

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI (AUTONOMOUS)

B.Tech-ARTIFICIAL INTELLIGENCE & MACHINE LEARNING (Effective for the batches admitted in 2021-22)

Vision

“To achieve excellence in the field of Artificial Intelligence and Machine Learning with professional competency”.

Mission

- To educate, train and develop highly qualified engineers capable of meeting the challenges of a rapidly growing artificial intelligence system and capable of handling other diverse issues in data science engineering.
- To educate students towards the design and development of intelligent products and services meeting global demands and standards
- Best utilize Industry Institute linkages to acquire professional competency.
- Create facilities of training and research in new thrust areas of computing thus promoting continuing education facilities.
- To enable the graduates to adapt to the rapidly changing technology with strong fundamentals

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.

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

**B. Tech - 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				
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 Lab	20AHS9902	Communicative English Lab	0	0	3	1.5	30	70	100
7	BS Lab	20ABS9907	Applied Physics Lab	0	0	3	1.5	30	70	100
8	ES Lab	20AES3302	Problem Solving and Programming Lab	0	0	3	1.5	30	70	100
Total credits							19.5	240	560	800

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

**B. Tech - Artificial Intelligence & Machine Learning
Semester II (First year)**

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P				
1	BS	20ABS9911	Probability and Statistics	3	0	0	3	30	70	100
2	BS	20ABS9921	Numerical Methods	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 -I	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	3	0	0	0	30	0	30
			Total credits				19.5	270	560	830

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

B. Tech - Artificial Intelligence & Machine Learning

Semester III (Second year)

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P				
1	BS	20ABS9914	Discrete Mathematical Structures	3	0	0	3	30	70	100
2	PC	20APC3301	Digital Electronics and 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 and Architecture	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 and Microprocessor Lab	0	0	3	1.5	30	70	100
9	SOC	20ASC3301	Client Side Scripting	1	0	2	2	100	0	100
10	MC	20AMC9902	Constitution of India	2	0	0	0	30	0	30
Total credits							21.5	370	560	930

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

B. Tech - Artificial Intelligence & Machine Learning

Semester IV (Second year)

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P				
1	PC	20APC3308	Software Engineering for AI	3	0	0	3	30	70	100
2	PC	20APC3309	Artificial Intelligence	3	0	0	3	30	70	100
3	PC	20APC3311	Data Warehousing and Mining	3	0	0	3	30	70	100
4	PC	20APC3313	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	2	1	0	3	30	70	100
7	PC Lab	20APC3310	Artificial Intelligence Lab	0	0	3	1.5	30	70	100
8	PC Lab	20APC3312	Data Warehousing and Mining Lab	0	0	3	1.5	30	70	100
9	PC Lab	20APC3314	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
<p>Community Service Project (Mandatory) for 6 weeks duration during summer vacation. (To visit the selected community to conduct survey (Socio-economic & domain survey) and conduct sensitization/awareness program/activities at the end of IV- semester before commencement of V-semester and complete immersion programme also during V-Semester and submit report in V - semester. Assessment will be done at the end of V-Semester)</p>										

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

B. Tech - Artificial Intelligence & Machine Learning

Semester V (Third year)

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P				
1	PC	20APC3315	Computer Networks & Cryptography	3	0	0	3	30	70	100
2	PC	20APC3316	Machine Learning	3	0	0	3	30	70	100
3	PC	20APC3317	Formal Languages And Automata Theory	3	0	0	3	30	70	100
4	OE - 1	20AOE9925	Deterministic and Stochastic Statistical Methods	3	0	0	3	30	70	100
		20AOE0303	Optimization Techniques	3	0	0				
		20AOE0552	Internet of Things	3	0	0				
5	PE - 1	20APE3301	Big Data Technologies	3	0	0	3	30	70	100
		20APE3302	Real Time Operating Systems	3	0	0				
		20APE3303	Distributed Computing	3	0	0				
		20APE3304	Ethics And Privacy In AI	3	0	0				
6	PC Lab	20APC3318	Computer Networks & Cryptography Lab	0	0	3	1.5	30	70	100
7	PC Lab	20APC3319	Machine Learning Lab	0	0	3	1.5	30	70	100
8	SC	20ASC3303	Conversational AI/ AI Chatbot	1	0	2	2	100	0	100
9	MC	20AMC9901	Biology for Engineers	3	0	0	0	30	0	30
10	CSP	20CSP3301	Evaluation of Community Service Project	0	0	0	1.5	100	0	100
Total credits							21.5	440	490	930

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

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

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

**B. Tech - Artificial Intelligence & Machine Learning
Semester VI (Third year)**

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P				
1	PC	20APC3320	Deep Learning Techniques	3	0	0	3	30	70	100
2	PC	20APC3321	Speech and Language Processing	3	0	0	3	30	70	100
3	PC	20APC3322	Big Data Analytics	3	0	0	3	30	70	100
4	PE - 2	20APE3304	Robotic Process Automation	3	0	0	3	30	70	100
		20APE3305	Automation of Model Building	3	0	0				
		20APE3306	Computer Vision	3	0	0				
5	PC Lab	20APC3323	Deep Learning Techniques Lab	0	0	3	1.5	30	70	100
6	PC Lab	20APC3324	Speech and Language Processing Lab	0	0	3	1.5	30	70	100
7	PC Lab	20APC3325	Big Data Analytics Lab	0	0	3	1.5	30	70	100
8	SC	20ASA0502	Soft Skills	1	0	2	2	100	0	100
9	MC	20AMC9904	Professional Ethics and Human Values	2	0	0	0	30	0	30
Total credits							21.5	340	490	830
Industrial/Research Internship (Mandatory) 2 Months during summer vacation										

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

B. Tech - Artificial Intelligence & Machine Learning

Semester VII (Fourth year)

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P				
1	PE - 3	20APE3308	Recommender Systems	3	0	0	3	30	70	100
		20APE3309	Intelligent Information Retrieval Systems	3	0	0				
		20APE3310	Knowledge Representation and Reasoning	3	0	0				
2	PE - 4	20APE3311	Optimization Techniques In AI	3	0	0	3	30	70	100
		20APE3312	AI for Image Analysis	3	0	0				
		20APE3313	Machine Learning for Unstructured data	3	0	0				
3	PE - 5 CBCC	20APE3314	Data Analytics	3	0	0	3	30	70	100
		20APE3315	Software Project Management							
		20APE3316	Linux Environment System							
4	PE-6	20APE3317	Information Retrieval Techniques	3	0	0	3	30	70	100
		20APE3318	Soft Computing	3	0	0				
		20APE3319	Principles of Data science	3	0	0				
5	OE - 2	20APE0415	Digital Image Processing	3	0	0	3	30	70	100
		20AOE3004	Embedded Systems	3	0	0				
		20AOE3601	Enabling Technologies for data science and analytics :IOT	3	0	0				
6	HE	20AOE0302	Management Science	3	0	0	3	30	70	100
		20AOE9901	English for Research Paper Writing	3	0	0				
		20AHSMB02	Entrepreneurship Development	3	0	0				
7	SC	20ASC3305	Exploratory Data Analysis with R	1	0	2	2	100	0	100
8	INTERNSHIP	20AIN3302	Evaluation of Industry Internship(III-II Summer Internship)	0	0	0	3	100	0	100
Total credits							23	380	420	800

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

B. Tech - Artificial Intelligence & Machine Learning

Semester VIII (Fourth year)

SI. No	Category	CourseCode	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P				
1	MOOCS	OE/PE		0	0	0	3	25	75	100
2	PR	20APR3001	Internship	0	0	0	3	100	-	100
3	PR	20APR3001	Project work	0	0	0	9	60	140	200
			Total credits				15	185	215	400

HONOURS IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

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

S.NO	SUB.CODE	COURSE NAME	WEEKS	CREDITS
1	20AHN3001	DESIGN AND IMPLEMENTATION OF HUMAN COMPUTER INTERFACES	12 Weeks	3 or 4
2	20AHN3002	SOCIAL NETWORKS	12 Weeks	3 or 4
3	20AHN3003	NO SQL DATABASES	12 Weeks	3 or 4
4	20AHN3004	ADVANCED IOT APPLICATIONS	12 Weeks	3 or 4
5	20AHN3005	INTRODUCTION TO INDUSTRY 4.0 AND INDUSTRIAL INTERNET OF THINGS	12 Weeks	3 or 4
6	20AHN3006	GETTING STARTED WITH COMPETITIVE PROGRAMMING	12 Weeks	3 or 4
7	20AHN3007	COMMUNICATION NETWORKS	12 Weeks	3 or 4
8	20AHN3008	COMPUTER NETWORKS AND INTERNET PROTOCOL	12 Weeks	3 or 4
9	20AHN3009	ALGORITHMIC GAME THEORY	12 Weeks	3 or 4
10	20AHN3010	SCALABLE DB.	12 Weeks	3 or 4
11	20AHN3011	APPLIED ACCELERATED ARTIFICIAL INTELLIGENCE.	12 Weeks	3 or 4
12	20AHN3012	AI: SEARCH METHODS FOR PROBLEM SOLVING.	12 Weeks	3 or 4
13	20AHN3013	ARTIFICIAL INTELLIGENCE; KNOWLEDGE REPRESENTATION AND REASONING	12 Weeks	3 or 4
14	20AHN3014	MULTI-CORE COMPUTER ARCHITECTURE-STORAGE	12 Weeks	3 or 4
15	20AHN3015	SOCIAL NETWORK ANALYSIS.	12 Weeks	3 or 4
		TOTAL		20

MINOR DEGREE IN ARTIFICIAL INTELLIGENCE AND DATA SCIENCE FOR ECE, EEE, CE & ME

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

S.NO	SUB.CODE	COURSE NAME	WEEKS	CREDITS
1	20AMN3001	OPERATING SYSTEMS	12 Weeks	3 or 4
2	20AMN3002	COMPUTER ORGANIZATION	12 Weeks	3 or 4
3	20AMN3003	COMPUTER NETWORKS	12 Weeks	3 or 4
4	20AMN3004	ARTIFICIAL INTELLIGENCE	12 Weeks	3 or 4
5	20AMN3005	DATA SCIENCE	12 Weeks	3 or 4
6	20AMN3006	PROGRAMMING IN MODERN C++	12 Weeks	3 or 4
7	20AMN3007	DATA ANALYTICS WITH PYTHON	12 Weeks	3 or 4
8	20AMN3008	SOFTWARE ENGINEERING	12 Weeks	3 or 4
9	20AMN3009	SOFTWARE PROJECT MANAGEMENT	12 Weeks	3 or 4
10	20AMN3010	INTRODUCTION TO DATABASE SYSTEMS	12 Weeks	3 or 4
11	20AMN3011	CLOUD COMPUTING	12 Weeks	3 or 4
12	20AMN3012	FOUNDATION OF CRYPTOGRAPHY	12 Weeks	3 or 4
13	20AMN3013	HARDWARE SECURITY	12 Weeks	3 or 4
14	20AMN3014	COMPUTER NETWORKS AND INTERNET PROTOCOL	12 Weeks	3 or 4
15	20AMN3015	COMMUNICATION NETWORKS	12 Weeks	3 or 4
16	20AMN3016	MINOR DISCIPLINE PROJECT IN AIDS (COMPULSORY)	-	5
		TOTAL		20

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

**B. Tech - CSE (Artificial Intelligence & Machine Learning)
(Effective for the batches admitted from 2021-22)
Semester I (First year)**

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

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

Year: I

Semester: I

Branch of Study: AI & ML

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

Course Outcomes:

CO1: Make use of matrix algebra techniques that is needed by engineers for practical application

CO2: Utilize mean value theorems to real life problems.

CO3: Interpret with functions of several variables which is useful in optimization.

CO4: Analyze 2-dimensional and 3- dimensional concepts in coordinate systems

CO5: utilize the concept of special functions.

Unit -1: Matrix Operations and Solving Systems of Linear Equations

12hrs

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

Unit -2: Quadratic Forms and Mean Value Theorems

9 hrs

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

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

Unit -3: 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 -4: 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 of plane regions enclosed by plane curves. Evaluation of triple integrals(Cartesian coordinates only).

Unit -5: 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- Orthogonality of Bessels functions.

Textbooks:

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

References:

1. Dr.T.K.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.

Mapping of course outcomes with program outcomes

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

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**(AUTONOMOUS)****Year: I****Semester: I****Branch of Study: AI & ML**

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

Course Outcomes**CO1:** Analyze the intensity variation of light due to interference, diffraction and polarization**CO2:** Analyze and apply the concepts of LASERs and optical fibers.**CO3:** Infer the properties of dielectric and magnetic materials.**CO4:** Apply the fundamentals of semiconductors for device applications**CO5:** Implement the behavior of superconductors in diverse fields & interpret the properties of nanomaterials for multiple applications.**Unit-1 : Optics****10Hrs**

Interference of light -principle of superposition-Conditions for sustained Interference-Interference in thin films (reflected light) - Newton's Rings -Determination of Wavelength. Diffraction-Fraunhofer diffraction- Single slit and double slit- Diffraction Grating. Polarization of Electromagnetic Waves: Description of Linear, Circular and Elliptical Polarization, Uniaxial and Biaxial Crystal, Double Refraction, Polarization by Double Refraction, Nicol Prism.

