ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)

(COMPUTER SCIENCE AND ENGINEERING- ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)
(Effective for the batches admitted in 2021-22)

Vision

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

Mission

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

Institutional Objectives

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

Core Values

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

Competencies and Performance Indicators (UG-CSE)

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation for the solution of complex engineering problems.	
Competency	**Indicators**
1.1 Demonstrate competence in mathematical modelling	1.1.1 Apply the knowledge of discrete structures, linear algebra, statistics and numerical techniques to solve problems
	1.1.2 Apply the concepts of probability, statistics and queuing theory in modeling of computer based system, data and network protocols.
1.2 Demonstrate competence in basic sciences	1.2.1 Apply laws of natural science to an engineering problem
1.3 Demonstrate competence in engineering fundamentals	1.3.1 Apply engineering fundamentals
1.4 Demonstrate competence in specialized engineering knowledge to the program	1.4.1 Apply theory and principles of computer science engineering to solve an engineering problem
PO 2: Problem analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	
Competency	**Indicators**
2.1 Demonstrate an ability to identify and formulate complex engineering problem	2.1.1 Evaluate problem statements and identifies objectives
	2.1.2 Identifies processes/modules/algorithms of a computer based system and parameters to solve a problem
	2.1.3 Identifies mathematical algorithmic knowledge that applies to a given problem
2.2 Demonstrate an ability to formulate a solution plan and methodology for an engineering problem	2.2.1 Reframe the computer based system into interconnected subsystems
	2.2.2 Identifies functionalities and computing resources.
	2.2.3 Identify existing solution/methods to solve the problem, including forming justified approximations and assumptions
	2.2.4 Compare and contrast alternative solution/methods to select the best methods
	2.2.5 Compare and contrast alternative solution processes to select the best process.
2.3 Demonstrate an ability to formulate and interpret a model	2.3.1 Able to apply computer engineering principles to formulate modules of a system with required applicability and performance.
	2.3.2 Identify design constraints for required performance criteria.
2.4 Demonstrate an ability to execute a solution process and analyze results	2.4.1 Applies engineering mathematics to implement the solution
	2.4.2 Analyze and interpret the results using contemporary tools.
	2.4.3 Identify the limitations of the solution and sources/causes.
	2.4.4 Arrive at conclusions with respect to the objectives.
PO 3: Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.	
Competency	**Indicators**
3.1 Demonstrate an ability to define a complex / open- ended problem in engineering terms	3.1.1 Able to define a precise problem statement with objectives and scope.
	3.1.2 Able to identify and document system requirements from stake holders.
	3.1.3 Ability to review state of the art literature to synthesize system requirements.
	3.1.4 Ability to choose appropriate quality attributes as defined by ISO/IEC/IEEE standard.

	3.1.5	Explore and synthesize system requirements from larger social and professional concerns.
	3.1.6	Ability to develop software requirement specifications (SRS).
3.2 Demonstrate an ability to generate a diverse set of alternative design solutions	3.2.1	Ability to explore design alternatives.
	3.2.2	Ability to produce a variety of potential design solutions suited to meet functional requirements.
	3.2.3	Identify suitable non functional requirements for evaluation of alternate design solutions.
3.3 Demonstrate an ability to select optimal design scheme for further development	3.3.1	Ability to perform systematic evaluation of the degree to which several design concepts meet the criteria.
	3.3.2	Consult with domain experts and stakeholders to select candidate engineering design solution for further development
3.4 Demonstrate an ability to advance an engineering design to defined end state	3.4.1	Ability to refine architecture design into a detailed design within the existing constraints.
	3.4.2	Ability to implement and integrate the modules.
	3.4.3	Ability to verify the functionalities and validate the design.
PO 4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.		
Competency	**Indicators**	
4.1Demonstrate an ability to conduct investigations of technical issues consistent with their level of knowledge and understanding	4.1.1	Define a problem for purposes of investigation, its scope and importance
	4.1.2	Ability to choose appropriate procedure/algorithm, data set and test cases.
	4.1.3	Ability to choose appropriate hardware/software tools to conduct the experiment
	4.1.4	Design and develop appropriate procedures/methodologies based on the study objectives
4.2 Demonstrate an ability to design experiments to solve open ended problems	4.2.1	Design and develop appropriate procedures/methodologies based on the study objectives
4.3 Demonstrate an ability to analyze data and reach a valid conclusion	4.3.1	Use appropriate procedures, tools and techniques to collect and analyze data
	4.3.2	Critically analyze data for trends and correlations, stating possible errors and limitations
	4.3.3	Represent data (in tabular and/or graphical forms) so as to facilitate analysis and explanation of the data, and drawing of conclusions
	4.3.4	Synthesize information and knowledge about the problem from the raw data to reach appropriate conclusions
PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.		
Competency	**Indicators**	
5.1 Demonstrate an ability to identify / create modern engineering tools, techniques and resources	5.1.1	Identify modern engineering tools, techniques and resources for engineering activities
	5.1.2	Create/adapt/modify/extend tools and techniques to solve engineering problems
5.2 Demonstrate an ability to select and apply discipline specific tools, techniques and resources	5.2.1	Identify the strengths and limitations of tools for (i) acquiring information, (ii) modeling and simulating, (iii) monitoring system performance, and (iv) creating engineering designs.
	5.2.2	Demonstrate proficiency in using discipline specific tools
5.3 Demonstrate an ability to evaluate the suitability and limitations of tools used to solve	5.3.1	Discuss limitations and validate tools, techniques and resources

