**OVERVIEW OF COMPUTER GRAPHICS SYSTEM**

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

**UNIT II**

**OUTPUT PRIMITIVES AND ATTRIBUTES**

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:**

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

**UNIT IV**

**THREE DIMENSIONAL GRAPHICS AND VIEWING**

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**

Visible Surface Detection Methods – Computer Animation.

**TEXTBOOK**

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

**REFERENCES**

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.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1. Engineering knowledge	1.3	1.3.1
CO2	PO4. Conduct investigations of complex problems	4.1	4.1.1
CO3	PO4. Conduct investigations of complex problems	4.3	4.3.1
CO4	PO1. Engineering knowledge	1.3	1.3.1
CO5	PO2. Problem Analysis	2.1	2.1.1

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<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19AMC9904</b>	<b>Professional Ethics And Human Values</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>

**Course Outcomes:**

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

**UNIT - I:**

**12hrs**

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:**

**12hrs**

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:**

**12hrs**

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:**

**15hrs**

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:**

**12hrs**

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.

**Text Books:**

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 Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
3. Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard Michael J Rabins, 4e ,Cengage learning, 2015.
4. Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008.

<b>List of COs</b>	<b>PO no. and keyword</b>	<b>Competency Indicator</b>	<b>Performance Indicator</b>
CO1	PO8. Ethics	8.1	8.1.1
CO2	PO8. Ethics	8.1	8.1.1
CO3	PO8. Ethics	8.1	8.1.1
CO4	PO8. Ethics	8.1	8.1.1
CO5	PO8. Ethics	8.1	8.1.1

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0517	OPERATING SYSTEMS LABORATORY	0	0	3	1.5

**Course Objectives:**

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

**Course outcomes:**

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

List of Experiments to be implemented in C/Java

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.

**Reference Books:**

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

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



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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0522	ARTIFICIAL INTELLIGENCE LABORATORY	0	0	3	1.5

**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:**

Up on the completion of Course, The student will be able to

- Implement search algorithms
- Solve Artificial Intelligence Problems
- Design Chatbot
- Implement Text Classification

List of Experiments to be implemented in Java/Python

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.

**References:**

1	Tensorflow: <a href="https://www.tensorflow.org/">https://www.tensorflow.org/</a>
2	Pytorch: <a href="https://pytorch.org/">https://pytorch.org/</a> , <a href="https://github.com/pytorch">https://github.com/pytorch</a>
3	Theano: <a href="http://deeplearning.net/software/theano/">http://deeplearning.net/software/theano/</a> <a href="https://github.com/Theano/Theano">https://github.com/Theano/Theano</a>
4	<a href="https://www.nltk.org/">https://www.nltk.org/</a>

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO3. Design/development of solutions	3.2	3.2.1
CO2	PO4. Conduct investigations of complex problems	4.2	4.2.1
CO3	PO5. Modern tool usage	5.2	5.2.1
CO4	PO5. Modern tool usage	5.1	5.1.2

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0508	COMPILER DESIGN LAB	0	0	2	1

**Course Objectives:**

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

**Course Outcomes:**

- Develop compiler tools
- Design simple compiler

**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-dimensional 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 scoping 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> | <ifstatement> | <whilestatement>
| <block> | <printstatement> | <empty>
<assignment>::=<identifier>=<expression>
| <identifier>[<expression>]=<expression>
<if statement>::=if<bexpression>then<slist>else<slist>endif
|if<bexpression>then<slisi>endif
<whilestatement>::=while<bexpression>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

<b>List of COs</b>	<b>PO no. and keyword</b>	<b>Competency Indicator</b>	<b>Performance Indicator</b>
CO1	PO3. Design/development of solutions	3.2	3.2.1
CO2	PO3. Design/development of solutions	3.3	3.3.1

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**B.Tech III Year II Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0510	COMPUTER NETWORKS	3	0	0	3

**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:**

Student will be able to

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

**Unit I**

**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**

**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**

**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**

**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**

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

**Text Books:**

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.

**References:**

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.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1. Engineering knowledge	1.3	1.3.1
CO2	PO2. Problem Analysis	2.2	2.2.2
CO3	PO1. Engineering knowledge	1.3	1.3.1
CO4	PO1. Engineering knowledge	1.4	1.4.1
CO5	PO2. Problem Analysis	2.1	2.1.1

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<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19APC0516</b>	<b>GRID AND CLOUD COMPUTING</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives:**

- The student should be made to:
- Understand how Grid computing helps in solving large scale scientific problems.
- Gain knowledge on the concept of virtualization that is fundamental to cloud computing. Learn how to program the grid and the cloud.
- Understand the security issues in the grid and the cloud environment.

**Course Outcomes:**

The student should be able to

- Apply the security models in the grid and the cloud environment.
- Use the grid and cloud tool kits.
- Apply the concept of virtualization.
- Apply grid computing techniques to solve large scale scientific problems

**UNIT I**

**INTRODUCTION:** Evolution of Distributed computing: Scalable computing over the Internet – Technologies for network based systems – clusters of cooperative computers - Grid computing Infrastructures – cloud computing - service oriented architecture – Introduction to Grid Architecture and standards – Elements of Grid – Overview of Grid Architecture.