Unit-2: Lasers and Fiber Optics**10Hrs**

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

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

Unit-3: Dielectric and Magnetic Materials**8Hrs**

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-4: Semiconductors**8Hrs**

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-5: Superconductors and Nanomaterials**10Hrs**

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

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

Textbooks:

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

References:

1. K Thyagarajan "Engineering Physics",-Mc Graw Hill Publishing Company Ltd, 2016
2. Shatendra Sharma, Jyotsna Sharma, " Engineering Physics", Pearson Education,2018
3. David J.Griffiths,"Introduction to Electrodynamics"-4/e, Pearson Education, 2014
4. T Pradeep, "A Text book of NanoScience and NanoTechnology"-Tata Mc Graw Hill 2013.

Mapping of course outcomes with program outcomes

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

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

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

Year: I

Semester: I

Branch of Study: AI & ML

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

Course Outcomes:

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

Unit-1 :

Lesson: On the Conduct of Life: William Hazlitt

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.

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

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

Grammar and Vocabulary- I : Parts of Speech, Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and uncountable; singular and plural; basic sentence structures; simple question form – Wh questions; word order in sentences.

Vocabulary -2: Formal/academic words and phrases..

Unit-2:

Lesson: The Brook: Alfred Tennyson

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

Speaking: Discussion in pairs/small groups on specific topics followed by short structured talks.

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Writing: Paragraph writing (specific topics) using suitable cohesive devices;

Mechanics of writing – punctuation, capital letters.

Grammar & Vocabulary building-1: Cohesive devices – linkers, sign posts and transition signals; use of articles and zero article; prepositions.

Vocabulary building: 2 Idioms and Phrases, Homonyms, Homophones and Homographs.

Unit-3:

Lesson: The Death Trap: Saki

Listening: Listening for global comprehension and summarizing what is listened to.

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed Reading: Reading a text in detail by making basic inferences – recognizing and interpreting specific context clues; strategies to use text clues for comprehension.

Writing: Summarizing – identifying main idea/s and rephrasing what is read.

Grammar and Vocabulary building-II: Direct and indirect speech, reporting verbs for academic purposes.

Technical Writing-1: personal experiences, unforgettable incidents, travelogues. (Imaginative, Narrative and Descriptive)

Unit-4:

Lesson: Innovation: Muhammad Yunus

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) – asking for and giving information/directions

Reading: Studying the use of graphic elements in texts to convey information, reveal trends / patterns / relationships, communicate processes or display complicated data.

Writing: Letter Writing: Official Letters/Report writing, e-mail writing

Grammar and Vocabulary: Quantifying expressions – adjectives and adverbs; comparing and contrasting; Voice – Active & Passive Voice.

Vocabulary:2 : Jigsaw Puzzles, Vocabulary Activities through Web tools

Unit-5:

Lesson: Politics and the English Language: George Orwell

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.

Speaking: Formal oral presentations on topics from academic contexts – without the use of PPT slides.

Reading: Reading for comprehension.

Writing: Writing structured essays on specific topics using suitable claims and evidences.

Grammar and Vocabulary: Editing short texts –identifying and correcting common errors in grammar and usage.

Technical Writing-2: Narrative short story, News paper articles on science fiction.

Textbooks:

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

Reference Books

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

Online Learning Resources:

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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1										3				
CO2									3					
CO3										3				
CO4										3				
CO5										3				

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

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

Year: I

Semester: I

Branch of Study: AI & ML

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

Course Outcomes:

CO1: Draw various curves applied in engineering

CO2: Draw the projection of points and lines located in different quadrants

CO3: Draw the projection of planes and solids located in different quadrants.

CO4: Draw sectional views and develop surfaces of a given object

CO5: Draw orthographic projections and isometric projections

UNIT - 1:

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 - 2:

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

UNIT - 3:

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 - 4:

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 - 5:

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 Agarwal & C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO2
CO1	3													
CO2	3	1												
CO3	3											1		
CO4	3											2		
CO5	3				3							3		

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

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

Year: I	Semester: I	Branch of Study: AI & ML			
COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AES3301	Problem Solving and Programming	3	0	0	3

Course Outcomes:

CO1: Able to know interconnection of peripherals and connects of algorithms and flowcharts

CO2: Able to know problem solving aspects, design and analysis of algorithm

CO3: Able to know flow control, input output and implementation functions

CO4: Able to solve computational problems using functions, array and pointers

CO5: Able to organise real world heterogeneous data and apply searching , sorting techniques with exception handling

Unit-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, and the analysis of algorithms.

Fundamental algorithms: Exchanging the values of two variables, counting, summation of a set of numbers, factorial computation, sine function computation, generation of the Fibonacci sequence, reversing the digits of an integer.

Unit-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 kth smallest element

Unit-5:

Sorting and Searching: Sorting by selection, sorting by exchange, sorting by insertion, sorting by partitioning, binary search.

Structures: Basics of structures, structures and functions, arrays of structures, pointers to structures, self-referential structures, table lookup, typedef, unions, bit-fields.

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

Text Books:

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

Reference Books:

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

Online Learning Resources:

www.nptel.ac.in

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	2											3	
C02	3	3	2										2	
C03	2	3	3										2	
C04	2	1	3	2									2	
C05	2	1	3	3	2			2				3	2	2

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

AIATS TPT - AIML

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

Year: I

Semester: I

Branch of Study: AI & ML

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AHS9902	Communicative English Lab	0	0	2	1.5

Course Outcomes

- CO1:** Create Awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English
- CO2:** Understanding the different aspects of the language with emphasis on LSRW skills and make use of different strategies in discussion
- CO3:** Improve word knowledge and apply skills in various languages learning activities
- CO4:** Analyze speech sounds, stress ,rhythm, intonation and syllable division for better listening and speaking comprehension
- CO5:** Evaluate and exhibit acceptable etiquette essential in social and professional presentations.

Unit-1:

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

Unit-2:

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

Unit-3:

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

Unit-4:

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

Unit-5:

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

Software Source:

K-Van Solutions Software

Reference:

Teaching English - British Council

Mapping of course outcomes with program outcomes

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

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI

(AUTONOMOUS)

Year: I

Semester: I

Branch of Study: AI & ML

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

Course Outcomes

CO1: Analyze the wave properties of light and the interaction of energy with the matter.

CO2: Apply electromagnetic wave propagation in different guided media.

CO3: Assess the electromagnetic wave propagation and its power in different media

CO4: Analyze the conductivity of semiconductors.

CO5: Interpret the dielectric and magnetic properties of materials and apply the nanomaterials for engineering applications.

List of Experiments

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

References:

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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO2
CO1				3										
CO2				3										
CO3				3										
CO4				3										
CO5				3										

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

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

Year: I	Semester: I	Branch of Study: AI & ML			
COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AES3302	Problem Solving and Programming Lab	0	0	3	1.5

Course Outcomes (CO):

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

Laboratory Experiments #

1. Assemble and disassemble parts of a Computer
 2. Design a C program which reverses the number
 3. Design a C program which finds the second maximum number among the given list of numbers.
 4. Construct a program which finds the kth smallest number among the given list of numbers.
 5. Design an algorithm and implement using C language the following exchanges $a \leftarrow b \leftarrow c \leftarrow d \leftarrow a$
 6. Develop a C Program which counts the number of positive and negative numbers separately and also compute the sum of them.
 7. Implement the C program which computes the sum of the first n terms of the series $\text{Sum} = 1 - 3 + 5 - 7 + 9$
 8. Design a C program which determines the numbers whose factorial values are between 5000 and 32565.
 9. Design an algorithm and implement using a C program which finds the sum of the infinite series $1 - x^2/2! + x^4/4! - x^6/6! + \dots$
 10. Design a C program to print the sequence of numbers in which each number is the sum of the three most recent predecessors. Assume first three numbers as 0, 1, and 1.
 11. Implement a C program which converts a hexadecimal, octal and binary number to decimal number and vice versa.
 12. Develop an algorithm which computes the all the factors between 1 and 100 for a given number and implement it using C.
 13. Construct an algorithm which computes the sum of the factorials of numbers between m and n.
 14. Design a C program which reverses the elements of the array.
 15. Given a list of n numbers, Design an algorithm which prints the number of stars equivalent to the value of the number. The stars for each number should be printed horizontally.
 16. Implement the sorting algorithms a. Insertion sort b. Exchange sort c. Selection sort d. Partitioning sort.
 17. Illustrate the use of auto, static, register and external variables.
 18. Design algorithm and implement the operations creation, insertion, deletion, traversing on a singly linked list.
 19. Develop a C program which takes two numbers as command line arguments and finds all the common factors of those two numbers.
 20. Design a C program which sorts the strings using array of pointers.
- Instructors may add some experiments to the above list. Moreover, 50% of the experiments are to be changed every academic year. Instructors can choose the experiments, provided those experiments are not repetitions.

Textbooks:

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

Reference Books:

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

Online Learning Resources:

www.nptel.ac.in/cprogramming

Mapping of course outcomes with program outcomes

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

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

AIATS TPT - AIML

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

**B. Tech - Artificial Intelligence & Machine Learning
Semester II (First year)**

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P				
1	BS	20ABS9911	Probability and Statistics	3	0	0	3	30	70	100
2	BS	20ABS9921	Numerical Methods	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	Computation Lab-I	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	3	0	0	0	30	0	30
			Total credits				19.5	270	560	830

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI

(AUTONOMOUS)

Year: I	Semester: II	Branch of Study: AI & ML			
COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20ABS9911	Probability and Statistics	3	0	0	3

Course Outcomes:

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

Unit-1:

10 Hrs

Descriptive statistics and methods for data science

Data science, Statistics Introduction, Population vs Sample, Collection of data, primary and secondary data, Type of variable: dependent and independent Categorical and Continuous variables, Data visualization, Measures of Central tendency, Measures of Variability (spread or variance) Skewness Kurtosis, correlation, correlation coefficient, rank correlation, regression coefficients, principle of least squares, method of least squares, regression lines

UNIT-2:

8 hrs

Probability

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

UNIT-3:

8 hrs

Probability distributions

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

Unit-4:

8 hrs

Estimation and Testing of hypothesis, large sample tests

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

Unit-5:

8 hrs

Small sample tests

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

Textbooks:

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

Reference Books:

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

Mapping of course outcomes with program outcomes

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

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

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

Year: I

Semester: II

Branch of Study: AI & ML

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

Course Outcomes:

- CO1:** Make use of the concepts of errors , relative and percentage errors
- CO2:** Solve the concepts of Algebraic & Transcendental Equations to solve different Engineering problems
- CO3:** Examine interpolation concepts in solving numerical methods
- CO4:** Infer the concepts of integration in numerical methods
- CO5:** Analyze the concepts of O.D.E on Numerical Methods

Unit – I

8hrs

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

10hrs

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

9hrs

Interpolation: Finite differences: forward backward, central differences the relation between finite differences. Finding the interpolating polynomial using Newton’s forward and backward interpolation formulae – Lagrange’s formulae. Gauss forward and backward formula, Stirling’s formula, Bessel’s formula.

UNIT – IV

9hrs

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

9hrs

Numerical solution of Ordinary Differential equations: Solution by Taylor’s series-Picard’s Method of successive Approximations-Euler’s Method- Runge - Kutta Methods. Numerical solutions of Laplace equation using finite difference approximation.

TEXT BOOKS:

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

REFERENCES:

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

Mapping of course outcomes with program outcomes

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

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

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

Year: I	Semester: II	Branch of Study: AI & 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 (CO):

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

Unit-1:

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-2:

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-3:

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, Mapfilter and reduce, Deleting elements, Lists and Strings, Objects and values, Aliasing, List arguments.

Unit-4:

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-5:

Classes and Functions: Time, Pure functions, Modifiers, Prototyping versus Planning

Classes and Methods: Object oriented features, Printing objects, The init method, The __str__ method, Operator overloading, Type-based Dispatch, Polymorphism, Interface and Implementation

Inheritance: Card objects, Class attributes, Comparing cards, decks, Printing the Deck, Add Remove shuffle and sort, Inheritance, Class diagrams, Data encapsulation.

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

Text books:

1. Allen B. Downey, -Think Python II, 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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3		2		2									
C02	2			2									2	1
C03	2	2	2	2									2	1
C04	2		3		2								2	1
C05	2	2	3		3				2				2	1

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

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

Year: I	Semester: II	Branch of Study: AI & 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 (CO):

CO1: Analyze and evaluate the efficiency of an algorithm

CO2: Implement linear data structures

CO3: implement non -linear data structures

CO4: Solve the problem of efficiently using graphs and Hashing techniques

CO5: Implement advanced sorting and organizing the file

Unit-1:

Introduction

Algorithm Specification, Performance analysis, Performance Measurement. Arrays: Arrays, Dynamically Allocated Arrays. Structures and Unions. Sorting: Motivation, Quick sort, how fast can we sort, Merge sort, Heap sort

Unit-2:

Stack, Queue and Linked lists

Stacks, Stacks using Dynamic Arrays, Queues, Circular Queues Using Dynamic Arrays, Evaluation of Expressions, Multiple Stacks and Queues. Linked lists: Singly Linked Lists and Chains, Representing Chains in C, Linked Stacks and Queues, Additional List Operations, Doubly Linked Lists.