an engineering problem	
	5.3.2 Verify the credibility of results from tool use with reference to the accuracy and limitations, and the assumptions inherent in their use
PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.	
Competency	**Indicators**
6.1 Demonstrate an ability to describe engineering roles in a broader context, e.g. pertaining to the environment, health, safety, legal and public welfare	6.1.1 Identify and describe various engineering roles; particularly as pertains to protection of the public and public interest at global, regional and local level
6.2 Demonstrate an understanding of professional engineering regulations, legislation and standards	6.2.1 Interpret legislation, regulations, codes, and standards relevant to your discipline and explain its contribution to the protection of the public
PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	
Competency	**Indicators**
7.1 Demonstrate an understanding of the impact of engineering and industrial practices on social, environmental and in economic contexts	7.1.1 Identify risks/impacts in the life-cycle of an engineering product or activity
	7.1.2 Understand the relationship between the technical, socio economic and environmental dimensions of sustainability
7.2 Demonstrate an ability to apply principles of sustainable design and development	7.2.1 Describe management techniques for sustainable development
	7.2.2 Apply principles of preventive engineering and sustainable development to an engineering activity or product relevant to the discipline
PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	
Competency	**Indicators**
8.1 Demonstrate an ability to recognize ethical dilemmas	8.1.1 Identify situations of unethical professional conduct and propose ethical alternatives
8.2 Demonstrate an ability to apply the Code of Ethics	8.2.1 Identify tenets of the ASME professional code of ethics
	8.2.2 Examine and apply moral & ethical principles to known case studies
PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	
Competency	**Indicators**
9.1 Demonstrate an ability to form a team and define a role for each member	9.1.1 Recognize a variety of working and learning preferences; appreciate the value of diversity on a team
	9.1.2 Implement the norms of practice (e.g. rules, roles, charters, agendas, etc.) of effective team work, to accomplish a goal.
9.2 Demonstrate effective individual and team operations-- communication, problem solving, conflict resolution and leadership skills	9.2.1 Demonstrate effective communication, problem solving, conflict resolution and leadership skills
	9.2.2 Treat other team members respectfully
9.3 Demonstrate success in a team based project	9.3.1 Present results as a team, with smooth integration of contributions from all individual efforts
PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions	
Competency	**Indicators**
10.1 Demonstrate an ability to comprehend technical literature and document project work	10.1.1 Read, understand and interpret technical and non- technical information
	10.1.2 Produce clear, well-constructed, and well-supported written engineering documents
	10.1.3 Create flow in a document or presentation - a logical progression of ideas so that the main point is clear
10.2 Demonstrate competence in listening, speaking, and presentation	10.2.1 Listen to and comprehend information, instructions, and viewpoints of others

	10.2.2	Deliver effective oral presentations to technical and non- technical audiences
10.3 Demonstrate the ability to integrate different modes of communication	10.3.1	Create engineering-standard figures, reports and drawings to complement writing and presentations
	10.3.2	Use a variety of media effectively to convey a message in a document or a presentation
PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.		
Competency	**Indicators**	
11.1 Demonstrate an ability to evaluate the economic and financial performance of an engineering activity	11.1.1	Analyze different forms of financial statements to evaluate the financial status of an engineering project
11.2 Demonstrate an ability to compare and contrast the costs/benefits of alternate proposals for an engineering activity	11.2.1	Analyze and select the most appropriate proposal based on economic and financial considerations.
11.3 Demonstrate an ability to plan/manage an engineering activity within time and budget constraints	11.3.1	Identify the tasks required to complete an engineering activity, and the resources required to complete the tasks.
	11.3.2	Use project management tools to schedule an engineering project so it is completed on time and on budget
PO 12: Life-long learning: Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.		
Competency	**Indicators**	
12.1 Demonstrate an ability to identify gaps in knowledge and a strategy to close these gaps	12.1.1	Describe the rationale for requirement for continuing professional development
	12.1.2	Identify deficiencies or gaps in knowledge and demonstrate an ability to source information to close this gap
12.2 Demonstrate an ability to identify changing trends in engineering knowledge and practice	12.2.1	Identify historic points of technological advance in engineering that required practitioners to seek education in order to stay current
	12.2.2	Recognize the need and be able to clearly explain why it is vitally important to keep current regarding new developments in your field
12.3 Demonstrate an ability to identify and access sources for new information	12.3.1	Source and comprehend technical literature and other credible sources of information
	12.3.2	Analyze sourced technical and popular information for feasibility, viability, sustainability, etc.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI (AUTONOMOUS)

B. Tech - CSE(Artificial Intelligence & Machine Learning)

(Effective for the batches admitted from 2021-22)

INDUCTION PROGRAM (3 weeks duration)
❖ Physical activity ❖ Creative Arts ❖ Universal Human Values ❖ Literary ❖ Proficiency Modules ❖ Lectures by Eminent People ❖ Visits to local Areas ❖ Familiarization to Dept./Branch &Innovations

Semester I (First year)

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P	C			
1	BS	20ABS9901	Algebra & Calculus	3	0	0	3	30	70	100
2	BS	20ABS9902	Applied Physics	3	0	0	3	30	70	100
3	HS	20AHS9901	Communicative English	3	0	0	3	30	70	100
4	ES	20AES0301	Engineering Graphics	1	0	4	3	30	70	100
5	ES	20AES3301	Problem Solving and Programming	3	0	0	3	30	70	100
6	HS	20AHS9902	Communicative English Lab	0	0	3	1.5	30	70	100
7	BS	20ABS9907	Applied Physics Lab	0	0	3	1.5	30	70	100
8	ES	20AES3302	Problem Solving and Programming Lab	0	0	3	1.5	30	70	100
			Total credits				**19.5**	**240**	**560**	**800**

Semester II (First year)