**UNIT II**

**GRID SERVICES:** Introduction to Open Grid Services Architecture (OGSA) – Motivation – Functionality Requirements – Practical & Detailed view of OGSA/OGSI – Data intensive grid service models – OGSA services.

**UNIT III**

**VIRTUALIZATION:** Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: Everything as a service: Infrastructure, platform, software - Pros and Cons of cloud computing – Implementation levels of virtualization – virtualization structure – virtualization of CPU, Memory and I/O devices – virtual clusters and Resource Management – Virtualization for data center automation.

**UNIT IV**

**PROGRAMMING MODEL:** Open source grid middleware packages – Globus Toolkit (GT4) Architecture , Configuration – Usage of Globus – Main components and 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, command line and java interface, dataflow of File read & File write.

**UNIT V**

**SECURITY:** Trust models for Grid security environment – Authentication and Authorization methods – Grid security infrastructure – Cloud Infrastructure security: network, host and application level – aspects of data security, provider data and its security, Identity and access management architecture, IAM practices in the cloud, SaaS, PaaS, IaaS availability in the cloud, Key privacy issues in the cloud.

**TEXT BOOK:**

1. Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, –Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet, First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.

**REFERENCES:**

1. Jason Venner, –Pro Hadoop- Build Scalable, Distributed Applications in the Cloud, A Press, 2009
2. Tom White, –Hadoop The Definitive Guide, First Edition. O'Reilly, 2009.
3. Bart Jacob (Editor), –Introduction to Grid Computing, IBM Red Books, Vervante, 2005
4. Ian Foster, Carl Kesselman, –The Grid: Blueprint for a New Computing Infrastructure, 2nd Edition, Morgan Kaufmann.
5. Frederic Magoules and Jie Pan, –Introduction to Grid Computing CRC Press, 2009.
6. Daniel Minoli, –A Networking Approach to Grid Computing, John Wiley Publication, 2005.
7. Barry Wilkinson, –Grid Computing: Techniques and Applications, Chapman and Hall, CRC, Taylor and Francis Group, 2010.

<b>List of COs</b>	<b>PO no. and keyword</b>	<b>Competency Indicator</b>	<b>Performance Indicator</b>
CO1	PO1. Engineering knowledge	1.4	1.4.1
CO2	PO5. Modern tool usage	5.1	5.1.1
CO3	PO6. The engineer and Society	6.1	6.1.1
CO4	PO4. Conduct investigations of complex problems	4.2	4.2.1

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0513	MACHINE LEARNING	3	0	0	3

**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**

- Ability to understand what is learning and why it is essential to the design of intelligent machines.
- Ability to design and implement various machine learning algorithms in a wide range of real-world applications.
- Acquire knowledge deep learning and be able to implement deep learning models for language, vision, speech, decision making, and more

**UNIT - I**

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 BACKPROPGRATION Algorithm, An illustrative Example: Face Recognition, Advanced Topics in Artificial Neural Networks.

**UNIT - II**

**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**

**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, Hierarchical clustering, Choosing the number of clusters, **Nonparametric Methods:** Introduction, Non Parametric density estimation, generalization to multivariate data, nonparametric classification, condensed nearest neighbor, Distance based classification, outlier detection, Nonparametric regression: smoothing models, how to choose the smoothing parameter

**UNIT- IV**

**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**

**Kernel Machines:** Introduction, Optimal separating hyperplane, the non separable case: Soft Margin Hyperplane, v-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.

**TEXT BOOKS:**

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

**REFERENCES:**

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

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO2. Problem Analysis	2.4	2.4.2
CO2	PO6. The engineer and Society	6.1	6.1.1
CO3	PO1. Engineering knowledge	1.3	1.3.1

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<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19APC0523</b>	<b>WEB PROGRAMMING</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives:**

- To introduce client side scripting with JavaScript and DHTML
- To introduce server side programming with Java Servlets, JSP and PHP.
- To learn the basic web concepts and Internet protocols

**Course Outcomes:**

- Demonstrate knowledge on web page design elements, dynamic content and database Interaction,
- Demonstrate understanding of what is XML and how to parse and use XML data.
- Use HTML, CSS, JavaScript, JQuery, Bootstrap and PHP technologies for web application development
- Design client-server applications using web technologies.
- Able to do server side programming with Java Servlets, JSP and PHP.

**UNIT I**

Introduction : Fundamentals of HTML, Working with text, Organizing text in HTML, Working with links and URLs, Creating tables, Working with images, Canvas, Forms, Frames and Multimedia.

HTML5: Introduction, HTML5 Document Structure, Creating editable content, checking spelling mistakes, Exploring custom data attributes, Client-Side storage, Drag and drop feature, offline web application, Web communications, Cross-Document messaging and desktop notifications.