Unit-3:

Trees

Introduction, Binary Trees, Binary Tree Traversals, Additional Binary Tree Operations, Binary Search Trees, Counting Binary Trees, Optimal Binary search Trees, AVL Trees. B-Trees: B- Trees, B + Trees.

Unit-4 :

Graphs and Hashing

The Graph Abstract Data Type, Elementary Graph Operations, Minimum Cost Spanning Trees, Shortest Paths and Transitive Closure

Hashing: Introduction to Hash Table, Static Hashing, Dynamic Hashing.

Unit-5:

Files and Advanced sorting

File Organization: Sequential File Organization, Direct File Organization, Indexed Sequential File Organization.

Advanced sorting: Sorting on Several keys, List and Table sorts, Summary of Internal sorting, External sorting.

Text Books:

1. Ellis Horowitz and SartajSahni, –Fundamentals of Data Structures in C, 2nd Edition, GalgotiaBook Source, Pvt. Ltd.,2004.
2. 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.

Mapping of course outcomes with program outcomes

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

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

AIITS TPT - AIML

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)

Year: I

Semester: II

Branch of Study: AI & ML

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

Course Outcomes:

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

Unit -1:

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 -2:

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-3:

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-4:

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-5:

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 : $\log_{b^m} = p \log_b m$
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

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

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

i. FRAME-1	ii. FRAME-2
-------------------	--------------------

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

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

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

Textbooks:

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

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.

Online Learning Resources:

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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3		2						1				2	2
C02	3		2						1				2	2
C03	3		2						1				2	2
C04	3		2						1				2	2
C05	3		3						1				2	2

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

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

Year: I	Semester: II	Branch of Study: AI & ML			
COURSE CODE	COURSE TITLE	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.

Course Outcomes (CO):

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

List of Experiments:

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

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

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

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

Up to 15 hashes at the bottom

4. Using turtles concept draw a wheel of your choice
5. Write a program that draws Archimedean Spiral
6. The letters of the alphabet can be constructed from a moderate number of basic elements, like vertical and horizontal lines and a few curves. Design an alphabet that can be drawn with a minimal number of basic elements and then write functions that draw the letters. The alphabet can belong to any Natural language excluding English. You should consider at least Ten letters of the alphabet.
7. The time module provides a function, also named time that returns the current Greenwich Mean Time in “the epoch”, which is an arbitrary time used as a reference point. On UNIX systems, the epoch is 1 January 1970.

```
>>> import time
>>> time.time()
1437746094.5735958
```

Write a script that reads the current time and converts it to a time of day in hours, minutes, and seconds, plus the number of days since the epoch.

8. Given $n+r+1 \leq 2r$. n is the input and r is to be determined. Write a program which computes minimum value of r that satisfies the above.
9. Write a program that evaluates Ackermann function
10. The mathematician Srinivasa Ramanujan found an infinite series that can be used to generate a numerical approximation of $1/\pi$:

Write a function called estimate_pi that uses this formula to compute and return an estimate of 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`.
- 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.
 - Given a text of characters, Write a program which counts number of vowels, consonants and special characters.
 - 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.
 - Given rows of text, write it in the form of columns.
 - Given a page of text. Count the number of occurrences of each letter (Assume case insensitivity and don't consider special characters). Draw a histogram to represent the same
 - Write program which performs the following operations on list's. Don't use built-in functions
 - Updating elements of a list
 - Concatenation of list's
 - Check for member in the list
 - Insert into the list
 - Sum the elements of the list
 - Push and pop element of list
 - Sorting of list
 - Finding biggest and smallest elements in the list
 - Finding common elements in the list
 - Write a program to count the number of vowels in a word.
 - Write a program that reads a file, breaks each line into words, strips whitespace and punctuation from the words, and converts them to lowercase.
 - 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.
 - 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.
 - 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.
 - Consider turtle object. Write functions to draw triangle, rectangle, polygon, circle and sphere. Use object oriented approach.
 - Write a program illustrating the object oriented features supported by Python.
 - 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.
 - Design a Python script to determine the difference in date for given two dates in YYYY:MM:DD format($0 \leq YYYY \leq 9999$, $1 \leq MM \leq 12$, $1 \leq DD \leq 31$) following the leap year rules.
 - Design a Python Script to determine the time difference between two given times in HH:MM:SS format. ($0 \leq HH \leq 23$, $0 \leq MM \leq 59$, $0 \leq SS \leq 59$).

Reference Books:

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

Mapping of course outcomes with program outcomes

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

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

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

Year: I	Semester: II	Branch of Study: AI & ML			
COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20ABS9918	Computation Lab-I	0	0	3	1.5

COURSE OUTCOMES:

- CO1:** Determine problems in linear algebra using MS-Excel's Tools
- CO2:** Apply Central Tendency, Dispersion, Correlation and Regression analysis as basics of Statistics using Ms- Excel's Tools.
- CO3:** Utilize properties of probability distributions and to perform using Ms- Excel's Tools.
- CO4:** Solving problems in Definite integrals numerically using Trapezoidal and Simpson's methods in Ms- Excel's Tools.
- CO5:** Analyse Statistics to solve large samples and Small samples problems using Statistical Tools practicing in Ms- Excel's Tools.

List of Experiments:

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 tendency 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, Dr. B.S. Grewal of Khanna Publishers, 42nd Edition .
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. Dr. T.K.V. Iyengar , Dr. B. KRISHNA GANDHI of S. CHAND PUBLISHERS 5th edition 2015

Mapping of course outcomes with program outcomes

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

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

AIITS TPT - AIML

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

Year: I

Semester: II

Branch of Study: AI & ML

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

Course Outcomes:

CO1: Select the data structure appropriate for solving the problem

CO2: Implement searching and sorting algorithms

CO3: Derive new data types

CO4: Illustrate the working of linear and non linear data structure

CO5: Organize the data using Files structure

Laboratory Experiments

- String operations using array of pointers
- Searching Algorithms (With the Number of Key Comparisons) Sequential, Binary and Fibonacci Search Algorithms.
- Sorting Algorithms: Insertion Sort, Selection Sort, Shell Sort, Bubble Sort, Quick Sort, Heap Sort, Merge Sort, and Radix Sort. Using the system clock, compute the time taken for sorting of elements. The time for other operations like I/O etc should not be considered while computing time.
- Implementation of Singly Linked List, Doubly Linked List, Circular Linked List
- Stack implementation using arrays
- Stack implementation using linked lists
- Queue implementation using arrays. Implement different forms of queue. While implementing you should be able to store elements equal to the size of the queue. No positions should be left blank.
- Queue implementation using linked lists
- Creation of binary search tree, performing operations insertion, deletion, and traversal.
- Breadth first search
- Depth first search
- Travelling sales man problem
- File operations
- Indexing of a file
- Reversing the links (not just displaying) of a linked list.
- Consider a linked list consisting of name of a person and gender as a node. Arrange the linked list using '_Ladies first' principle. You may create new linked lists if necessary.
- An expression can be represented in three ways: infix, prefix and postfix. All the forms are necessary in different contexts. Write modules to convert from one form to another form.
- A table can be defined as a collection of rows and columns. Each row and column may have a label. Different values are stored in the cells of the table. The values can be of different data types. Numerical operations like summation, average etc can be performed on rows/columns which contain numerical data. Such operations are to be prevented on data which is not numeric. User may like to insert row/columns in the already existing table. User may like to remove row/column. Create table data type and support different operations on it.

Textbooks:

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

Reference Books:

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

Online Learning Resources:

<https://www.youtube.com/watch?v=zWg7U00EAOE&list=PLBF3763AF2E1C572F>

Mapping of course outcomes with program outcomes

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

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI

(AUTONOMOUS)

Year: I

Semester: II

Branch of Study: AI & ML

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AMC9903	Environmental Studies	3	0	0	0

Course Outcomes:

CO1: Students gets sufficient information that clarifies modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.

CO2: Students realise the need to change their approach. So as to perceive our own environmental issues correctly , using practical approach based on observation and self learning.

CO3: Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.

CO4: Interpretation of different types of environmental pollution problems and designing of new solid waste management techniques usage

CO5: To get knowledge on various environmental acts and to engage all the students life – long learning of rain water harvesting.

UNIT -1:

18Hrs

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-2:

20Hrs

Ecosystems: Concept of an ecosystem. – Structure and functions of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Biodiversity And Its Conservation : Introduction- Definition: genetic, species and ecosystem diversity – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man – wildlife conflicts – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity

UNIT-3:

10Hrs

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-4:

15Hrs

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-5:

10Hrs

Human Population and the Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Text Books:

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Kaushik, New Age Publishers.
3. Environmental Studies by Sri Krishna Hitech publishing Pvt. Ltd.

Reference Books:

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

Mapping of course outcomes with program outcomes

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

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

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

B. Tech - Artificial Intelligence & Machine Learning

Semester III (Second year)

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P				
1	BS	20ABS9914	Discrete Mathematical Structures	3	0	0	3	30	70	100
2	PC	20APC3301	Digital Electronics and 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 and Architecture	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 and Microprocessor Lab	0	0	3	1.5	30	70	100
9	SOC	20ASC3301	Client Side Scripting	1	0	2	2	100	0	100
10	MC	20AMC9902	Constitution of India	2	0	0	0	30	0	30
Total credits							21.5	370	560	930

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPTI**(AUTONOMOUS)****Year: II****Semester: I****Branch of Study: AI & ML**

COURSECODE	COURSE TITLE	L	T	P	CREDITS
20ABS9914	Discrete Mathematical Structures (Common to: CSE, CIC, AIDS, AIML, CSE(DS))	3	0	0	3

COURSE OBJECTIVES:

Introduce the concepts of mathematical logic and gain knowledge in sets, relations and functions and Solve problems using counting techniques and combinatorics and to introduce generating functions and recurrence relations. Use Graph Theory for solving real world problems.

COURSE OUTCOMES

After completion of the course, students will be able to

CO1: Make use of mathematical logic to solve problems

CO2: Analyze the concepts and perform operations related to sets, relations and functions.

CO3: Identify basic counting techniques to solve combinatorial problems.

CO4: Evaluate solutions by using recurrence relations

CO5: Utilize Graph Theory in solving computer science problems

UNIT-1:

Mathematical Logic: Introduction, Statements and Notation, Connectives, Well-formed formulas, Tautology, Duality law, Equivalence, Implication, Normal Forms, Functionally complete set of connectives, Inference Theory of Statement Calculus, Predicate Calculus, Inference theory of Predicate Calculus.

UNIT-2:

Set theory: Basic Concepts of Set Theory, Relations and Ordering, The Principle of Inclusion- Exclusion, Pigeon hole principle and its application, Functions composition of functions, Inverse Functions, Recursive Functions, Lattices and its properties. Algebraic structures: Algebraic systems-Examples and General Properties, Semi groups and Monoids, groups, sub groups, homomorphism, Isomorphism.

UNIT-3:

Elementary Combinatorics: Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multinomial Theorems.

UNIT-4:

Recurrence Relations: Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence relations, Solving Recurrence Relations by Substitution and Generating functions, The Method of Characteristic roots, Solutions of Inhomogeneous Recurrence Relations

UNIT-5:

Graphs: Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multigraphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four Color Problem

TEXT BOOKS

1. Joe L. Mott, Abraham Kandel and Theodore P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians, 2nd Edition, Pearson Education, 2008
2. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 2017.

REFERENCE BOOKS

1. Kenneth H. Rosen, Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, McGraw Hill Education (India) Private Limited, 2017
2. Graph Theory with Applications to Engineering and Computer Science by Narsingh Deo, 1979.

Mapping of course outcomes with program outcomes

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

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

AIITS TPT - AIML

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**(AUTONOMOUS)****Year: II****Semester: I****Branch of Study: AI & ML**

COURSECODE	COURSETITLE	L	T	P	CREDITS
20APC3301	Digital Electronics and Microprocessors (Common to: CSE, CIC, AIDS, AIML, CSE(DS))	3	0	0	3

COURSE OBJECTIVES:

- To understand all the concepts of Logic Gates and Boolean Functions.
- To learn about Combinational Logic and Sequential Logic Circuits.
- To design logic circuits using Programmable Logic Devices.
- To understand basics of 8086 Microprocessor and 8051 Microcontroller.
- To understand architecture of 8086 Microprocessor and 8051 Microcontroller.
- To learn Assembly Language Programming of 8086 and 8051.

COURSE OUTCOMES:

After Completion of this course, the student will be able to:

- CO1:** Design Logic circuit using basic concepts of Boolean algebra.
CO2: Design Logic circuit using basic concepts of PLDs.
CO3: Design sequential logic circuits.
CO4: Design application using 8086 Microprocessor.
CO5: Design application using 8051 Microcontroller.