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P	C			
1	BS	20ABS9911	Probability and Statistics	3	0	0	3	30	70	100
2	BS	20ABS9921	Numerical Methods for Engineer	3	0	0	3	30	70	100
3	ES	20AES3303	Basics of Python Programming	3	0	0	3	30	70	100
4	ES	20AES3305	Data Structures	3	0	0	3	30	70	100
5	ES	20AES3307	Web Design	1	0	4	3	30	70	100
6	ES Lab	20AES3304	Basics Of Python Programming Lab	0	0	3	1.5	30	70	100
7	BS Lab	20ABS9918	Computational Lab	0	0	3	1.5	30	70	100
8	ES Lab	20AES3306	Data Structures Lab	0	0	3	1.5	30	70	100
9	MC	20AMC9903	Environmental Studies	2	0	0	0	30	0	30
			Total credits				**19.5**	**270**	**560**	**830**

Semester III (Second year)

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P	C			
1	BS	20ABS9914	Discrete Mathematical Structures	3	0	0	3	30	70	100
2	PC	20APC3301	Digital Electronics& Microprocessors	3	0	0	3	30	70	100
3	PC	20APC3302	Database Management Systems	3	0	0	3	30	70	100
4	PC	20APC3304	Object Oriented Programming through Java	3	0	0	3	30	70	100
5	PC	20APC3306	Computer Organization	3	0	0	3	30	70	100
6	PC Lab	20APC3303	Database Management Systems Lab	0	0	3	1.5	30	70	100
7	PC Lab	20APC3305	Object Oriented Programming through Java Lab	0	0	3	1.5	30	70	100
8	PC Lab	20APC3307	Computer Organization Lab	0	0	3	1.5	30	70	100
9	SOC	20ASC3301	Client Side Scripting	1	0	2	2	30	70	100
10	MC	20AMC9904	Professional Ethics and Human Values	2	0	0	0	30	0	30
			Total credits				**21.5**	**300**	**630**	**930**

Semester IV (Second year)

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P	C			
1	ES	20AES3008	Deterministic & Stochastic Statistical Methods	3	0	0	3	30	70	100
2	PC	20APC3308	Artificial Intelligence	3	0	0	3	30	70	100
3	PC	20APC3310	Data warehousing and Mining	3	0	0	3	30	70	100
4	PC	20APC3312	Operating Systems	3	0	0	3	30	70	100
5	HS	20AHSMB01	Managerial Economics and Financial Analysis	3	0	0	3	30	70	100
6	HS	20AHS9905	Universal Human Values	3	1	0	3	30	70	100
7	ES	20AES3309	Artificial Intelligence Lab	0	0	3	1.5	30	70	100
8	PC	20APC3311	Data warehousing and Mining Lab	0	0	3	1.5	30	70	100
9	PC	20APC3313	Operating Systems Lab	0	0	3	1.5	30	70	100
10	SOC	20ASC3302	Server Side Scripting	1	0	2	2	100	0	100
			Total credits				**24.5**	**370**	**630**	**1000**

Semester V (Third year)

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P	C			
1	PC	20APC3314	Design and Analysis of Algorithms	3	0	0	3	30	70	100
2	PC	20APC3315	Introduction to Machine Learning	3	0	0	3	30	70	100
3	PC	20APC3317	Computer Networks	3	0	0	3	30	70	100
4	OE	20AOE3301	Cloud Computing	2	0	2	3	30	70	100
		20AOE3302	Information Retrieval	2	0	2				
		20AOE3303	Parallel and Distributed Computing	2	0	2				
5	PE	20APE3301	Human Computer Interaction	3	0	0	3	30	70	100
		20APE3302	Data Privacy and Security	3	0	0				
		20APE3303	Game Programming	3	0	0				
6	PC	20APC3316	Introduction to Machine Learning Lab	0	0	3	1.5	30	70	100
7	PC	20APC3018	Computer Networks Lab	0	0	3	1.5	30	70	100
8	SOC	20ASC3303	Computer Science and Engineering Workshop Lab	1	0	2	2	100	0	100
9	MC	20AMC9902	Constitution of India	2	0	0	0	30	0	30
10	INTERNSHIP	20AIN3301	Internship	0	0	0	1.5	50	0	50
			Total credits				21.5	390	490	880

Semester VI (Third year)

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P	C			
1	PC	20APC3319	Big Data Architecture	3	1	0	3	30	70	100
2	PC	20APC3321	Cryptography and Network Security	3	0	0	3	30	70	100
3	PC	20APC3323	Natural Language Programming	3	0	0	3	30	70	100
4	PE	20APE3304	Computational Intelligence	3	0	0	3	30	70	100
		20APE3305	Industry 4.0	3	0	0				
		20APE3306	Advanced Databases	3	0	0				
5	OE	20AOE3304	Robotic Sensors, Vision And Hardware Implementation	2	0	2	3	30	70	100
		20APE0416	Wireless Sensor Networks	2	0	2				
		20APC0323	Operation Research	2	0	2				
6	PC	20APC3320	Big Data Architecture Lab	0	0	3	1.5	30	70	100
7	PC	20APC3322	Cryptography and Network Security Lab	0	0	3	1.5	30	70	100
8	PC	20APC3324	Natural Language Programming Lab	0	0	3	1.5	30	70	100
9	SOC	20ASC3304	Graphic Design Using Photoshop	1	0	2	2	100	0	100
10	MC	20AMC9901	Biology for Engineers	2	0	0	0	30	0	30
			Total credits				**21.5**	**370**	**560**	**930**

Semester VII (Fourth year)