**UNIT II**

CSS: Introduction, CSS Selectors, Inserting CSS in an HTML document, Backgrounds, Fonts and Text Styles, Creating boxes, Displaying, Positioning and floating elements, Features of CSS3, Media Queries.

XML: Basic XML- Document Type Definition XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation, News Feed (RSS and ATOM).

**UNIT III**

Java Script: An introduction to JavaScript-JavaScript DOM Model-Date and Objects,- Regular Expressions- Exception Handling- Validation-Built-in objects-Event Handling- DHTML with JavaScript. Servlets: Java Servlet Architecture - Servlet Life Cycle- Form GET and POST actions- Session Handling- Understanding Cookies.

JSP Application Development: The Anatomy of a JSP Page, JSP Processing, JSP Application Design and JSP Environment, JSP Declarations, Directives, Expressions, Scripting Elements, implicit objects. Java Beans: Introduction to Beans, Deploying java Beans in a JSP page.

JQuery: Introduction, JQuery selectors, Events, Methods to access HTML elements and attributes, Introduction to AJAX

**UNIT IV**

Bootstrap: Getting started with Bootstrap, Creating responsive layouts using Bootstrap CSS – Basic HTML Structure for Bootstrap, Responsive classes, Rendering images, the grid system, Construing data entry forms.

Introduction to PHP : Variables and data types, Operators, Expressions and Statements, Strings, Arrays and Functions.

**UNIT V**

PHP Advanced Concepts: Using cookies, Using HTTP Headers, Using sessions, Authenticating Users, Using Environment and configuration variables, Working with date and time.

PHP with MySQL : Interacting with database, Prepared statement, Database Transactions.

**Text Books:**

1. Deitel and Deitel and Nieto, “Internet and World Wide Web - How to Program”, Prentice Hall, 5th Edition, 2011.
2. W.Jason Gilmore, Beginning PHP & MySql, APRESS, Fourth Edition, 2011.

**Reference Books**

1. Herbert Schildt, “Java-The Complete Reference”, Eighth Edition, Mc Graw Hill Professional, 2011.
2. Core Servlets AND Java Server Pages VOLUME 1: CORE TECHNOLOGIES By Marty Hall and Larry Brown Pearson
3. Snig Bahumik, Bootstrap Essentials, PACKT Publishing, 2015.
4. PHP 5 Recipes A problem Solution Approach Lee Babin, Nathan A Good, Frank M.Kromann and Jon Stephens.

<b>List of COs</b>	<b>PO no. and keyword</b>	<b>Competency Indicator</b>	<b>Performance Indicator</b>
CO1	PO1. Engineering knowledge	1.3	1.3.1
CO2	PO1. Engineering knowledge	1.3	1.3.1
CO3	PO3. Design/development of solutions	3.3	3.3.2
CO4	PO5. Modern tool usage	5.1	5.1.1
CO5	PO5. Modern tool usage	5.1	5.1.1

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0504	OBJECT-ORIENTED ANALYSIS AND DESIGN	3	0	0	3

**Course Objectives:**

This course is designed to:

- Understand the basic concepts of object-oriented techniques
- Build the Model of the software system using UML diagrams
- Elucidate design patterns as templates for good design
- Learn the object-oriented methodology in software design
- Explore testing techniques for object-oriented software

**Course outcomes:**

Upon completion of the course, the students should be able to:

- Analyze the problem from object oriented perspective
- Model complex systems using UML Diagrams
- Choose the suitable design patterns in software design
- Adapt Object-Oriented Design Principles
- Identify the challenges in testing object-oriented software

**Unit – 1: Basic concepts**

**Basic concepts:** objects, classes, abstract classes, data types, ADT, encapsulation and information hiding, inheritance, association, aggregation, composition, polymorphism, dynamic binding, object-oriented principles.

**Unit – 2: Modeling Using UML**

**UML Diagrams:** Use case diagrams, class diagrams, various relationships among classes: generalization, association, aggregation, composition, inheritance, dependency etc., object diagram, UML packages, activity diagram, state machine diagram, sequence diagram, communication diagram, interaction overview diagram, component diagram, deployment diagram, UML 2 diagrams.

**Unit – 3: Design Patterns**

Basic pattern concepts, Types of patterns, some common design patterns such as Expert, Creator, Façade, MVS, MVC, Publish-Subscribe, Observer, Proxy etc.

**Unit – 4: Designing using UML**

Overview of OOAD methodology, Use case model development, Domain modeling, Identification of entity objects, Brooch's object identification method, Interaction modeling, CRC cards, Applications of the analysis and design process, object-oriented design principles. OOD goodness criteria, CK Metrics, LK Metrics, MOOD Metrics, Code Refactoring

**Unit – 5 : Testing Object Oriented Software**

Challenges in testing object-oriented software, Implications of object-oriented Features in testing object-oriented software, Importance of grey-box testing of object-oriented software, Coverage analysis, State-based testing, Class testing, Fault-Based Testing, Scenario-Based Test Design, Integration Testing: Thread-based integration Strategies, Use-based integration Strategies, Cluster Testing, Validation Testing, System Testing, Testing tools.