UNIT - 1:**Number Systems & Code Conversion**

Number Systems & Code conversion, Boolean Algebra & Logic Gates, Truth Tables, Universal Gates, Simplification of Boolean functions, SOP and POS methods – Simplification of Boolean functions using K-maps, Signed and Unsigned Binary Numbers.

UNIT - 2:**Combinational Circuits**

Combinational Logic Circuits: Adders & Subtractors, Multiplexers, Demultiplexers, Encoders, Decoders, Programmable Logic Devices.

UNIT - 3:**Sequential Circuits:**

Sequential Logic Circuits: RS, Clocked RS, D, JK, Master Slave JK, T Flip-Flops, Shift Registers, Types of Shift Registers, Counters, Ripple Counter, Synchronous Counters, Asynchronous Counters, Up-Down Counter

UNIT - 4:**Microprocessors - I:**

8085 microprocessor Review (brief details only), 8086 microprocessor, Functional Diagram, register organization 8086, Flag register of 8086 and its functions, Addressing modes of 8086, Pin diagram of 8086, Minimum mode & Maximum mode operation of 8086, Interrupts in 8086.

UNIT - 5:**Microprocessors and Interfacing:**

Instruction set of 8086, Assembler directives, Procedures and Macros, Simple programs involving arithmetic, logical, branch instructions, Ascending, Descending and Block move programs, String Manipulation Instructions. Overview of 8051 microcontroller, Architecture, I/O ports and Memory organization, addressing modes and instruction set of 8051(Brief details only), Simple Programs.

TEXT BOOKS:

1. M. Morris Mano, Michael D. Ciletti, Digital Design, Pearson Education, 5th Edition, 2013
2. Anil K. Maini, Digital Electronics: Principles, Devices and Applications, John Wiley & Sons, Ltd., 2007.
3. N. Senthil Kumar, M. Saravanan, S. Jeevanathan, Microprocessor and Microcontrollers, Oxford Publishers, 2016
4. Advanced microprocessors and peripherals-A.K Ray and K.M.Bhurchandani, TMH, 2nd edition,2006.

REFERENCE BOOKS:

1. Thomas L. Floyd, Digital Fundamentals – A Systems Approach, Pearson, 2013.
2. Charles H. Roth, Fundamentals of Logic Design, Cengage Learning, 5th, Edition, 2004.
3. D.V.Hall, Microprocessors and Interfacing. TMGH, 2nd edition, 2006.
Kenneth.J.Ayala, The 8051 microcontroller, 3rd edition, Cengage Learning,2010.

Mapping of course outcomes with program outcomes

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

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

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

Year: II	Semester: I	Branch of Study: AI & ML			
COURSECODE	COURSETITLE	L	T	P	CREDITS
20APC3302	Database Management Systems (Common to: CSE, CIC, AIDS, AIML, CSE(DS))	3	0	0	3

COURSE OBJECTIVES:

This course is designed to:

- Train in the fundamental concepts of database management systems, database modeling and design, SQL, PL/SQL and system implementation techniques.
- Enable students to model ER diagrams for any customized application
- Inducting appropriate strategies for optimization of queries.
- Provide knowledge on transaction and concurrency techniques

COUSEOUTCOMES:

After completion of the course, students will be able to

- CO1:** know the fundamentals of Databases
- CO2:** Understand SQL and PL/SQL Concepts
- CO3:** Design a database for a real-world information system
- CO4:** Process and Optimize the query
- CO5:** Working of transaction and concurrency techniques in real time applications

UNIT-1:

Introduction: Database systems applications, Purpose of Database Systems, view of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database users and Administrators, **Introduction to Relational Model:** Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations

UNIT-2:

Introduction to SQL: Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub-queries, Modification of the Database. **Intermediate SQL:** Joint Expressions, Views, Transactions, Integrity Constraints, SQL Data types and schemas, Authorization.

Advanced SQL: Accessing SQL from a Programming Language, Functions and Procedures, Triggers, Recursive Queries, OLAP, Formal relational query languages

UNIT-3:

Database Design and the E-R Model: Overview of the Design Process, The Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Reduction to Relational Schemas, Entity-Relationship Design Issues.

Relational Database Design:

Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional-Dependency Theory, Algorithms for Decomposition, Decomposition Using Multivalued Dependencies, More Normal Forms.

UNIT-4:

Query Processing: Overview, Measures of Query cost, Selection operation, sorting, Join Operation, other operations, Evaluation of Expressions.

Query optimization: Overview, Transformation of Relational Expressions, Estimating statistics of Expression results, Choice of Evaluation Plans, Materialized views, Advanced Topics in Query Optimization.

UNIT-5:

Transaction Management: Transactions: Concept, A Simple Transactional Model, Storage Structures, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Isolation and Atomicity, Transaction Isolation Levels, Implementation of Isolation Levels, Transactions as SQL Statements.

Concurrency Control: Lock-based Protocols, Deadlock Handling, Multiple granularity, Timestamp-based Protocols, and Validation-based Protocols.

Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with Loss of Nonvolatile Storage, Early Lock Release and Logical Undo Operations

TEXT BOOKS:

1. A. Silberschatz, H.F.Korth, S.Sudarshan, -Database System Concepts,6/e, TMH 2019
2. Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA

REFERENCES:

1. Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA
2. Database Principles Fundamentals of Design Implementation and Management, Carlos Coronel, Steven Morris, Peter Robb, Cengage Learning.
3. Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH

Online Learning Resources:

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

Mapping of course outcomes with program outcomes

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

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

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

Year: II	Semester: I	Branch of Study: AI & ML			
COURSECODE	COURSE TITLE	L	T	P	CREDITS
20APC3304	Object Oriented Programming through Java (Common to: AIDS, AIML)	3	0	0	3

COURSE OBJECTIVES:

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

- To understand object oriented programming concepts, and apply them in solving Problems.
- To introduce the principles of inheritance and polymorphism and implementation of packages and interfaces.
- To learn java's exception handling mechanism, String Handling Methods.
- To introduce the concepts of multithreading and Collection Framework and internet programming using applets.
- To introduce the design of Graphical User Interface swing controls.

COUSE OUTCOMES:

CO1: Understanding the Syntax, Semantics and features of Java Programming Language.

CO2: To gain knowledge on Object Oriented Programming concepts.

CO3: Raise Exceptions and handle exceptions.

CO4: Analyze the method of creating Multi-threading programs

CO5: Ability to create GUI applications & perform event handling.

Unit-1:

Object Oriented Thinking: History of Java, Java Buzzwords, Overview of OOP CLASSES AND **Objects:** Classes, Objects, Simple Java Program, Methods, Constructors, this Keyword, Garbage Collection, Data Types, Variables, Arrays, Operators, Control Statements Overloading of Methods and Constructors, Parameter Passing, Recursion, String Class and String handling methods.

Unit- 2:

Inheritance: Inheritance Basics, Using Super, Multilevel Hierarchy, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Using final with Inheritance, Object Class.

Packages: Packages, Access Protection, Importing Packages.

Interfaces: Defining an Interface, Implementing Interface, Applying Interface, Variables in Interfaces, Interfaces can be extended.

Unit-3:

Exception Handling: Exception Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built in Exceptions, Creating Own Exception Sub Classes.

Input and Output Operations: I/O basics, reading console input, writing console output, the PrintWriter class, reading and writing files, automatically closing a file.

Generic Programming — Generic classes — generic methods — Bounded Types — Restrictions and Limitations.

Unit-4:

Multithreading: Java Thread Model, The Main Thread, Thread Life Cycle, Creating Thread and Multiple Threads, isAlive() and join(), Thread Priorities, Synchronization, Inter thread Communication, Suspending, Resuming and Stopping Threads.

Collection Framework: Collection Overview, Collection Interfaces: The Collection Interface, the List Interface, the Queue Interface, Collection Classes: Array List Class, Linked List Class, String Tokenizer, Scanner.

Unit-5:

Applets: Applet Basics, Life Cycle of an Applet, Simple Applet Display Methods, The HTML APPLETtag, Passing Parameters to Applets.

Swing: Introduction to Swing Model-View-Controller design pattern button, layout management, Swing Components

Text Books:

1. Herbert Schildt. Java. The complete reference, TMH. 12th Edition, McGraw Hill, 2021
2. Cay. S. Horstmann and Gary Cornell Core Java 2, Vol 2, Advanced Features, Pearson Education, 7th Edition, 2004

Reference Books:

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

Online Learning Resources:

www.javatpoint.com

Mapping of course outcomes with program outcomes

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

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**(AUTONOMOUS)****Year: II****Semester: I****Branch of Study: AI & ML**

COURSECODE	COURSE TITLE	L	T	P	CREDITS
20APC3306	Computer Organization and Architecture	3	0	0	3

COURSE OBJECTIVES:

- To learn the fundamentals of computer organization and its relevance to classical and modern problems of computer design
- To understand the structure and behavior of various functional modules of a computer.
- To learn the techniques that computers use to communicate with I/O devices
- To acquire the concept of pipelining and exploitation of processing speed.
- To learn the basic characteristics of multiprocessors

COURSE OUTCOMES:

After completion of the course, students will be able to

CO1: Understand computer architecture concepts related to the design of modern processors, memories and I/Os

CO2: Design Arithmetic and control unit

CO3: Identify the hardware requirements of Primary and Secondary memory and Understand the importance of I/O devices and its interface circuits.

CO4: Identify pipeline hazards and possible solutions to those hazards

CO5: Understand Scalable Architectures, Pipelining, Superscalar processors, multiprocessors

UNIT - 1: Basic Structure of Computer, Machine Instructions and Programs

Basic Structure of Computer: Computer Types, Functional Units, Basic operational Concepts, Bus Structure, Software, Performance

Machine Instructions and Programs: Numbers, Arithmetic Operations and Programs, Instructions and Instruction Sequencing, Addressing Modes, Basic Input/output Operations, Stacks and Queues, Subroutines, Additional Instructions.

UNIT - 2: Arithmetic, Basic Processing Unit

Arithmetic: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations.

Basic Processing Unit: Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control, and Multi programmed Control.

UNIT - 3: The Memory System, Input/Output Organization

The Memory System: Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage.

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

UNIT - 4: Pipelining, Large Computer Systems

Pipelining: Basic Concepts, Data Hazards, Instruction Hazards, Influence on Instruction Sets

Large Computer Systems: Forms of Parallel Processing, Array Processors, The Structure of General-Purpose multiprocessors, Interconnection Networks.

Unit -5: Computer Architecture

Parallel and Scalable Architectures, Multiprocessors and Multicomputers, cache coherence and synchronization mechanism, Three Generations of Multicomputers, Message-passing Mechanisms, Multivector and SIMD computers, Vector Processing Principles, Multivector Multiprocessors, Compound Vector processing, SIMD computer Organizations.

Textbooks:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, -Computer Organization, 5th Edition, McGraw Hill Education, 2013.
2. M. Morris Mano, -Computer System Architecture, 3rd Edition, Pearson Education, 2017.
3. Advanced Computer Architecture Second Edition, Kai Hwang, Tata McGraw Hill Publishers.

References

1. Themes and Variations, Alan Clements, -Computer Organization and Architecture, CENGAGE Learning.
2. SmrutiRanjanSarangi, -Computer Organization and Architecture, McGraw Hill Education.
3. John P.Hayes, -Computer Architecture and Organization, McGraw Hill Education

Online Learning Resources:

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

Mapping of course outcomes with program outcomes

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

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

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

Year: II

Semester: I

Branch of Study: AI & ML

COURSECODE	COURSETITLE	L	T	P	CREDITS
20APC3303	Database Management Systems Lab (Common to: CSE, CIC, AIDS, AIML, CSE(DS))	0	0	3	1.5

COURSE OBJECTIVE:

- To implement the basic knowledge of SQL queries and relational algebra.
- To construct database models for different database applications.
- To apply normalization techniques for refining of databases.
- To practice various triggers, procedures, and cursors using PL/SQL.
- To design and implementation of a database for an organization

COURSE OUTCOMES:

After completion of the course, students will be able to

CO1: Write SQL Queries

CO2: Implement PL/SQL programs

CO3: Design database for any real world problem

List of Experiments:

1. CREATION OF TABLES

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

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

- a. Add a column commission with domain to the Employee table.
 - b. Insert any five records into the table.
 - c. Update the column details of job
 - d. Rename the column of Employ table using alter command.
 - e. Delete the employee whose empno is19.
2. Create department table with the following structure.

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

- a. Add column designation to the department table.
 - b. Insert values into the table.
 - c. List the records of emp table grouped bydeptno.
 - d. Update the record where deptno is9.
 - e. Delete any column data from the table
3. Create a table called Customer table

Name	Type
Cust name	Varchar2(20)

Cust street	Varchar2(20)
Cust city	Varchar2(20)

- Insert records into the table.
- Add salary column to the table.
- Alter the table column domain.
- Drop salary column of the customer table.
- Delete the rows of customer table whose ust_city is '_hyd'.