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P	C			
1	PC	20APC3325	Information Security	3	0	0	3	30	70	100
2	PE	20APE3307	Deep Learning	3	0	0	3	30	70	100
		20APE3308	Business Process Management	3	0	0				
		20APE3309	Health Care Analytics	3	0	0				
3	PE	20APE3310	Block Chain	3	0	0	3	30	70	100
		20APE3311	Cloud Security and Privacy	3	0	0				
		20APE3312	Social Network Analysis	3	0	0				
4	PE	20APE3313	Cyber Security	3	0	0	3	30	70	100
		20APE3314	Virtual Reality	3	0	0				
		20APE3315	Quantum Computing	3	0	0				
5	OE	20APE0415	Speech Processing	2	0	2	3	30	70	100
		20AOE3004	Internet of Things	2	0	2				
		20AOEMB02	Knowledge Engineering	2	0	2				
6	OE	20AOE3305	Introduction to Watson AI	2	0	2	3	30	70	100
		20AOE3306	Data Science Tools	2	0	2				
		20AOE3307	Automation Anywhere - RPA	2	0	2				
7	SOC	19MBA0105	Statistical Computing And Data Analysis Using R Programming	1	0	2	2	100	0	100
8	INTERNSHIP	20AIN3302	Internship	0	0	0	3	100	0	100
			Total credits				**23**	**380**	**420**	**800**

Semester VIII (Fourth year)

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P	C			
1	MAJOR PROJECT	20APR3301	Project, Project work, seminar and internship in industry	0	0	0	12	60	140	200
			Total credits				**12**	**60**	**140**	**100**

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI
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Year: I **Semester: I** **Branch of Study: AI and ML**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20ABS9901	Algebra and Calculus	3	0	0	3

Course Objectives:

- This course will illuminate the students in the concepts of calculus and linear algebra.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes:

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

Unit I : Matrix Operations and Solving Systems of Linear Equations 12hrs

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 9hrs

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 10hrs

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-Orthoganality of Bessels functions.

Textbooks:

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

References:

1. Dr.T.K.VIyengar, B.Krishna Gandhi, S. Ranganathamamd M.V.S.S.N Prasad, Mathematics – 1, S.Chandpublications.
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, McGrawHillEducation.
4. N. Bali, M. Goyal, C.Watkins, Advanced Engineering Mathematics, Infinity SciencePress.

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI
(AUTONOMOUS)

Year: I **Semester: I** **Branch of Study: AI and ML**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20ABS9902	Applied Physics	3	0	0	3

Course Objectives:

- To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications.
- To explain the significant concepts of dielectric and magnetic materials this leads to potential applications in the emerging micro devices.
- To impart knowledge in basic concepts of electromagnetic waves and its propagation in optical fibers along with its Engineering applications.
- To identify the importance of semiconductors in the functioning of electronic devices.
- To teach the concepts related to superconductivity which lead to their fascinating applications.
- To familiarize the applications of nano materials relevant to engineering branches.

Course Outcomes

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

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'seffect-BCSTheory(Qualitative) - Josephson effect (AC&DC)-Types of Superconductors-Applications of superconductors.

Nanomaterials–Significance of nanoscale–: Physical, Mechanical, Magnetic, Optical properties of nanomaterials –Synthesis of nanomaterials:Top-down-Ball Milling, Bottom-up-Chemical vapour deposition–Characterization of nanomaterials : X-Ray Diffraction (XRD), Scanning Electron Microscope (SEM)-Applications of Nanomaterials.

Textbooks:

1. M. N. Avadhanulu, P. G. Kshirsagar&TVSArun Murthy" A Text book of Engineering Physics"-S. Chand Publications,11thEdition 2019.
2. Bhattacharya, D.K. & Poonam, T. "Engineering Physics" . Oxford University Press, 2015.
3. B.K.Pandey and S.Chaturvedi, Engineering Physics, Cengage Learning, 2012.

References:

1. K Thyagarajan "Engineering Physics",-McGraw Hill Publishing Company Ltd, 2016
2. Shatendra Sharma, Jyotsna Sharma, " Engineering Physics", Pearson Education,2018
3. Halliday, D., Resnick, R. & Walker, J. "Principles of Physics" . Wiley, 2015.
4. David J.Griffiths,"Introduction to Electrodynamics"-4/e, Pearson Education, 2014
5. T Pradeep, "A Text book of NanoScience and NanoTechnology"-Tata McGraw 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)

Year: I **Semester: I** **Branch of Study: AI and ML**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AHS9901	Communicative English	3	0	0	3

Course Objectives:

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

Course Outcomes:

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

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

Unit 1 : **10 Hours (4L+6P)**

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 un countable; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences.

Unit 2: **10 Hours (4L+6P)**

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: **10 Hours (4L+6P)**

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: **8 Hours (2L+6P)**
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: **8 Hours (2L+6P)**
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)
Suggested books:

Text Book:

- English all round: Communication Skills for Under graduation Learners Vol. I, Orient BlackSwanPublisers, 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: Description	Performance Indicator: Description
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, makes effective presentations, and gives and receives 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, makes 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, makes 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, makes effective presentations, and give and receive clear instructions.	10.2	10.2.1

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI (AUTONOMOUS)

Year: I **Semester: I** **Branch of Study: AI and ML**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AES0301	Engineering Graphics	1	0	4	3

Course Objectives:

- Instruct the utility of drafting & modeling packages in orthographic and isometric drawings.
- Train the usage of 2D and 3D modeling.
- Instruct graphical representation of machine components

Course outcomes:

- Draw various curves applied in engineering.
- Show projections of solids and sections graphically.
- Draw the development of surfaces of solids.
- Use computers as a drafting tool.
- Draw isometric and orthographic

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

UNIT II

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

UNIT III

Projections of Planes: Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line. Projections of regular plane surfaces.