**Text Book:**

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

**Reference Books:**

1. Rumbaugh and Blaha, Object-oriented Modeling and design with UML, Pearson, 2007
2. Bernd Bruegge and, Allen H. Dutoit, Object-Oriented Software Engineering Using UML, Patterns, and Java, Pearson, 2009

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO2. Problem Analysis	2.1	2.1.1
CO2	PO3. Design/development of solutions	3.1	3.1.1
CO3	PO3. Design/development of solutions	3.3	3.3.1
CO4	PO4. Conduct investigations of complex problems	4.1	4.1.1
CO5	PO4. Conduct investigations of complex problems	4.2	4.2.1



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<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19APE0505</b>	<b>CYBER SECURITY</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives:**

- Appraise the current structure of cyber security roles across the DoD enterprise, including the roles and responsibilities of the relevant organizations.
- Evaluate the trends and patterns that will determine the future state of cyber security

**Course Outcomes:**

- Analyze threats and risks within context of the cyber security architecture
- Appraise cyber security incidents to apply appropriate response
- Evaluate decision making outcomes of cyber security scenarios

**Unit-I**

Cyber crime: Mobile and Wireless devices-Trend mobility-authentication service security-Attacks on mobile phones-mobile phone security Implications for organizations- Organizational measurement for Handling mobile-Security policies and measures in mobile computing era. Cases.

**Unit-II**

Tools and methods used in cyber crime-Proxy servers and Anonymizers – Phishing Password cracking-Key loggers and Spy wares-Virus and worms-Trojan Horse and Backdoors-Steganography-SQL Injection-Buffer overflow-Attacks on wireless network. Cases.

**Unit-III**

Understanding computer forensic-Historical background of cyber forensic, Forensic analysis of e-mail-Digital forensic life cycle-Network forensic-Setting up a computer forensic Laboratory-Relevance of the OSI 7 Layer model to computer Forensic- Computer forensic from compliance perspectives. Cases.

**Unit-IV**

Forensic of Hand –Held Devices-Understanding cell phone working characteristics- Hand-Held devices and digital forensic- Toolkits for Hand-Held device-Forensic of i-pod and digital music devices-Techno legal Challenges with evidence from hand-held Devices. Cases.

**Unit-V**

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

**Text book:**

1. Nina Godbole & Sunit Belapure “Cyber Security”, Wiley India, 2012.

**REFERENCES:**

1. Harish Chander, “cyber laws & IT protection”, PHI learning pvt.ltd, 2012.
2. Dhiren R Patel, “Information security theory & practice”,PHI learning pvt ltd,2010.
3. MS.M.K.Geetha & Ms.Swapne Raman”Cyber Crimes and Fraud Management, ”MACMILLAN,2012. Pankaj Agarwal : Information Security & Cyber Laws (Acme Learning), Excel, 2013.
4. Vivek Sood, Cyber Law Simplified, TMH, 2012.

<b>List of COs</b>	<b>PO no. and keyword</b>	<b>Competency Indicator</b>	<b>Performance Indicator</b>
CO1	PO2. Problem Analysis	2.1	2.1.1
CO2	PO2. Problem Analysis	2.3	2.3.1
CO3	PO4. Conduct investigations of complex problems	4.3	4.3.4

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<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19APE0506</b>	<b>BIG DATA ANALYTICS</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives**

- Understand the basic concepts and importance of Big Data
- Familiarize with the installation of Hadoop and how to analyze the Big Data
- Understand the design concepts of HDFS
- Provide good insight for developing a MapReduce applications
- Understand Hadoop environment.
- Explore the concepts of Pig, Hive, Spark and HBase

**Course Outcomes:**

Upon completion of the course, the students should be able to:

- Explain the concepts and challenges of big data
- Determine why existing technologies are inadequate to analyze the large data.
- Outline the operations viz. Collect, manage, store, query, and analyze various forms of big data.
- Apply large-scale analytic tools to solve some of the open big data problems.
- Analyze the impact of big data for business decisions and strategies.
- Design different big data applications.

**UNIT-I**

**Introduction to Big Data:** What is Big Data? Why Big Data is Important? Meet Hadoop, Data, Data Storage and Analysis, Comparison with other systems, History of Apache Hadoop, Hadoop Ecosystem, VMWare Installation of Hadoop. Analyzing the Data with Hadoop, Scaling Out.

**UNIT- II**

**HDFS:** The Design of HDFS, HDFS Concepts, The Command-Line Interface, Hadoop Filesystems, The Java Interface, Data flow.

**MapReduce:** Developing a MapReduce application, The Configuration API, Setting up the Development Environment, Running Locally on Test Data, Running on a Cluster

**UNIT-III**

**How MapReduce Works:** Anatomy of a MapReduce, Job Run, Failures, Shuffle and Sort, TaskExecution.

**MapReduce Types and Formats:** MapReduce Types, Input formats, output formats.

**UNIT-IV**

**Hadoop Environment:** Setting up a Hadoop Cluster, Cluster specification, Cluster Setup and Installation, Hadoop Configuration, Security.