4. Create a table called branch table.

Name	Type
Branch name	Varchar2(20)
Branch city	Varchar2(20)
asserts	Number

5. Increase the size of data type for asserts to the branch.

- Add and drop a column to the branch table.
- Insert values to the table.
- Update the branch name column
- Delete any two columns from the table

6. Create a table called sailor table

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

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

7. Create a table called reserves table

Name	Type
Boat id	Integer
sid	Integer
day	Integer

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

2. QUERIES USING DDL AND DML

- Create a user and grant all permissions to the user.
 - Insert the any three records in the employee table and use rollback. Check the result.
 - Add primary key constraint and not null constraint to the employee table.

- d. Insert null values to the employee table and verify the result.
2.
 - a. Create a user and grant all permissions to the user.
 - b. Insert the any three records in the employee table and use rollback. Check the result.
 - c. Add primary key constraint and not null constraint to the employee table.
 - d. Insert null values to the employee table and verify the result.
3.
 - a. Create a user and grant all permissions to the user.
 - b. Insert the any three records in the employee table and use rollback. Check the result.
 - c. Add primary key constraint and not null constraint to the employee table.
 - d. Insert null values to the employee table and verify the result.
4.
 - a. Create a user and grant all permissions to the user.
 - b. Insert values in the department table and use commit.
 - c. Add constraints like unique and not null to the department table.
 - d. Insert repeated values and null values into the table.
5.
 - a. Create a user and grant all permissions to the user.
 - b. Insert values into the table and use commit.
 - c. Delete any three records in the department table and use rollback.
 - d. Add constraint primary key and foreign key to the table.
6.
 - a. Create a user and grant all permissions to the user.
 - b. Insert records in the sailor table and use commit.
 - c. Add save point after insertion of records and verify save point.
 - d. Add constraints not null and primary key to the sailor table.
7.
 - a. Create a user and grant all permissions to the user.
 - b. Use revoke command to remove user permissions.
 - b. Change password of the user created.
 - c. Add constraint foreign key and not null.
8.
 - a. Create a user and grant all permissions to the user.
 - b. Update the table reserves and use save point and rollback.
 - c. Add constraint primary key , foreign key and not null to the reserves table
 - d. Delete constraint not null to the table column

3. E-R MODELS USING RATIONAL ROSE

- a. Construct the E-R model for **Library management system** using Rational Rose.
- b. Construct the E-R model for **ATM** using Rational Rose.
- c. Construct the E-R model for **Online shopping** using Rational Rose.
- d. Construct the E-R model for **Hostel management** using Rational Rose.
- e. Construct the E-R model for **Hospital management** system using Rational Rose

4. QUERIES USING AGGREGATE FUNCTIONS

1.
 - a. By using the group by clause, display the enames who belongs to deptno 10 along with average salary.
 - b. Display lowest paid employee details under each department.
 - c. Display number of employees working in each department and their department number.
 - d. Using built in functions, display number of employees working in each department and their department name from dept table. Insert deptname to dept table and insert deptname for each row, do the required thing specified above.
 - e. List all employees which start with either B or C.
 - f. Display only these ename of employees where the maximum salary is greater than or equal to 5000.
2.
 - a. Calculate the average salary for each different job.
 - b. Show the average salary of each job excluding manager.
 - c. Show the average salary for all departments employing more than three people.
 - d. Display employees who earn more than the lowest salary in department 30
 - e. Show that value returned by sign (n)function.
 - f. How many days between day of birth to current date
3.
 - a. Show that two substring as single string.
 - b. List all employee names, salary and 15% rise in salary.
 - c. Display lowest paid emp details under each manager
 - d. Display the average monthly salary bill for each deptno.

- e. how the average salary for all departments employing more than two people.
 - f. By using the group by clause, display the eid who belongs to deptno 05 alongwith average salary.
4.
 - a. Count the number of employees in department20
 - b. Find the minimum salary earned by clerk.
 - c. Find minimum, maximum, average salary of all employees.
 - d. List the minimum and maximum salaries for each job type.
 - e. List the employee names in descending order.
 - f. List the employee id, names in ascending order by empid.
 5.
 - a. Find the sids , names of sailors who have reserved all boats called—INTERLAKE Find the age of youngest sailor who is eligible to vote for each rating level with at least two such sailors.
 - b. Find the sname , bid and reservation date for each reservation.
 - c. Find the ages of sailors whose name begin and end with B and has at least 3characters.
 - d. List in alphabetic order all sailors who have reserved red boat.
 - e. Find the age of youngest sailor for each rating level.
 6.
 - a. List the Vendors who have delivered products within 6 months from order date.
 - b. Display the Vendor details who have supplied both Assembled and Subparts.
 - c. Display the Sub parts by grouping the Vendor type (Local or Non Local).
 - d. Display the Vendor details in ascending order.
 - e. Display the Sub part which costs more than any of the Assembled parts.
 - f. Display the second maximum cost Assembled part

5. PROGRAMS ON PL/SQL

1.
 - a. Write a PL/SQL program to swap two numbers.
 - b. Write a PL/SQL program to find the largest of three numbers.
2.
 - a. Write a PL/SQL program to find the total and average of 6 subjects and display the grade.
 - b. Write a PL/SQL program to find the sum of digits in a given number.
3.
 - a. Write a PL/SQL program to display the number in reverse order.
 - b. Write a PL/SQL program to check whether the given number is prime or not.
4.
 - a. Write a PL/SQL program to find the factorial of a given number.
 - b. Write a PL/SQL code block to calculate the area of a circle for a value of radius varying from 3 to 7. Store the radius and the corresponding values of calculated area in an empty table named areas,consisting of two columns radius and area.
5.
 - a. Write a PL/SQL program to accept a string and remove the vowels from the string. (When _hello' passed to the program it should display _Hll' removing e and o from the worldHello).
 - b. Write a PL/SQL program to accept a number and a divisor. Make sure the divisor is less than or equal to 10. Else display an error message. Otherwise Display the remainder in words.

6. PROCEDURES AND FUNCTIONS

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

7. TRIGGERS

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

CUSTOMERS table:

ID	NAME	AGE	ADDRESS	SALARY
1	Alive	24	Khammam	2000
2	Bob	27	Kadappa	3000
3	Catri	25	Guntur	4000

4	Dena	28	Hyderabad	5000
5	Eeshwar	27	Kurnool	6000
6	Farooq	28	Nellore	7000

- Creation of insert trigger, delete trigger, update trigger practice triggers using the passenger database. Passenger(Passport_ id INTEGER PRIMARY KEY, Name VARCHAR (50)Not NULL, Age Integer Not NULL, Sex Char, Address VARCHAR (50) Not NULL);
 - Write a Insert Trigger to check the Passport_ id is exactly six digits or not.
 - Write a trigger on passenger to display messages '_1 Record is inserted', '_1 record is deleted', '_1 record is updated' when insertion, deletion and updation are done on passenger respectively.
- Insert row in employee table using Triggers. Every trigger is created with name any trigger have same name must be replaced by new name. These triggers can raised before insert, update or delete rows on data base. The main difference between a trigger and a stored procedure is that the former is attached to a table and is only fired when an INSERT, UPDATE or DELETE occurs.
- Convert employee name into uppercase whenever an employee record is inserted or updated. Trigger to fire before the insert or update.
- Trigger before deleting a record from emp table. Trigger will insert the row to be deleted into table called delete _emp and also record user who has deleted the record and date and time of delete.
- Create a transparent audit system for a table CUST_MSTR. The system must keep track of the records that are being deleted or updated

8. PROCEDURES

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

9. CURSORS

- Write a PL/SQL block that will display the name, dept no, salary of fist highest paid employees. Update the balance stock in the item master table each time a transaction takes place in the item transaction table. The change in item master table depends on the item id is already present in the item master then update operation is performed to decrease the balance stock by the quantity specified in the item transaction in case the item id is not present in the item master table then the record is inserted in the item master table.
- Write a PL/SQL block that will display the employee details along with salary using cursors.
- To write a Cursor to display the list of employees who are working as a Managers or Analyst.
- To write a Cursor to find employee with given job and deptno.

5. Write a PL/SQL block using implicit cursor that will display message, the salaries of all the employees in the `_employee` table are updated. If none of the employee's salary are updated we get a message 'None of the salaries were updated'. Else we get a message like for example, 'Salaries for 1000 employees are updated' if there are 1000 rows in `_employee` table

10. CASE STUDY: BOOK PUBLISHING COMPANY

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

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

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

Create the logical data model using E-R diagrams

11. CASE STUDY GENERAL HOSPITAL

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

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

Create the logical data model using E-R diagrams

12. CASE STUDY: CAR RENTAL COMPANY

A database is to be designed for a car rental company. The information required includes a description of cars, subcontractors (i.e. garages), company expenditures, company revenues and customers. Cars are to be described by such data as: make, model, year of production, engine size, fuel type, number of passengers, registration number, purchase price, purchase date, rent price and insurance details. It is the company policy not to keep any car for a period exceeding one year. All major repairs and maintenance are done by subcontractors (i.e. franchised garages), with whom CRC has long-term agreements. Therefore the data about garages to be kept in the database includes garage names, addresses, range of services and the like. Some garages require payments immediately after a repair has been made; with others CRC has made arrangements for credit facilities. Company expenditures are to be registered for all outgoings connected with purchases, repairs, maintenance, insurance etc. Similarly the cash inflow coming from all sources: Car hire, car sales, insurance claims must be kept of file. CRC maintains a reasonably stable client base. For this privileged category of customers special credit card facilities are provided. These customers may also book in advance a particular car. These reservations can be made for any period of time up to one month. Casual customers must pay a deposit for an estimated time of rental, unless they wish to pay by credit card. All major credit cards are accepted. Personal details such as name, address, telephone number, driving license, number about each customer are kept in the database. For the above case study, do the following:

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

Create the logical data model using E-R diagrams

13. CASE STUDY: STUDENT PROGRESS MONITORING SYSTEM

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

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

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

References:

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

Online Learning Resources/Virtual Labs:

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

Mapping of course outcomes with program outcomes

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

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

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

Year: II

Semester: I

Branch of Study: AI & ML

COURSECODE	COURSE TITLE	L	T	P	CREDITS
20APC3305	Object Oriented Programming through Java Lab (Common to : AIDS, AIML)	0	0	3	1.5

COURSE OBJECTIVES:

- To experiment with the syntax and semantics of java language and gain experience with java programming
- Learn to use object orientation to solve problems and use java language to implement them.

COURSE OUTCOMES:

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

List of Experiments:

1. Installation of Java software, study of any integrated development environment, Use Eclipse or Net bean platform and acquaint with the various menus. Create a test project, add a test class and run it.
 - a) Practice Java Basic Programs on Classes and Objects.
2. a) Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection (i.e domestic or commercial). Commute the bill amount using the following tariff.
If the type of the EB connection is domestic, calculate the amount to be paid as follows:
First 100 units - Rs. 1 per unit; 101-200 units - Rs. 2.50 per unit; 201 -500 units - Rs. 4 per unit; 501 units - Rs. 6 per unit. If the type of the EB connection is commercial, calculate the amount to be paid as follows: First 100 units - Rs. 2 per unit; 101-200 units - Rs. 4.50 per unit; 201 -500 units - Rs. 6 per unit; > 501 units - Rs. 7 per unit
 - b) Write a java program to illustrate the concept of class with method overloading.
 - C) Write a java program to illustrate the concept of class with Constructors overloading.
3. a) Write a program to create a class named shape. It should contain 2 methods, draw() and erase() that prints
-Drawing Shape and -Erasing Shape respectively. For this class, create three sub classes, Circle, Triangle and Square and each class should override the parent class functions - draw () and erase (). The draw() method should print -Drawing Circle, -Drawing Triangle and -Drawing Square respectively. The erase() method should print -Erasing Circle, -Erasing Triangle and -Erasing Square respectively. Create objects of Circle, Triangle and Square in the following way and observe the polymorphic nature of the class by calling draw() and erase() method using each object. Shape c=new Circle(); Shape t=new Triangle(); Shape s=new Square();
 - b) Write a Java Program to demonstrate inheritance & usage of super
4. a) Write a Java Program to implement multilevel inheritance.
 - b) Write a Java program to implement the method overriding
 - c) Write a Java program to implement dynamic method dispatch.
5. a) Write a Java program to implement abstract class.
 - b) Write a Java Program to implement Packages.
 - c) Write a Java Program to implement Access Protection in Packages.
6. a) Write a Java program to demonstrate interfaces.