Projections of Solids: Projections of regular solids inclined to one or both planes by rotational or auxiliary views method.

UNIT IV

Sections of solids: Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections.

Development of surfaces: Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts.

UNIT V

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

Additional Sources

YouTube: http-sewor,Carleton.cag,kardos/88403/drawings.html conic sections-online, red woods.edu

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI
(AUTONOMOUS)

Year: I **Semester: I** **Branch of Study: AI and ML**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AES3301	Problem Solving and Programming	3	0	0	3

Course Objectives:

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

Course Outcomes:

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

Unit 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, 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^{th} 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. PradipDey, and ManasGhosh, "Programming in C", 2018, Oxford UniversityPress.
2. PelinAksoy, and Laura Denardis, "Information Technology in Theory", 2017, Cengage Learning.
3. Byron Gottfried and Jitender Kumar Chhabra, "Programming with C", 4thEdition, 2019, McGraw Hill Education.

Reference Books:

1. RS Bichkar "Programming with C", 2012, UniversitiesPress.
2. R.G. Dromey, "How to Solve it by Computer". 2014,Pearson.
3. Brian W. Kernighan, and Dennis M. Ritchie, "The C Programming Language", 2ndEdition, Pearson 2015.

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

`ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI (AUTONOMOUS)

Year: I **Semester: I** **Branch of Study: AI and ML**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AHS9902	Communicative English Lab	0	0	3	1.5

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.

Unit 1

1. Phonetics for listening comprehension of various accents
2. Reading comprehension
3. Describing objects/places/persons

Unit 2

1. JAM
2. Small talks on general topics
3. Debates

Unit 3

1. Situational dialogues – Greeting and Introduction
2. Summarizing and Note making
3. Vocabulary Building

Unit4

1. Asking for Information and Giving Directions
2. Information Transfer
3. Non-verbal Communication – Dumb Charade

Unit 5

1. Oral Presentations
2. Précis Writing and Paraphrasing
3. 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: Description	Performance Indicator: Description
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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)

Year: I **Semester: I** **Branch of Study: AI and ML**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20ABS9907	Applied Physics Lab	0	0	3	1.5

Course Objectives:

- Understands the concepts of interference and diffraction and their applications.
- Understand the role of optical fiber parameters in communication.
- Recognize the importance of energy gap in the study of conductivity and hall effect in a semiconductor.
- Illustrates the magnetic and dielectric materials applications.
- Apply the principles of semiconductors in various electronic devices.

Course Outcomes

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

List of Experiments

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI (AUTONOMOUS)

Year: I **Semester: I** **Branch of Study: AI and ML**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AES3302	Problem Solving and Programming Lab	0	0	3	1.5

Course outcomes:

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

Laboratory Experiments #

1. Assemble and disassemble parts of a Computer
2. Design a C program which reverses the number
3. Design a C program which finds the second maximum number among the given list of numbers.
4. Construct a program which finds the kth smallest number among the given list of numbers.
5. Design an algorithm and implement using C language the following exchanges a ← b ← c ←d ← a
6. Develop a C Program which counts the number of positive and negative numbers separately and also compute the sum of them.
7. Implement the C program which computes the sum of the first n terms of the series Sum = 1 – 3 + 5 -7 +9
8. Design a C program which determines the numbers whose factorial values are between 5000 and32565.
9. Design an algorithm and implement using a C program which finds the sum of the infinite series $1 – x^2/2! + x^4/4! – x^6/6! + ...$
10. Design a C program to print the sequence of numbers in which each number is the sum of the three most recent predecessors. Assume first three numbers as 0, 1, and 1.
11. Implement a C program which converts a hexadecimal, octal and binary number to decimal number and vice versa.
12. Develop an algorithm which computes the all the factors between 1and100 for a given number and implement it using C.
13. Construct an algorithm which computes the sum of the factorials of numbers between m and n.
14. Design a C program which reverses the elements of the array.
15. Given a list of n numbers, Design an algorithm which prints the number of stars equivalent to the value of the number. The starts for each number should be printed horizontally.
16. Implement the sorting algorithms a. Insertion sort b. Exchange sort c. Selection sort d. Partitioning sort.
17. Illustrate the use of auto, static, register and external variables.
18. Design algorithm and implement the operations creation, insertion, deletion, traversing on a singly linked list.
19. Develop a C program which takes two numbers as command line arguments and finds all the common factors of those two numbers.
20. Design a C program which sorts the strings using array of pointers.
21. Design a C Program to solve Tower of Hanoi problem.

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

References:

1. B. Govindarajulu, "IBM PC and Clones Hardware Trouble shooting and Maintenance", Tata McGraw-Hill, 2nd edition,2002.

2. R.G. Dromey, “How to Solve it by Computer”. 2014,Pearson.

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI
(AUTONOMOUS)

Year: I **Semester: II** **Branch of Study: AI and ML**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20ABS9911	Probability and Statistics	3	0	0	3

Course Objectives:

- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various applications Engineering

Course Outcomes:

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

Unit 1: Descriptive statistics and methods for data science **10 hrs**

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 **8 hrs**

Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.

Unit 3: Probability distributions **8 hrs**

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

Unit 4: Estimation and Testing of hypothesis, large sample tests **8 hrs**

Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems

Unit 5: Small sample tests **8 hrs**

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

Textbooks:

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

Reference Books:

1. S.Chand ,Probability and Statistics, Dr.T.K.V.Iyengar, Dr.B.Krishna Gandhi, S.Ranganatham, Dr.M.V.S.S.N.Prasad
2. S. Ross, a First Course in Probability, Pearson Education India, 2002.

3. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968.