**Pig:** Installing and Running Pig, an Example, Comparison with Databases, Pig Latin, User-Defined Functions, Data Processing Operators.

**UNIT-V**

**Hive:** Installing Hive, Running Hive, Comparison with traditional Databases, HiveQL, Tables, Querying Data.

**Spark:** Installing Spark, Resilient Distributed Datasets, Shared Variables, Anatomy of a Spark Job Run.

**HBase:** HBasics, Installation, clients, Building an Online Query Application.

**Text Books:**

1. Tom White, "Hadoop: The Definitive Guide" Fourth Edition, O'reilly Media, 2015.
2. Big Data, Big Analytics: Emerging business intelligence and analytic trends for today's businesses, Michael Minnelli, Michelle Chambers, and Ambiga Dhiraj, Wiley Cio Series

**Reference Books:**

1. Glenn J. Myatt, Making Sense of Data , John Wiley & Sons, 2007
2. Michael Berthold, David J.Hand, Intelligent Data Analysis, Spingers, 2007.
3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, Understanding BigData : Analytics for Enterprise Class Hadoop and Streaming Data, McGraw Hill Publishing, 2012.
4. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets Cambridge University Press, 2012.

<b>List of COs</b>	<b>PO no. and keyword</b>	<b>Competency Indicator</b>	<b>Performance Indicator</b>
CO1	PO1. Engineering knowledge	1.3	1.3.1
CO2	PO2. Problem Analysis	2.2	2.2.2
CO3	PO1. Engineering knowledge	1.3	1.3.1

CO4	PO5. Modern tool usage	5.3	5.3.2
CO5	PO7. Environment and sustainability	7.1	7.1.1
CO6	PO3. Design/development of solutions	3.4	3.4.3

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI  
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<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19AHEMBO2</b>	<b>ENTREPRENEURSHIP DEVELOPMENT</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Outcomes:**

- Understand the concept of Entrepreneurship and challenges in the world of Competition.
- Apply the Knowledge in generating ideas for New Ventures and design business plan structure.
- Analyze various sources of finance and subsidies to entrepreneurs.
- Evaluate the role of central government and state government in promoting women Entrepreneurship.
- Study the role of incubations in fostering startups.

**UNIT-I : Introduction to Entrepreneurship**

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**

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**

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**

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**

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](http://login.cengage.com))
2. Nandan H, “ Fundamentals of Entrepreneurship”, PHI, 2013.

**Reference Books:**

1. Vasant Desai, “Small Scale Industries and Entrepreneurship”, HimalayaPublishing 2012.
2. Rajeev Roy “Entrepreneurship”, 2<sup>nd</sup> Edition, Oxford, 2012.
3. B.Janakiram and M.Rizwana|| “Entrepreneurship Development: Text &Cases”, Excel Books, 2011.
4. Stuart Read, Effectual “Entrepreneurship”, Routledge, 2013.

**Online Learning Resources:**

1. Entrepreneurship-Through-the-Lens-of-enture Capital
2. <http://www.onlinevideolecture.com/?course=mba-programs&subject=entrepreneurship>
3. [http://nptel.ac.in/courses/122106032/Pdf/7\\_4.pd](http://nptel.ac.in/courses/122106032/Pdf/7_4.pd)
4. <http://freevideolectures.com/Course/3514/Economics/-/Management-/- Entrepreneurship/50>

<b>List of Cos</b>	<b>PO no. and keyword</b>	<b>Competency Indicator</b>	<b>Performance Indicator</b>
CO1	PO1: Engineering Knowledge	1.2 1.3	1.2.1 1.3.1
CO2	PO3: Design/Development of Solutions	3.2	3.2.1 3.2.2
CO3	PO11: Project management and finance	11.2	11.2.1
CO4	PO6: The engineer and society	6.2	6.2.1
CO5	PO3: Design/Development of Solutions	3.3	3.2.2

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<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19APCO216</b>	<b>NEURAL NETWORKS AND FUZZY LOGIC</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Outcomes:**

1. Understand the basic architecture of artificial neural network terminologies and techniques.
2. Understand approaches and architectures of Artificial Intelligence.
3. Perform the training of neural networks using various learning rules.
4. Create different neural networks of various architectures both feed forward and feed backward.
5. Application of ANN to System Identification and Pattern recognition.

**UNIT – I ARTIFICIAL NEURAL NETWORKS**

Approaches to AI – Architectures of AI – Symbolic Reasoning System – Rule based Systems – Knowledge Representation – Expert Systems. Introduction and motivation: Neural Network, Human Brain, Structure of biological neuron, Memory, Comparison between Artificial and Biological Neural Networks – Basic Building Blocks of ANN – Artificial Neural Network Terminologies, Artificial Intelligence and Neural Networks.

**UNIT – II**

**Learning Process:** Layers, activation functions, learning methods: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning, Memory, Adaption, Back Propagation and Differentiation, Supervised Learning, unsupervised learning.