- b) Write a Java program to implement the multiple inheritance using interfaces.
7. a) Write a Java program to implement the exception handling mechanism.
 b) Write a Java program to implement the nested try statement.
 c) Write a Java program to implement your own exception class.
8. a) Write a Java Program to demonstrate the following String Handlings.
 i. String Length & Concatenation.
 ii. Character Extraction.
 iii. String Comparison.
 iv. Searching and modifying String.
 b) Write a Java Program to demonstrate String Buffer Class.
9. a) Write a Java program for multi-thread implementation.
 b) Write a Java program to implement producer consumer problem using inter-thread communication mechanism.
10. a) Practice any two Programs on Collections.
 b) Practice any two Programs on String Tokenizer & Scanner.
11. a) Write a Java Program to develop an applet that displays a simple message.
 b) Develop an applet that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named –Compute! is clicked.
 c) Write a java program to handle keyboard events.
 d) Write a java program to handle Mouse events
12. a) Write a Java Program to demonstrate AWT Label & Button.
 b) Write a Java Program to demonstrate JLabel, JTextField & JButton.
 c) Write a program to design a calculator using event driven programming paradigm of java

Text Books:

- Herbert Schildt. Java. The complete reference, TMH. 9th Edition, 2014.
- H.M. Dietel and P.J. Dietel, Java How to Program 6th Edition, Pearson Education/PHI, 2004
- Y. Daniel Liang, Introduction to Java programming, Pearson Education, 6th Edition.
- Cay Horstmann, Big Java, 2nd edition, Wiley Student Edition, Wiley India Private Limited.

Online Learning Resources/Virtual Labs:

<http://www.javatpoint.com>

Mapping of course outcomes with program outcomes

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

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

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

Year: II	Semester: I	Branch of Study: AI & ML			
COURSECODE	COURSETITLE	L	T	P	CREDITS
20APC3307	Computer Organization and Microprocessor Lab	0	0	3	1.5

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

List of Experiments:

Exercises in Digital Electronics:

1. Implement Logic gates using NAND and NOR gates
2. Design a Full adder using gates
3. Design and implement the 4:1 MUX, 8:1 MUX using gates /ICs.
4. Design and Implement a 3 to 8 decoder using gates
5. Design a 4 bit comparator using gates/IC
6. Design and Implement a 4 bit shift register using Flip flops
7. Design and Implement a Decade counter

Microprocessors (8086 Assembly Language Programming)

9. 8 Bit Addition and Subtraction.
10. 16 Bit Addition.
11. BCD Addition.
12. BCD Subtraction.
13. 8 Bit Multiplication.
14. 8 Bit Division.
15. Searching for an Element in an Array.
16. Sorting in Ascending and Descending Orders.
17. Finding Largest and Smallest Elements from an Array.

Exercises in Computer Organization:

18. Implement a C program to perform Binary Addition & Subtraction.
19. Implement a C program to perform Multiplication of two binary numbers
20. Implement a C program to perform Multiplication of two binary numbers (signed) using Booth's Algorithms.
21. Implement a C program to perform division of two binary numbers (Unsigned) using restoring division algorithm.
22. Implement a C program to perform division of two binary numbers (Unsigned) using non-restoring division algorithm.

Reference Books:

1. Switching theory and logic design –A. Anand Kumar PHI, 2013
2. Advanced microprocessor & Peripherals-A. K. Ray and K. M. Bherchandavi, TMH, 2nd edition, 2016.
3. Switching and Finite Automatic theory-Zvi Kohavi, Niraj K.Jha Cambridge, 3rd edition, 2009
4. Digital Design –Morris Mano, PHI, 3rd edition, 2010
5. Microprocessor and Interfacing –Douglas V. Hall, TMGH 2nd edition, 2017

Online Learning Resources/Virtual Labs:

<http://www.edx.org>

Mapping of course outcomes with program outcomes

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

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

AIITS TPT - AIMML

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI

(AUTONOMOUS)

Year: II

Semester: I

Branch of Study: AI & ML

COURSECODE	COURSE TITLE	L	T	P	CREDITS
20ASC3301	Client Side Scripting (Common to: CSE, CIC, AIDS, AIML)	1	0	2	2

COURSE OBJECTIVES:

- To provide knowledge on basic concepts of web Programming
- To design Web Pages and form validation using java scripting.
- To learn the important concepts like CSS, DOM, DNS,AJAX and XML.
- To Demonstrate the functions of html in web communication.
- To quickly be able to understand the different parts of a web page

COURSE OUTCOMES:

Upon the completion of Data Mining practical course, the student will be able to:

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

UNIT-1 : Basics of JavaScript Programming

Features of JavaScript, Object Name, Property, Method, Dot Syntax, Main Event, Values and Variables, Operators and Expressions – Primary Expressions, Object and Array Initializers, Function Definition Expression, Property Access Expressions, Invocation Expressions, If Statement, if...else, if..elseif, Nested if Statement, Switch... Case Statement, Loop Statement – for Loop, for...in Loop, while Loop, do...while Loop, continue Statement, Querying and Setting Properties and Deleting Properties, Property Getters andSetters.

- WAP to print hello world
- WAP to use comments in JavaScript.
- WAP to add a noscript block.
- Write a Script in <head>...</head> section.
- Write a Script in <body>...</body> section.
- Write a Script in <body>...</body> and <head>...</head> sections.
- Write a Script using arithmetic, Comparison, Logical, Bitwise, and Assignment operators
- Write code to understand how the Conditional Operator and typeof operator works in JavaScript.
- Write code to understand the working of if statement, if...else statement, and if...else if... statement.
- Implement switch-case statement.
- Implement while loop, do-while and for loop in JavaScript.
- WAP to print the web browser's Navigator object using for loop.
- WAP To implement break, continue and label in JavaScript.
- Write code to call the function that displays the text message on clicking a button.

UNIT – 2 : Array, Function and String

Array – Declaring an Array, Initializing an Array, Defining an Array Elements, Looping an Array, Adding an Array Element, Sorting an Array Element, Combining an Array Elements into a String, Changing Elements of an Array, Objects as Associative Arrays, Function – Defining a Function, Writing a Function, Adding an Arguments, Scope of Variable and Arguments, Calling a Function – Calling a Function With or Without an Argument, Calling Function from HTML, Function Calling another Function, Returning the Value from a Function, String – Manipulate a String, Joining a String, Retrieving a Character from given Position, Retrieving a Position of Character in a String, Dividing Text, Copying a Sub-string, Converting String to Number and Numbers to String, Changing the Case of String, Finding a Unicode of a Character – charCodeAt(), fromCharCode().

- Write code to call the function that displays the text message on clicking a button.
- WAP to call a function that takes two parameters, name and age. Print the same.
- Define a function that takes two parameters and concatenates them before returning the resultant in the calling program.

Unit- 3 : Form and Event Handling

Building Blocks of a Form, Properties and Methods of Form, Button, Text, Text Area, Checkbox, RadioButton, Select Element, Form Events – Mouse Event, Key Events, Form Objects and Elements, ChangingAttribute Value Dynamically, Changing Option List Dynamically, Evaluating Checkbox Selection, Changing a Label Dynamically, Manipulating Form Elements, Intrinsic JavaScript Functions, DisablingElements, Read Only Elements.

- Write code to implement the following events – onclick, onsubmit, onmouseover and onmouseout.
- Design a Registration form (include email id and password) and perform validation to all its fields.

Unit-4 : Objects

Window Object, Math, Number, and Date Objects, Handling Strings Using Regular Expressions. Implement Number, Date, Math, Boolean, Strings, Arrays, RegEx, and HTML DOM objects with all its properties and methods.

Unit-5 : Cookies and Browser Data

Cookies – Basic of Cookies, Reading a Cookie Value, Writing a Cookie Value, Creating a Cookies, Deleting a Cookies, Setting the Expiration Date of Cookie, Browser – Opening a Window, Giving the New Window Focus, Window Position, Changing the Content of Window, Closing a Window, Scrolling a Web Page, Multiple Windows at Once, Creating a Web Page in New Window, JavaScript in URLs, JavaScript Security, Timers, Browser Location and History.

- Set a customer name in an input cookie.
- WAP to get all the cookies.
- Extend the expiry date of a cookie by 1 Month.
- Delete a cookie by setting its expiry date to one month behind the current date.
- Do a page redirect using JavaScript at client side.
- Show an appropriate message to your site visitors before redirecting them to a new page. WAP with atime delay to load a new page.
- Redirect your site visitors onto a different page based on their browsers.
- Use an alert box to give a warning message.
- Implement a confirmation dialog box to take user's consent on any option.
- Use a prompt dialog box.
- Use of void is to purposely generate the undefined value.
- Demonstrates how to create an Object.
- Create an object with a User-Defined Function.
- Write code to add a function along with an object.
- Demonstrate with keyword in JavaScript.

Text Books:

1. Javascript Beginners Guide, John Pollock, TMH, 4th Edition, 2013
2. JavaScript. Demystified, JIM KEOGH , McGraw-Hill, 2005

Reference Books:

1. JavaScript™ For Dummies,® 4th Edition, by Emily Vander Veer, Published by Wiley Publishing, Inc ©2005.
2. JavaScript for impatient programmers (beta), by Dr. Axel Rauschmayer © 2019.
3. Javascript: Beginners Guide on Javascript Programming, by Nick Goddard © 2016.

Online Learning Resources:

W3Schools, <https://www.tutorialspoint.com/javascript/index.htm>, nptel Videos

Mapping of course outcomes with program outcomes

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

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

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

Year: II

Semester: I

Branch of Study: AI & ML

COURSECODE	COURSETITLE	L	T	P	CREDITS
20AMC9902	Constitution of India (Common to: CSE, CIC, AIDS, AIML, CSE(DS))	3	0	0	0

COURSE OUTCOMES:

Students will be able to:

CO1: Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.

CO2: Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.

CO3: Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

CO4: Discuss the Powers and functions of Governor, President, Judiciary.

CO5: Discuss the functions of local administration bodies

UNIT - 1:

4Hrs

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

UNIT - 2:

8Hrs

Philosophy of the Indian Constitution - Preamble Salient Features

UNIT - 3:

8Hrs

Contours of Constitutional Rights & Duties - Fundamental Rights - Right to Equality- Right to Freedom - Right against Exploitation - Right to Freedom of Religion - Cultural and Educational Rights - Right to Constitutional Remedies - Directive Principles of State Policy - Fundamental Duties.

UNIT - 4:

8Hrs

Organs of Governance - Parliament - Composition - Qualifications and Disqualifications - Powers and Functions - Executive - President □ Governor - Council of Ministers - Judiciary, Appointment and Transfer of Judges, Qualifications - Powers and Functions

UNIT - 5:

8Hrs

Local Administration - District's Administration head: Role and Importance - Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation- Pachayati raj: Introduction, PRI: ZillaPachayat - Elected officials and their roles, CEO Zilla Panchayat: Position and role - Block level: Organizational Hierarchy (Different departments) - Village level: Role of Elected and Appointed officials - Importance of grass root democracy.

Textbooks:

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

Mapping of course outcomes with program outcomes

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

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

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

B. Tech - Artificial Intelligence & Machine Learning

Semester IV (Second year)

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P				
1	PC	20APC3308	Software Engineering for AI	3	0	0	3	30	70	100
2	PC	20APC3309	Artificial Intelligence	3	0	0	3	30	70	100
3	PC	20APC3311	Data Warehousing and Mining	3	0	0	3	30	70	100
4	PC	20APC3313	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	2	1	0	3	30	70	100
7	PC Lab	20AES3310	Artificial Intelligence Lab	0	0	3	1.5	30	70	100
8	PC Lab	20APC3312	Data Warehousing and Mining Lab	0	0	3	1.5	30	70	100
9	PC Lab	20APC3314	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

Community Service Project (Mandatory) for 6 weeks duration during summer vacation.

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

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

Year: II	Semester: II	Branch of Study: AI & ML			
COURSECODE	COURSETITLE	L	T	P	CREDITS
20APC3308	Software Engineering for AI	3	0	0	3

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

After completion of the course, students will be able to

- CO1:** Understand the methods and issues in software engineering
- CO2:** Apply the principles of Artificial Intelligence for Software engineering
- CO3:** Design AI based software
- CO4:** Apply the algorithms of Machine learning in solving problems
- CO5:** Design Expert systems

UNIT – 1: Introduction to Computer Software for AI, AI Problems and Conventional SE Problems, Software Engineering Methodology

Computers and software systems, An introduction to Software engineering, Bridges and buildings versus software systems, the software crisis, A demand for more software power, Responsiveness to human users, Software systems in new types of domains, Responsiveness to dynamic usage environments, Software systems with self-maintenance capabilities, A need for AI systems

What is an AI problem, Ill-defined specifications, correct versus 'good enough' solutions, It's the HOW not the WHAT, the problem of dynamics, the quality of modular approximations, Context-free problems?

Specify and verify—the SAV methodology, the myth of complete specification, what is verifiable, Specify and test—the SAT methodology, testing for reliability, the strengths, the weaknesses, what are the requirements for testing, what's in a specification, Prototyping as a link.