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI
(AUTONOMOUS)

Year: I **Semester: II** **Branch of Study: AI and ML**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20ABS9921	Numerical Methods for Engineer	3	0	0	3

Course Outcomes:

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

Unit - I

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, 2014
2. Introductory Methods of Numerical Analysis, S.S. Sastry, PHI publisher, 2012

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, McGraw Hill publishers.
4. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI
(AUTONOMOUS)

Year: I **Semester: II** **Branch of Study: AI and ML**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AES3303	Basics of Python Programming	3	0	0	3

Course Objectives:

- To learn the fundamentals of Python
- To elucidate problem-solving using a Python programming language
- To introduce a function-oriented programming paradigm through python
- To get training in the development of solutions using modular concepts
- To introduce the programming constructs of python

Course Outcomes:

Student should be able to

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

Unit – I

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, Theinit 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.

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. NageswaraRao, "Core Python Programming", 2nd edition, Dreamtech Press, 2019

List of COs	PO no and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Knowledge of Engineering fundamentals	1.4	1.4.1
CO2	PO 3: Development of Solutions	3.2	3.2.2
CO3	PO 3: Development of Solutions	3.2	3.2.2
CO4	PO 2: Problem analysis	2.1	2.1.2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI
(AUTONOMOUS)

Year: I **Semester: II** **Branch of Study: AI and ML**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AES3305	Data Structures	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 modeling of the given problem as a graph
- To elucidate the existing hashing techniques

Course Outcomes:

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

Unit 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: Linear Structure - 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: Non Linear Structure - 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: Non Linear Structure - 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. Reema Thareja, "Programming in C", Second Edition, Oxford University Press, 2016.
2. Ellis Horowitz and SartajSahni, "Fundamentals of Data Structures in C", 2nd Edition, Galgotia Book Source, Pvt. Ltd.,2004.
3. Alan L. Tharp, "File Organization and Processing", Wiley and Sons,1988.

Reference Books:

1. D. Samanta, "Classic Data Structures", 2ndEdition, Prentice-Hall of India, Pvt. Ltd., India, 2012.
2. Peter Bras, "Advanced Data Structures", Cambridge University Press, 2016
3. Richard F.Gilberg, BehrouzA. Forouzan, "Data Structures A Pseudo code Approach with C", Second

Edition, Cengage Learning 2005.

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)

Year: I **Semester: II** **Branch of Study: AI and ML**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AES3307	Web Design	1	0	4	3

Course Objectives:

- To introduce need and basics of a website
- To create a form using layouts including media
- To gain knowledge about the uniformity of web pages using CSS
- To align different media contents using CSS for a website
- To Demonstrate various concepts of HTML, CSS

Course Outcomes:

- Ability to create dynamic and interactive websites
- Gain knowledge of using layouts including media
- Demonstrate understanding of uniformity of web pages using CSS.
- Able to align different media contents using CSS for a website.
- Able to design rich client presentation using HTML, CSS.

Unit I :

Where Do I Start-What Does a Web Designer Do, What Languages Do I Need to Learn, What Do I Need to Buy, How the Web Works-The Internet Versus the Web, Serving Up Your Information, A Word About Browsers, Web Page Addresses (URLs), The Anatomy of a Web Page, Some Big Concepts You Need to Know-A Dizzying Multitude of Devices, Sticking with the Standards, Progressive Enhancement, Responsive Web Design, One Web for All (Accessibility), The Need for Speed (Site Performance)

HTML Markup for Structure: Creating a Simple Page-A Web Page, Launch a Text Editor, Step 1: Start with Content, Step 2: Give the Document Structure, Step 3: Identify Text Elements, Step 4: Add an Image, Step 5: Change the Look with a Style Sheet, When Good Pages Go Bad, Validating Your Documents. Marking Up Text-Paragraphs, Headings, Lists, More Content Elements, Organizing Page Content, The Inline Element Roundup, Generic Elements (div and span), Some Special Characters

Unit II :

HTML Markup for Structure: Adding Links-The href Attribute, Linking to Pages on the Web, Linking Within Your Own Site, Targeting a New Browser Window, Mail Links, Telephone Links. Adding Images-First, a Word on Image Formats, The img Element, A Window in a Window. Table Markup-How Tables Are Used, Minimal Table Structure, Spanning Cells, Table Accessibility, Wrapping Up Tables

HTML Markup for Structure: Forms-How Forms Work, The form Element, Variables and Content, The Great Form Control Roundup, Form Accessibility Features, Form Layout and Design. What's Up, HTML5-A Funny Thing Happened on the Way to XHTML 2, In the Markup Department, Meet the APIs,Video and Audio, Canvas

Unit III:

CSS for Presentation: Cascading Style Sheets Orientation-The Benefits of CSS, How Style Sheets Work, The Big Concepts, Moving Forward with CSS. Formatting Text-The Font Properties, Changing Text Color, A Few More Selector Types, Text Line Adjustments, Underlines and Other "Decorations", Changing Capitalization, Spaced Out, Text Shadow, Changing List Bullets and Numbers. Colors and Backgrounds-Specifying Color Values, Foreground Color, Background Color, Playing with Opacity, Introducing…Pseudo-class Selectors, Pseudo-element Selectors, Attribute Selectors, Background Images, The Shorthand background Property, Like a Rainbow (Gradients), External Style Sheets. Thinking Inside the Box-The Element Box, Specifying Box Dimensions, Padding, Borders, Margins, Assigning Display Roles, Adding Drop Shadows to Boxes

Unit IV:

CSS for Presentation: Floating and Positioning- Normal Flow, Floating, Positioning Basics, Relative Positioning, Absolute, Positioning, Fixed Positioning. Page Layout with CSS- Page Layout Strategies, page Layout Techniques, Multicolumn Layouts Using Floats, Positioned Layout, Top-to-Bottom Column Backgrounds. Transitions, Transforms, and Animation- Ease-y Does It (CSS Transitions), CSS Transforms, Keyframe Animation. CSS Techniques- A Clean Slate (CSS Reset), Image Replacement Techniques, CSS Sprites, Styling Forms, Styling Tables, Basic Responsive Web Design, Wrapping Up Style Sheets.