**UNIT – III NETWORKS**

Basic Building Blocks of ANN – Artificial Neural Network Terminologies – McCulloch Pitts Neuron Model – Learning Rules – ADALINE and MADALINE Models – Perceptron Networks – Back Propagation Neural Networks – Associative Memories - Self-Organization Map – Hopfield models – ART networks.

**UNIT – IV UNIT – IV FUZZYLOGIC**

Classical Sets – Fuzzy Sets – Fuzzy Properties and Operations – Fuzzy Logic System  
– Fuzzification – Defuzzification – Membership Functions – Fuzzy Rule base – Fuzzy Logic Controller Design.

**UNIT – V FUZZY LOGIC APPLICATIONS**

Fuzzy pattern recognition – Fuzzy control system – Aircraft landing control problem - Statistical process control- Fuzzy cognitive mapping – Probability measures – Possibility and necessity measures.

**TEXT BOOKS:**

1. S. N. Sivanandam, S. Sumathi and S. N. Deepa, “Introduction to Neural Networks using MATLAB”, McGraw Hill Edition, 2006.
2. Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, Third Edition, WILEY India Edition, 2012.

**REFERENCES:**

1. S. N. Sivanandam, S. Sumathi and S. N. Deepa, “Introduction to Fuzzy Logic using MATLAB”, Springer International Edition, 2013.
2. Laurene V. Fausett “Fundamentals of Neural Networks: Architectures, Algorithms and Applications” United States Edition.
3. Yung C. Shin and Chengying Xu, “Intelligent System – Modeling, Optimization & Control, CRC Press, 2009.

<b>List of COs</b>	<b>PO no. and keyword</b>	<b>Competency Indicator</b>	<b>Performance Indicator</b>
CO1	PO1. Engineering knowledge	1.3	1.3.1
CO2	PO1. Engineering knowledge	1.3	1.3.1
CO3	PO5. Modern tool usage	5.1	5.1.2
CO4	PO3. Design/development of solutions	3.3	3.3.1
CO5	PO6. The engineer and Society	6.1	6.1.1

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APE0413	CELLULAR AND MOBILE COMMUNICATIONS	3	0	0	3

**Course Outcomes:**

Upon completion of the course students will be able to

**CO1:** understand impairments due to multipath fading channel..

**CO2:** Understand the fundamental techniques to overcome the different fading effects.

**CO3:** To understand Co-channel and Non Co-channel interferences

**CO4:** Able to familiar with cell coverage for signal and traffic, diversity techniques and mobile antennas.

**CO5:** Understanding of frequency management, channel assignment and types of handoff

**UNIT I:**

**CELLULAR MOBILE RADIO SYSTEMS:** Introduction to Cellular Mobile system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, Hexagonal shaped cells, Analog and Digital Cellular systems.

**ELEMENTS OF CELLULAR RADIO SYSTEM DESIGN:** General description of the problem, concept of frequency channels, Co-channel Interference Reduction Factor, desired C/I from a normal case in a Omni directional Antenna system, Cell splitting, consideration of the components of cellular system.

**UNIT II:**

**INTERFERENCE:** Introduction to Co-channel interference, real time co-channel interference, Co-channel measurement, design of Antenna system, Antenna parameters and their effects, diversity receiver, non-co-channel interference-different types.

**UNIT III:**

**CELL COVERAGE FOR SIGNAL AND TRAFFIC:** Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long distance propagation antenna height gain, form of a point to point model.

**UNIT IV:**

**CELL SITE AND MOBILE ANTENNAS:** Sum and difference patterns and their synthesis, Omni directional antennas, directional antennas for interference reduction, space diversity antennas, umbrella pattern antennas, minimum separation of cell site antennas, high gain antennas.

**FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT:** Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells, non-fixed channel assignment.

**UNIT V:**

**HANDOFF:** Handoff, dropped calls and cell splitting, types of handoff, handoff invitation, delaying handoff, forced handoff, mobile assigned handoff. Intersystem handoff, cell splitting, micro cells, vehicle locating methods, dropped call rates and their evaluation.

**DIGITAL CELLULAR NETWORKS:** GSM architecture, GSM channels, multiplex access scheme, TDMA, CDMA.

**TEXT BOOKS:**

1. Mobile cellular telecommunications-W .C. Y. Lee, Tata Mc-Graw Hill, 2nd Edition, 2006.
2. Wireless communications-Theodore. S. Rapport, Pearson Education,2<sup>nd</sup> Edn., 2002.