UNIT – 2: An Incremental and Exploratory Methodology, New Paradigms for System Engineering

Classical methodology and AI problems, The RUDE cycle, how do we start, Malleable software, AI muscles on a conventional skeleton How do we proceed, how do we finish, The question of hacking, Conventional paradigms Automatic programming, Transformational implementation, The "new paradigm" of Blazer, Cheatham and Green, Operational requirements of Kowalski, The POLITE methodology

UNIT –3: Towards a Discipline of Exploratory Programming, Machine Learning: Much Promise, Many Problems

Reverse engineering, Reusable software Design knowledge, Stepwise abstraction, The problem of decompiling, Controlled modification, Structured growth
Self-adaptive software, The promise of increased software power, The threat of increased software problems

UNIT – 4: Machine Learning and Expert Systems

Practical machine learning examples, Multisession inductive programming, Expert Systems: The Success Story, Expert systems as AI software, Engineering expert systems, The lessons of expert systems for engineering AI software

UNIT – 5: AI into Practical Software

Support environments, Reduction of effective complexity, Moderately stupid assistance, An engineering toolbox, Self-reflective software, Over engineering software, Summary and What the Future Holds

TEXT BOOKS:

1. Derek Partridge, "Artificial Intelligence and Software Engineering", Glenlake Publishing Company, 1998.

REFERENCES:

1. " The role of Artificial Intelligence in Software Engineering", K. Nitalksheswara Rao,2020
2. "Farid Meziane &Sunil Vadera, "Artificial Intelligence Applications for Improved Software Engineering Development", Information Science Reference, 2009

Mapping of course outcomes with program outcomes

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

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

AIITS TPT - AIML

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

Year: II	Semester: II	Branch of Study: AI & ML			
COURSECODE	COURSETITLE	L	T	P	CREDITS
20APC3309	Artificial Intelligence	3	0	0	3

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

UNIT -1:

Introduction: What is AI, Foundations of AI, History of AI, The State of Art.

Intelligent Agents: Agents and Environments **Good Behavior:** The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNIT -2:

Solving Problems by searching: Problem Solving Agents, Example problems, searching for Solutions, Uninformed Search Strategies, Informed search strategies, Heuristic Functions

Beyond Classical Search: Local Search Algorithms and Optimization Problems, Local Search in Continuous Spaces, Searching with Nondeterministic Actions, Searching with partial observations, online search agents and unknown environments.

UNIT -3:

Reinforcement Learning: Introduction, Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, applications of RL

Natural Language Processing: Language Models, Text Classification, Information Retrieval, Information Extraction.

UNIT -4:

Natural Language for Communication: Phrase structure grammars, Syntactic Analysis, Augmented Grammars and semantic Interpretation, Machine Translation, Speech Recognition

Perception: Image Formation, Early Image Processing Operations, Object Recognition by appearance, Reconstructing the 3D World, Object Recognition from Structural information, Using Vision.

UNIT -5:

Robotics: Introduction, Robot Hardware, Robotic Perception, Planning to move, planning uncertain movements, Moving, Robotic software architectures, application domains

Philosophical foundations: Weak AI, Strong AI, Ethics and Risks of AI, Agent Components, Agent Architectures, Are we going in the right direction, What if AI does succeed.

Text Books:

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

Reference Books:

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

Online Learning Resources:

<http://peterindia.net/AILinks.html>

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	2	2											
C02	3	3	3	2	3								2	2
C03	2	2	2	2	2									3
C04		3	3		3									3
C05	3	2	1			1		1				1	1	1

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

AIATS TPT - AIML

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

Year: II	Semester: II	Branch of Study: AI & ML			
COURSECODE	COURSE TITLE	L	T	P	CREDITS
20APC3311	Data Warehousing and Mining (Common to: AIDS, AIML)	3	0	0	3

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

UNIT – 1:

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

UNIT – 2:

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

UNIT – 3:

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

UNIT – 4:

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

UNIT – 5:

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

TEXT BOOKS:

1. a Mining: Concepts and Techniques, Jiawei Han and Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, Second Edition, 2012.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson Education, 2016.

REFERENCES:

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

Online Learning Resources:

<https://www.youtube.com/watch?v=ykZ-UGcYWg&list=PLLspfyOYoQcl6Nno3gPkq0h5YSe81hsc>

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	3										1	1	1
C02	2	3	2										1	
C03	2	3	2	2	3	2								2
C04	2	2	3	2	2	3						2	1	
C05	2	2	3	2	2	3						2	1	1

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

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

Year: II	Semester: II	Branch of Study: AI & ML			
COURSECODE	COURSETITLE	L	T	P	CREDITS
20APC3313	Operating Systems (Common to: CSE, CIC, AIDS, AIML, CSE(DS))	3	0	0	3

COURSE OBJECTIVES:

The course is designed to

- Understand basic concepts and functions of operating systems
- Understand the processes, threads and scheduling algorithms.
- Provide good insight on various memory management techniques
- Expose the students with different techniques of handling deadlocks
- Explore the concept of file-system and its implementation issues
- Familiarize with the basics of the Linux operating system
- Implement various schemes for achieving system protection and security

COURSE OUTCOMES:

After completion of the course, students will be able to

CO1: Distinguish between the different types of operating system environments.

CO2: Apply the concepts of process synchronization & CPU scheduling

CO3: Develop solutions to deadlock and memory management

CO4: Analyze various disk scheduling algorithms and file system interfaces

CO5: Analyze the various security issues and goals of protection

UNIT - 1:

Operating Systems Overview: Operating system functions, Operating system structure, operating systems Operations, protection and security, Computing Environments, Open- Source Operating Systems

System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, operating system structure, operating system debugging, System Boot.

Processes: Process concept, process Scheduling, Operations on processes, Inter process Communication, Examples of IPC systems.

UNIT - 2:

Threads: overview, Multicore Programming, Multithreading Models, Thread Libraries, Implicit Threading, Threading Issues.

Process Synchronization: The critical-section problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic problems of synchronization, Monitors, Synchronization examples, Alternative approaches.

CPU Scheduling: Scheduling-Criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling, Real-Time CPU Scheduling, Algorithm Evaluation.

UNIT - 3:

Memory Management: Swapping, contiguous memory allocation, segmentation, paging, structure of the page table.

Virtual memory: Demand paging, page-replacement, Allocation of frames, Thrashing, Memory-Mapped Files, Allocating Kernel Memory

Deadlocks: System Model, deadlock characterization, Methods of handling Deadlocks, Deadlock prevention, Detection and Avoidance, Recovery from deadlock.

UNIT - 4:

Mass-storage structure: Overview of Mass-storage structure, Disk structure, Disk attachment, Disk scheduling, Swap-space management, RAID structure, Stable-storage implementation.

File system Interface: The concept of a file, Access Methods, Directory and Disk structure, File system mounting, File sharing, Protection.

File system Implementation: File-system structure, File-system Implementation, Directory Implementation, Allocation Methods, Free-Space management.

UNIT - 5:

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

to Hardware operations.

Protection: Goals of Protection, Principles of Protection, Domain of protection, Access Matrix, Implementation of Access Matrix, Access control, Revocation of Access Rights, Capability- Based systems, Language – Based Protection

Security: The Security problem, Program threats, System and Network threats, Cryptography as a security tool, User authentication, Implementing security defenses, Firewalling to protect systems and networks, Computer–security classifications.

Text Books:

1. Operating System Concepts, Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Wiley, Eight Edition, 2018.
2. Modern Operating Systems, Andrew S Tanenbaum, Second Edition, PHI, 2001.

Reference Books:

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

Online Learning Resources:

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

Mapping of course outcomes with program outcomes

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

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

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

Year: II	Semester: II	Branch of Study: AI & ML			
COURSECODE	COURSE TITLE	L	T	P	CREDITS
20AHSMB01	Managerial Economics And Financial Analysis (Common to: CSE, CIC, AIDS, AIML, CSE(DS))	3	0	0	3

COURSE OUTCOMES (CO):

- CO1:** Understand the fundamentals of Economics and Managerial economics viz., Demand, Production, cost, revenue and markets.
- CO2:** Apply the Concept of Production cost and revenues for effective Business decision
- CO3:** Analyze how to invest their capital and maximize returns.
- CO4:** Evaluate the capital budgeting techniques.
- CO5:** Define the concepts related to financial accounting and management and able to develop the Accounting statements and evaluate the financial performance of business entity.

UNIT - 1: MANAGERIAL ECONOMICS

Introduction – meaning, nature, significance, functions, and advantages, ME and its role in other fields. Demand - Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing forecasting, Methods.

UNIT - 2: PRODUCTION AND COST ANALYSIS

Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least- cost combination– Short run and Long run Production Function- Isoquants and Isocosts, MRTS - Cobb-Douglas Production Function - Laws of Returns - Internal and External Economies of scale. Cost & Break-Even Analysis - Cost concepts and Cost behavior- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems)-Managerial significance and limitations of Break-Even Analysis.

UNIT - 3: BUSINESS ORGANIZATIONS AND MARKETS

Introduction – Nature, meaning, significance, functions and advantages. Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition– Oligopoly-Price-Output Determination - Pricing Methods and Strategies.

UNIT - 4: CAPITAL BUDGETING

Introduction to Capital, Sources of Capital. Short-term and Long-term Capital : Working capital, types, Estimating Working capital requirements. Capital Budgeting – Features, Proposals, Time value of money. Methods and Evaluation of Projects – Pay Back Method, Accounting Rate of Return (ARR), Net Present Value (NPV), and Internal Rate Return (IRR) Method (simple problems).

UNIT - 5: FINANCIAL ACCOUNTING AND ANALYSIS

Introduction – Nature, meaning, significance, functions and advantages. Concepts and Conventions- Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

TEXTBOOKS:

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

REFERENCES

1. Ahuja Hl Managerial economics Schand,3/e,2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2013.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, NewDelhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage, 2013.

Online Learning Resources:

<https://www.slideshare.net/123ps/managerial-economics-ppt>

<https://www.slideshare.net/rossanz/production-and-cost-45827016>
<https://www.slideshare.net/darkyla/business-organizations-19917607> <https://www.slideshare.net/balarajbl/market-and-classification-of-market> <https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396>
<https://www.slideshare.net/ashu1983/financial-accounting>.

Mapping of course outcomes with program outcomes

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

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

AITS TPT - AIMVL

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI**(AUTONOMOUS)****Year: II****Semester: II****Branch of Study: AI & ML**

COURSECODE	COURSE TITLE	L	T	P	CREDITS
20AHS9905	Universal Human Values (Common to: CSE, CIC, AIDS, AIML, CSE(DS))	2	1	0	3

COURSE OBJECTIVES:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

COURSE OUTCOMES (CO):

On completion of this course, the students will be able to

- CO1:** Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
- CO2:** They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
- CO3:** They would have better critical ability.
- CO4:** They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
- CO5:** It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

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

- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration-what is it? - Its content and process; ‘Natural Acceptance’ and Experiential Validation- as the process for self-exploration
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
- Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT II: Understanding Harmony in the Human Being - Harmony in Myself!

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

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

UNIT III: Understanding Harmony in the Family and Society- Harmony in Human- Human

Relationship.

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family

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

UNIT IV: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature
- Understanding Existence as Co-existence of mutually interacting units in all- pervasive space
- Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film -Home| can be used), pollution, depletion of resources and role of technology etc.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT- V: Implications of the above Holistic Understanding of Harmony on Professional Ethics.

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

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

TEXT BOOKS

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

REFERENCE BOOKS

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

Mapping of course outcomes with program outcomes

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

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

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

Year: II		Semester: II		Branch of Study: AI & ML			
COURSECODE	COURSETITLE			L	T	P	CREDITS
20APC3310	Artificial Intelligence Lab			0	0	3	1.5

COURSE OBJECTIVES:

This course is designed to:

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

COURSE OUTCOMES:

Upon the completion of Course, The student will be able to

CO1: Implement search algorithms

CO2: Solve Artificial Intelligence Problems

CO3: Develop the solutions using Backtracking

CO4: Design Chatbot

CO5: Implement basic problems by using NLTK(Natural Language Tool Kit)

List of Tasks

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

Reference Books:

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

Mapping of course outcomes with program outcomes

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

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

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

Year: II		Semester: II		Branch of Study: AI & ML		
COURSECODE	COURSETITLE	L	T	P	CREDITS	
20APC3312	Data Warehousing and Mining Lab (Common to: AIDS, AIML)	0	0	3	1.5	

COURSE OUTCOMES:

Upon the completion of Data warehousing and Mining practical course, the student will be able to:

CO1: Learn how to use different data mining tools.

CO2: Learn to execute data mining tasks using a data mining toolkit (Orange data mining tool kit) and visualize the results.

CO3: Understanding linear regression model in the orange environment.

CO4: Demonstrate the working of algorithms for data mining tasks such as association rule mining, classification and clustering.

CO5: Demonstrate the usage of Silhouettes.

Data Mining Experiments:

Weka Programs:

1. Create data in .csv and .arff formats to import in weka
2. Perform Data Preprocessing on a sample dataset - Discretization, Dimensionality Reduction, Data Transformation, Data Normalization
3. Perform Association Rule Mining and generate top 10 rules for supermarket.arff
4. Build a tree classifier on weather data to decide on the playing conditions.
5. Build a Naïve Bayes classifier on weather data to decide on the playing conditions.
6. Evaluate the performance of a classifier in knowledge flow environment.
7. Perform Clustering on any sample dataset on different algorithms and compare the results.
8. Using Experimenter in Simple mode, compare different classifiers with respect to the results generated for iris.arff.
9. Using Experimenter in advanced mode, demonstrate how to analyze the results from an experiment and the importance of statistical significance when interpreting results.
10. Plot Multiple ROC curves on a dataset using J48 and Random Forest Classifiers.
11. Perform training and testing of Naive Bayes incrementally. The results are sent to a TextViewer and predictions are plotted by a StripChart component.
12. Demonstrate how to Access a database using WEKA tool.
13. Use Knowledge flow canvas and develop a directed graph for C4.5 execution.