Unit V:

1. Design a page having suitable background colour and text colour with title "My First Web Page" using all the attributes of the Font tag.
2. Create a HTML document giving details of your [Name, Age], [Address, Phone] and [Register Number, Class] aligned in proper order using alignment attributes of Paragraph tag.
3. Write HTML code to design a page containing some text in a paragraph by giving suitable heading style.
4. Create a page to show different character formatting (B, I, U, SUB, SUP) tags.
   i. *viz :* $log_b m^p = p log_b m$
5. Write HTML code to create a Web Page that contains an Image at its centre.
6. Create a web page with an appropriate image towards the left hand side of the page, when user clicks on the image another web page should open.
7. Create web Pages using Anchor tag with its attributes for external links.
8. Create a web page for internal links; when the user clicks on different links on the web page it should go to the appropriate locations/sections in the same page.
9. Write a HTML code to create a web page with pink colour background and display moving message in red colour.
10. Create a web page, showing an ordered list of all second semester courses (Subjects).
11. Create a web page, showing an unordered list of names of all the Diploma Programmes (Branches) in your institution.
12. Create a HTML document containing a nested list showing a content page of any book.
13. Create the following table in HTML

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

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

i. FRAME-1	ii. FRAME-2

15. Create a web page which should generate following output:

<table>
<tr><td rowspan="2">i. FRAME-1</td><td>ii. FRAME-2</td></tr>
<tr><td>iii. FRAME-3</td></tr>
</table>

16. Create a table to show your class time table.
17. Use tables to provide layout to your HTML page describing your college infrastructure.
18. Use and tags to provide a layout to the above page instead of a table layout.
19. Use frames such that page is divided into 3 frames 20% on left to show contents of pages, 60% in center to show body of page, remaining on right to show remarks.
20. Embed Audio and Video into your HTML web page.
21. Create a webpage with HTML describing your department use paragraph and list tags.

22. Apply various colors to suitably distinguish key words , also apply font styling like italics, underline and two other fonts to words you find appropriate , also use header tags.
23. Create links on the words e.g. ―Wi-Fi and ―LAN‖ to link them to Wikipedia pages.
24. Insert an image and create a link such that clicking on image takes user to other page.
25. Change the background color of the page; At the bottom create a link to take user to the top of the page.
26. Develop static pages (using only HTML) of an online book store, the pages should resemble: www.amazon.com, the website should consist the following pages, home page, registration and user login, user profile page, books catalog, shopping cart, payment by credit card, order confirmation.
27. Create a web page using Embedded CSS and multimedia
28. Write an HTML page that contains a selection box with a list of 5 countries, when the user selects a country, its capital should be printed next to the list; Add CSS to customize the properties of the font of the capital (color, bold and font size).
29. Wap in html to design a Bio-Data.
30. Wap in html to create a webpage with four frames (Picture, table, list, and hyperlink).
31. Wap in html to show all character elements in html.
32. Wap in html to create a webpage to show the block level elements and text level elements.
33. Wap in html to create a webpage to show various confectionary items using ordered list and unordered list.
34. Wap in html to create a webpage to show different hobbies.
35. Wap in html to show India map.
36. Wap in html to create a web page using style sheet.
37. Wap in html to create a web page to show registration
38. Wap in html to show books in inventory in different tables by using rowspan and colspan.
39. Create a Web Page in HTML to show Admission form in OITM
40. A Web Page in HTML to show your resume using Appropriate Formatting Elements.
41. A Web Page in HTML to show all the Text, Color, Background and Font Elements
42. Write a Program to Create a Nested List.

Textbooks:

1. Jennifer Niederst Robbins, "Learning Web Design", OREILLY 4th Edition, 2012

References:

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

Web References:

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

List of COs	PO no. and keyword	Competency	Performance Indicator
CO1	PO3: Design/ Development of solutions	3.2	3.2.2
CO2	PO5: Modern tool usage	5.1	5.1.2
CO3	PO2: Problem analysis	2.4	2.4.2
CO4	PO2: Problem analysis	2.4	2.4.2
CO5	PO3: Design/ Development of solutions	3.2	3.2.2

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Year: I **Semester: II** **Branch of Study: AI and ML**

Subject Code	Subject Name	L	T	P	Credits
20AES3304	BASICS OF PYTHON PROGRAMMING LAB	0	0	3	1.5

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 <= 2r .n is the input and r is to be determined. Write a program which computes minimum value of r that satisfies the above.
9. Write a program that evaluates Ackermann function
10. The mathematician Srinivasa Ramanujan found an infinite series that can be used to generate a

numerical approximation of 1/ π :
Write a function called estimate_pi that uses this formula to compute and return an estimate of π.