**REFERENCES:**

1. Principles of Mobile Communications – Gordon L. Stuber, Springer International 2nd Edition, 2001.
2. Modern Wireless Communication –Simon Haykin Michael Moher, Persons Eduction, 2005.
3. Wireless Communication theory and Techniques, Asrar U.H .Sheikh ,Springer, 2004.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1. Engineering knowledge	1.3	1.3.1
CO2	PO2. Problem Analysis	2.2	2.2.2
CO3	PO2. Problem Analysis	2.2	2.2.2
CO4	PO1. Engineering knowledge	1.4	1.4.1
CO5	PO5. Modern tool usage	5.1	5.1.1

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<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19APC0525</b>	<b>COMPUTER NETWORKS LAB</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Course Outcomes:**

After the completion of the course the student can able to:

**CO1:** Deal with Error detection/ correction techniques

**CO2:** Learn about Data link layer protocols

**CO3:** Learn about network layer protocols

**CO4:** Able to get knowledge about simulator

**List of Experiments**

1. Implementation of Error Detection / Error Correction Techniques
2. Implementation of Stop and Wait Protocol and sliding window
3. Implementation and study of Goback-N and selective repeat protocols
4. Implementation of High Level Data Link Control
5. Write a socket Program for Echo/Ping/Talk commands.
6. To create scenario and study the performance of network with CSMA / CA protocol and compare with CSMA/CD protocols.
7. Implementation of Link state routing algorithm
8. Implement the data link layer framing methods such as character, character-stuffing and bitstuffing.
9. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP
10. 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.
11. Implement Dijkstra's algorithm to compute the shortest path through a network
12. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
13. Implement distance vector routing algorithm for obtaining routing tables at each node.
14. Write a program for congestion control using Leaky bucket algorithm.
15. 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

**Reference Books:**

1. Shivendra S.Panwar, Shiwen Mao, Jeong-dong Ryoo, and Yihan Li, –TCP/IP Essentials A Lab-Based Approach, Cambridge University Press, 2004.
2. Cisco Networking Academy, –CCNA1 and CCNA2 Companion Guidel, Cisco Networking Academy Program, 3<sup>rd</sup> edition, 2003.
3. Ns Manual, Available at: <https://www.isi.edu/nsnam/ns/ns-documentation.html>, 2011.
4. Elloitte Rusty Harold, –Java Network Programming, 3<sup>rd</sup> edition, O'REILLY, 2011.

<b>List of Cos</b>	<b>PO no. and keyword</b>	<b>Competency Indicator</b>	<b>Performance Indicator</b>
CO1	PO4. Conduct investigations of complex problems	4.1	4.1.1
CO2	PO 1: Engineering knowledge	1.3	1.3.1
CO3	PO 1: Engineering knowledge	1.3	1.3.1
CO4	PO 1: Engineering knowledge	1.3	1.3.1

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0518	GRID AND CLOUD COMPUTING LAB	0	0	2	1

**Course Objectives:**

The student should be made to:

- Be familiar with developing web services/Applications in grid framework.
- Be exposed to tool kits for grid and cloud environment.
- Learn to use Hadoop
- Learn to run virtual machines of different configuration.

**Course Outcomes:**

The student should be able to

- Design and Implement applications on the Cloud.
- Design and implement applications on the Grid.
- Use the grid and cloud tool kits.

**GRID COMPUTING PROGRAMS USING GRIDSIM**

1. Program to creates one Grid resource with three machines
2. Program to to create one or more Grid users. A Grid user contains one or more Gridlets
3. Program to shows how two GridSim entities interact with each other ; main( i.e. example3 class) creates Gridlets and sends them to the other GridSim entities, i.e. Test class
4. Program shows how a grid user submits its Gridlets or tasks to one grid resource entity
5. Program to show how a grid user submits its Gridlets or task to many grid resource entities
6. Program to show how to create one or more grid users and submits its Gridlets or task to many grid resource entities
7. Program to creates one Grid resource with three machines

**Grid computing programs using Use Globus Toolkit or equivalent:**

- Develop a new Web Service for Calculator.
- Develop new OGSA-compliant Web Service.
- Using Apache Axis develop a Grid Service.
- Develop applications using Java or C/C++ Grid APIs
- Develop secured applications using basic security mechanisms available in Globus Toolkit.
- Develop a Grid portal, where user can submit a job and get the result. Implement it with and without GRAM concept.

**CLOUD COMPUTING**

**Programs on SaaS**

1. Create a word document of your class time table and store locally and on the cloud with doc, and pdf format. ( use www.zoho.com and docs.google.com)
2. Create a spread sheet which contains employee salary information and calculate gross and total sal using the formula  
 $DA=10\% \text{ OF BASIC}$   
 $HRA=30\% \text{ OF BASIC}$   
 $PF=10\% \text{ OF BASIC IF BASIC} \leq 3000$   
 $12\% \text{ OF BASIC IF BASIC} > 3000$   
 $TAX=10\% \text{ OF BASIC IF BASIC} \leq 1500$   
 $=11\% \text{ OF BASIC IF BASIC} > 1500 \text{ AND BASIC} \leq 2500$   
 $=12\% \text{ OF BASIC IF BASIC} > 2500$   
 $NET\_SALARY=BASIC\_SALARY+DA+HRA-PF-TAX$
3. Prepare a ppt on cloud computing –introduction , models, services ,and architecture
4. Create your resume in a neat format using google and zoho cloud

**Programs on PaaS**

1. Write a Google app engine program to generate n even numbers and deploy it to google cloud
2. Google app engine program multiply two matrices
3. Google app engine program to validate user ; create a database login(username, password) in mysql and deploy to cloud
4. Write a Google app engine program to display nth largest no from the given list of numbers and deploy it into google cloud
5. Google app engine program to validate the user Use mysql to store user info and deploy on to the cloud
6. Implement Prog 1-5 using Microsoft Azure

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO3. Design/development of solutions	3.3	3.3.1
CO2	PO3. Design/development of solutions	3.3	3.3.1
CO3	PO5. Modern tool usage	5.1	5.1.1



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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19APC0524	WEB PROGRAMMING LAB	0	0	2	1

**Course Objectives:**

- To introduce client side scripting with JavaScript and DHTML
- To introduce server side programming with Java Servlets, JSP and PHP.
- To learn the basic web concepts, protocols and frameworks for web development.