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

It should use a while loop to compute terms of the summation until the last term is smaller than $1e^{-15}$ (which is Python notation for 10^{-15}). You can check the result by comparing it to math.pi.
11. Choose any five built-in string functions of C language. Implement them on your own in Python. You should not use string related Python built-in functions.
12. Given a text of characters, Write a program which counts number of vowels, consonants and special characters.
13. Given a word which is a string of characters. Given an integer say 'n', Rotate each character by 'n' positions and print it. Note that 'n' can be positive or negative.
14. Given rows of text, write it in the form of columns.
15. Given a page of text. Count the number of occurrences of each latter (Assume case insensitivity and don't consider special characters). Draw a histogram to represent the same
16. Write program which performs the following operations on list's. Don't use built-in functions
a) Updating elements of a list
b) Concatenation of list's
c) Check for member in the list
d) Insert into the list
e) Sum the elements of the list
f) Push and pop element of list
g) Sorting of list
h) Finding biggest and smallest elements in the list
i) Finding common elements in the list
17. Write a program to count the number of vowels in a word.
18. Write a program that reads a file, breaks each line into words, strips whitespace and punctuation from the words, and converts them to lowercase.
20. 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)

Lab Outcomes:
Student should be able to

- Design solutions to mathematical problems.
- Organize the data for solving the problem.

- Develop Python programs for numerical and text based problems.
- Select appropriate programming construct for solving the problem.
- Illustrate object oriented concepts.

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,
Available at http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
2. Paul Barry, "Head First Python a Brain Friendly Guide" 2nd Edition, O'Reilly, 2016
3. DainelY.Chen "Pandas for Everyone Python Data Analysis" Pearson Education, 2019

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI
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Year: I **Semester: II** **Branch of Study: AI and ML**

Subject Code	Subject Name	L	T	P	Credits
20ABS9918	Computational Lab	0	0	3	1.5

COURSE OUTCOMES

- To understand solving problems in linear algebra using MS-Excel's Tools.
- To analyse Central Tendency, Dispersion, Correlation and Regression analysis as basics of Statistics using Ms- Excel's Tools.
- To understand properties of probability distributions and to perform using Ms- Excel'sTools.
- Solving problems in Definite integrals numerically using Trapezoidal and Simpson's methods in Ms-Excel's Tools.
- To analyse Statistics to solve large samples and Small samples problems using Statistical Tools practicing in Ms- Excel'sTools.

CONCEPTS TO BE COVERED

LINEAR ALEBRA

1. Algebraic operations on matrices i.e Addition of Matrices and Subtraction of Matrices.
2. Practice of Multiplication of Matrices.
3. Find the transpose of a matrix and Determinant of a Matrix.
4. Find inverse of a given matrix.
5. Find the Rank of a given matrix using Row reduced Echelon form.

STATISTICS

6. Practice descriptive statistics like measures of central tendancy i.e Mean , Median , Mode dispersion with examples.
7. Calculate Mean deviation from the Mean of an Ungrouped Data.
8. Calculate Mean deviation from Mean of a Grouped Data with Discrete Frequency Distribution.
9. Calculate Mean deviation from Mean of a Grouped Data with Continuous Frequency Distribution .
10. Calculate mean deviation from the median of a Discrete frequency distribution.
11. Calculate Variance and Standard Deviation for ungrouped data
12. Calculate coefficient of correlation with some examples.
13. Calculate Rank correlation coefficient with some examples.
14. Calculate linear Regression lines using Data Analysis with some examples.
15. Calculate linear Regression line with slope and y-intercept using excel

NUMERICAL METHODS

16. Calculate the approximate area for given function using Trapezoidal method and Simpson's in Numerical Integration.
17. Calculate equation of Straight line by least squares method in excel.
18. Calculate equation of Parabola by least squares method in excel
19. Calculate equation of Exponential curve by least squares method in excel

PROBABILITY

20. Calculate F-Test two sample variance
21. Calculate Single mean in large samples using Z- Test
22. Calculate difference between two means large samples using Z – test.
23. Test Single mean in small samples using t- test.
24. Test difference between two means in small samples using t- test.
25. Solving problems on Chi- square test for testing goodness of fit.

References

1. Higher Engineering in Mathematics by Dr.B.S.Grewal of Khanna Publishers, 42nd Edition, 2017.
2. Engineering Mathematics-I by Dr.T.K.V.Iyengar,Dr.B.KRISHNA GANDHI of S.CHAND PUBLISHERS, Sixteenth Revised Edition 2020.
3. Probability and Statistics by Dr.T.K.V. IYENGAR ,DR.B.KRISHNA GANDHI of S.CHAND PUBLISHERS, 5th edition 2015.

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI
(AUTONOMOUS)

Year: I **Semester: II** **Branch of Study: AI and ML**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AES3306	Data Structures Lab	0	0	3	1.5

Course Objectives:

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

Course Outcomes:

- Select the data structure appropriate for solving the problem
- Implement searching and sorting algorithms
- Design new data types
- Illustrate the working of stack and queue
- Organize the data in the form of files

Laboratory Experiments

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.

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)

Year: I **Semester: II** **Branch of Study: AI and ML**

Subject Code	Subject Name	L	T	P	Credits
20AMC9903	Environmental Studies	2	0	0	0

Course Outcomes:

- Students get sufficient information that clarifies modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.
- Students realize the need to change their approach, so as to perceive our own environmental issues correctly, using practical approach based on observation and self-learning.
- Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.
- Interpretation of different types of environmental pollution problems and designing of new solid waste management techniques usage
- To get knowledge on various environmental acts and to engage all the students life - long learning of rain water harvesting

UNIT I

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

UNIT III

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, 2004.
2. Environmental Studies by Kaushik, New Age Publishers, 2018.
3. Environmental Studies by Sri Krishna Hitech publishing Pvt. Ltd, 2016.

Reference Books:

1. Environmental studies by R.Rajagopalan, Oxford University Press, 2015.
2. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications, 2005.
3. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited, 2013.
4. Environmental studies by A. Ravi Krishnan, G. Sujatha Sri Krishna Hitech publications, 2018.

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