**Course Outcomes:**

- Demonstrate knowledge on web page design elements, dynamic content and database Interaction,
- Demonstrate understanding of XML and how to parse and use XML data.
- Use HTML, CSS, JavaScript, JQuery, Bootstrap and PHP technologies for web application development
- Design client-server applications using web technologies.
- Able to do server side programming with Java Servlets, JSP and PHP.
- Able to do bootstrap programming on WebPages.

1. To create a simple student bio-data form using html5. It should contain the following name (text box), address (multiline text box), gender (radio button male, female), skill sets known (check boxes - c, c++, java, C# etc), extra-curricular activities (text box), nationality (combo box), submit and reset button.

2. To create an html page with different types of frames such as floating frame, navigation frame & mixed frame.

3. Design the webpage by applying the different styles using inline, external & internal style sheets.

4. 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).

5. Design a webpage with Header, unequal columns and footer and give background colors and images through external CSS.

6. Create and save an XML document at the server, which contains 10 users information. Write a program which takes User Id as input and returns the user details by taking the user information from the XML document.

7. Write an XML file which will display the Book information which includes the following:

- 1) Title of the book      2) Author Name      3) ISBN number      4) Publisher name 5) Edition      6) Price

Write a Document Type Definition (DTD) to validate the above XML file.

8. To write a JavaScript program to define a user defined function for sorting the values in an array. Use HTML5 for user interface.

9. Write a JSP Servlet program to implement the single text field calculator.

10. To create an html page to demonstrate exception handling in JavaScript, Create an html page named as –exception.html and do the following.

i. within the script tag write code to handle exception

a) Define a method RunTest() to get any string values (str) from the user and call the method Areletters(str).

b) In Areletters(str) method check whether str contain only alphabets (a-z, AZ), if not throw exception.

c) Define an exception method Input Exception (str) to handle the exception thrown by the above method.

11. Write a JSP Servlet program to demonstrate session handling using

- a) url rewriting    b) hidden form field    c) cookies    d) sessions

12. Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and, pwd4 respectively. Write a Servlet for doing the following.

a) Create a Cookie and add these four user id's and passwords to this Cookie.

b) Read the user id and passwords entered in the Login form (week1) and authenticate with the values (user id and passwords) available in the cookies.

If he is a valid user(i.e., user-name and password match) you should welcome him by name(user-name) else you should display “ You are not an authenticated user “

13. Design a program for embedding the bootstrap images in to a web pages in following ways

- a) Rounded Corners      b) Circle      c) Thumbnail

14. Design a program for displaying various alerts in bootstrap as following

- i) Success message ii) Danger message iii) Info message iv) Warning message.

15. Write a program in PHP for a simple email processing with attachment using forms

16. Design PHP codes for the following queries:

a) Find out area of a triangle, rectangle, hexagon.

b) Reverse a number, string & swap numbers.

c) Find out palindrome of a number & string.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1. Engineering knowledge	1.3	1.3.1
CO2	PO1. Engineering knowledge	1.4	1.4.1
CO3	PO3. Design/development of solutions	3.3	3.3.1
CO4	PO3. Design/development of solutions	3.3	3.3.2
CO5	PO5. Modern tool usage	5.1	5.1.1
CO6	PO5. Modern tool usage	5.1	5.1.1

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<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19AMC9902</b>	<b>Constitution Of India</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>

**Course Outcome:**

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. 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.
4. Discuss the Powers and functions of Governor, President, and Judiciary.
5. Discuss the functions of local administration bodies

**UNIT - I**

History of Making of the Indian Constitution - History Drafting Committee, (Composition & Working).

**UNIT - II**

Philosophy of the Indian Constitution - Preamble Salient Features

**UNIT - III**

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**

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**

Local Administration - District's Administration head: Role and Importance - Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation- Panchayati raj: Introduction, PRI: Zilla Panchayat - 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.

**Suggested books for reading:**

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.

<b>List of COs</b>	<b>PO no. and keyword</b>	<b>Competency Indicator</b>	<b>Performance Indicator</b>
CO1	PO6. The engineer and Society	6.2	6.2.1
CO2	PO6. The engineer and Society	6.2	6.2.1
CO3	PO6. The engineer and Society	6.2	6.2.1
CO4	PO6. The engineer and Society	6.2	6.2.1
CO5	PO6. The engineer and Society	6.2	6.1.1