Data Warehousing Experiments:

Build Data Warehouse and Explore WEKA

A. Build a Data Warehouse/Data Mart (using open source tools like Pentaho Data Integration tool, Pentaho Business Analytics; or other data warehouse tools like Microsoft-SSIS, Informatica, Business Objects, etc.).

- (i). Identify source tables and populate sample data
- (ii). Design multi-dimensional data models namely Star, snowflake and Fact constellation schemas for any one enterprise (ex. Banking, Insurance, Finance, Healthcare, Manufacturing, Automobile, etc.).
- (iii). Write ETL scripts and implement using data warehouse tools
- (iv). Perform various OLAP operations such as slice, dice, roll up, drill up and pivot (v). Explore visualization features of the tool for analysis like identifying trends etc.

B. Explore WEKA Data Mining/Machine Learning Toolkit

- (i). Downloading and/or installation of WEKA data mining toolkit,
- (ii). Understand the features of WEKA toolkit such as Explorer, Knowledge Flow interface, Experimenter, command-line interface.
- (iii). Navigate the options available in the WEKA (ex. Select attributes panel, Preprocess panel, Classify panel, Cluster panel, Associate panel and Visualize panel)
- (iv). Study the arff file format
- (v). Explore the available data sets in WEKA.
- (vi). Load a data set (ex. Weather dataset, Iris dataset, etc.) (vii). Load each dataset and observe the following:
 - i. List the attribute names and their types
 - ii. Number of records in each dataset
 - iii. Identify the class attribute (if any)
 - iv. Plot Histogram
 - v. Determine the number of records for each class.
 - vi. Visualize the data in various dimensions

Perform data preprocessing tasks and Demonstrate performing association rule mining on data sets

- A. Explore various options available in Weka for preprocessing data and apply (like Discretization Filters, Resample filter, etc.) on each dataset
- B. Load each dataset into Weka and run Apriori algorithm with different support and confidence values. Study the rules generated.
- C. Apply different discretization filters on numerical attributes and run the Apriori association rule algorithm. Study the rules generated. Derive interesting insights and observe the effect of discretization in the rule generation process.

Demonstrate performing classification on data sets

- A. Load each dataset into Weka and run ID3, J48 classification algorithm. Study the classifier output. Compute entropy values, Kappa statistic.
- B. Extract if-then rules from the decision tree generated by the classifier, Observe the confusion matrix and derive Accuracy, F-measure, TPrate, FPrate, Precision and Recall values. Apply cross-validation strategy with various fold levels and compare the accuracy results.
- C. Load each dataset into Weka and perform Naïve-bayes classification and k- Nearest Neighbour classification. Interpret the results obtained.
- D. Plot RoC Curves
- E. Compare classification results of ID3, J48, Naïve-Bayes and k-NN classifiers for each dataset, and deduce which classifier is performing best and poor for each dataset and justify.

Demonstrate performing clustering on data sets

- A. Load each dataset into Weka and run simple k-means clustering algorithm with different values of k (number of desired clusters). Study the clusters formed. Observe the sum of squared errors and centroids, and derive insights.
- B. Explore other clustering techniques available in Weka.

- C. Explore visualization features of Weka to visualize the clusters. Derive interesting insights and explain.

Demonstrate performing Regression on data sets

- A. Load each dataset into Weka and build Linear Regression model. Study the clusters formed. Use Training set option. Interpret the regression model and derive patterns and conclusions from the regression results.
- B. Use options cross-validation and percentage split and repeat running the Linear Regression Model. Observe the results and derive meaningful results.
- C. Explore Simple linear regression technique that only looks at one variable

Resource Sites:

1. <http://www.pentaho.com/>
2. <http://www.cs.waikato.ac.nz/ml/weka/>

Orange Programs

Datasets to be used: (but not limited to)

1. brownselected.tab
2. heartdisease.tab
3. housing.tab
4. iris.tab
5. titanic.tab
6. zoo.tab

1. Installation of Orange Data mining Tool kit in Windows/Linux environment and creating basic workflows to read, process, and visualize the data. The visualization includes data table and scatter plots. Apply the task for all the 6 datasets and compare the results.
2. Demonstrate the usage of workflows in orange tool kit using widgets. Apply the task for all the 6 datasets and compare the results.
3. Demonstrate the visualization of widgets Box plot, Linear projection, and the data distributions by reading iris and heart disease datasets. Apply the task for all the other 4 datasets and compare the results.
4. Demonstrate the visualization of widgets scatter plot, line plot, bar plot by reading iris and heart disease datasets. Apply the task for all the other 4 datasets and compare the results.
5. Data Exploration using various widgets, understanding the data distributions and saving the results asHTML or PDF, or to a file that includes all workflows that are related to the report items and which you can later open in Orange. Apply the task for all the 6 datasets and compare the results.
6. Demonstrate the usage of loading the spreadsheets from the local computer and applying Data filtering and pre-processing to the given data. Apply the task for all the 6datasets and compare the results.
7. Loading the spreadsheets from the local computer and applying the classification model to the given data. Apply the task for all the 6 datasets and compare the results.
8. Demonstrate the usage of classification by reading heart disease data, and predict which persons have clogged arteries and visualize the results using tree viewer. Observe the information gain, information gain ratio and gini decrease measures.
9. Load a sailing.tab dataset that records the conditions under which a friend skipper went sailing, build a tree and visualize it in the Tree Viewer.
10. Demonstrate the usage of combination of classification tree viewer and scatter plot. Identify the best visualization of iris dataset, that is the one best separates the instances from different classes, then connect the tree viewer with scatter plot and visualize the results. Apply the task for all the other datasets and compare the results.
11. Apply principal component analysis on the given dataset as a pre-processing and compare the results. Applythe task for all the 6 datasets and compare the results.
12. Understanding the quality of the models by analysing the prediction results using classification accuracy. Apply the task for all the 6 datasets and compare the results.
13. Increasing the robustness of the models by splitting the dataset using cross-validation through the Test &Score widget. Apply the task for all the 6 datasets and compare the results.

References:

1. Zupan, Demsar,: Introduction to Data Mining; Introduction to Data Mining Working notes for the hands-on course with Orange Data Mining, May 2018
2. Orange Data Mining Library Documentation Release 3 – Orange Data mining

Mapping of course outcomes with program outcomes

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

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

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

Year: II	Semester: II	Branch of Study: AI & ML			
COURSECODE	COURSETITLE	L	T	P	CREDITS
20APC3314	Operating Systems Lab (Common to: CSE, CIC, AIDS, AIML, CSE(DS))	0	0	3	1.5

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

CO1: Ensure the development of applied skills in operating systems related areas.

CO2: Able to write software routines modules or implementing various concepts of operating system.

List of Tasks

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

Reference Books:

1. -Operating System Concepts, Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Eighth edition, John Wiley, 2018.
2. -Operating Systems: Internals and Design Principles, Stallings, Sixth Edition- 2009, Pearson Education
3. -Modern Operating Systems, Andrew S Tanenbaum, Second Edition, PHI.
4. -Operating Systems, S.Haldar, A.A.Aravind, Pearson Education.
5. -Principles of Operating Systems, B.L.Stuart, Cengage learning, India Edition.2013-2014
6. -Operating Systems, A.S.Godbole, Second Edition, TMH.
7. -An Introduction to Operating Systems, P.C.P. Bhatt, PHI.

Online Learning Resources/Virtual Labs:

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

Mapping of course outcomes with program outcomes

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

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

AIITS TPT - AIML

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

Year: II

Semester: II

Branch of Study: AI & ML

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20ASC3302	Server Side Scripting (Common to: CSE, CIC, AIDS, AIML)	1	0	2	2

COURSE OBJECTIVES:

- To learn about Java, HTML, DHTML concepts.
- To know about server side programming
- To gain the Knowledge of XML and its applications

COURSE OUTCOMES:

CO1: Learn the installation guide of MYSQL, XAMPP5, APACHE and PHP

CO2: Able to design code for simple dynamic web pages

CO3: Design PHP and SQL/MySQL Integration.

CO4: Design Basic Projects

CO5: Able to provide protection to web server

UNIT-1: Getting Up and Running, PHP Language Structure

Getting Up and Running: Installation Quick Start Guide with XAMPP5 - Installing and Configuring MySQL - Installing and Configuring Apache - Installing and Configuring PHP -

PHP Language Structure: The Building Blocks of PHP - Flow Control Functions in PHP - Working with Functions - Working with Arrays - Working with Objects

1. Installation of XAMPP server
2. Write PHP code to print Hello World program
3. Demonstrate 8 basic data types in PHP.
4. Demonstrate the scope of variables declared in PHP code.
5. Demonstrate Arithmetic, Comparison, Logical (or Relational), Assignment and Conditional (or ternary) Operators.
6. Demonstrate if, elseif ...else and switch statements.
7. Demonstrate for, while, do – while, and for each loop.
8. Write code to create and access numeric arrays.
9. Demonstrate the usage of associative arrays.
10. Implement Multi-dimensional arrays
11. Create a multidimensional array of movies organized by genre. This should take the form of an associative array with genres as keys, such as Science Fiction, Action, Adventure, and so forth. Each of the array's elements should be an array containing movie names, such as Alien, Terminator 3, Star Wars, and so on. After creating your arrays, loop through them, printing the name of each genre and its associated movies.
12. Create a function that accepts four string variables and returns a string that contains an HTML table element, enclosing each of the variables in its own cell.
13. Create a class called baseCalc() that stores two numbers as properties. Next, create a calculate() method that prints the numbers to the browser.
14. Create classes called addCalc(), subCalc(), mulCalc(), and divCalc() that inherit functionality from baseCalc() but override the calculate() method and print appropriate totals to the browser.

UNIT -2: Getting Involved with the Code,

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

1. Create a feedback form that accepts a user's full name and an email address. Use case-conversion functions to capitalize the first letter of each name the user submits and print the result back to the browser. Check that the user's email address contains the @ symbol and print a warning otherwise.
2. Create an array of doubles and integers. Loop through the array, converting each element to a floating-point number with a precision of 2. Right-align the output within a field of 20 characters.
3. Create a birthday countdown script. Given form input of month, day, and year, output a message that tells the user how many days, hours, minutes, and seconds until the big day.
4. Create a calculator script that enables the user to submit two numbers and choose an operation (addition, multiplication, division, or subtraction) to perform on them.

5. Use hidden fields with the script you created in activity 1 to store and display the number of requests that the user submitted.
6. Create a script that uses session functions to track which pages in your environment the user has visited.
7. Create a new script that will list for the user all the pages he/she has visited within your environment, and when.
8. Create a form that accepts a user's first and second name. Create a script that saves this data to a file.
9. Create a script that reads the data file you created in the first activity. In addition to writing its contents to the browser (adding a tag to each line), print a summary that includes the number of lines in the file and the file's size.
10. Draw a New Image, shapes and lines.
11. Create a New Image with Color Fills.
12. Draw A Basic Pie Chart and 3D Pie Chart
13. Creating a New Image from an Existing Image.
14. Creating an Image from User Input.
15. Creating an Image with Custom Font and Text

UNIT -3: PHP with database connectivity

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

1. to open and close a database connection.
2. to select a database. to select a database.
3. to create a table
4. to drop a database.
5. to drop a table
6. to insert record into employee table.
7. take input using HTML Form and insert records into table.
8. to display all the records from employee table.
9. to display all the records from employee table using `mysql_fetch_assoc()` function.
10. to display all the records from employee table using `MYSQL_NUM` argument.
11. to release cursor memory at the end of `SELECT` statement.
12. to display 10 records per page.
13. to take user input of employee ID and update employee salary.
14. to take user input of employee ID and delete an employee record from employee table.
15. Use `SELECT INTO OUTFILE` query for creating table backup.

UNIT -4: Basic Projects

Managing a Simple Mailing List - Creating an Online Address Book - Creating a Simple Discussion Forum - Creating an Online Storefront - Creating a Shopping Cart Mechanism - Creating a Simple Calendar - Restricting Access to Your Applications - Logging and Monitoring Web Server Activity - Application Localization - Working with XML and JSON

1. Common Functions in an Included File
2. Subscribe and Unsubscribe with `manage.php`
3. Send Mail to Your List of Subscribers
4. Modify the `manage.php` script to display the user's email as part of the response message for any action that is taken.
5. Modify the `sendmymail.php` script to add additional form fields that will correspond to section headings in the message string itself. Remember that when the form is submitted, those strings will have to be concatenated into one message string that is sent to the `mail()` function.

UNIT -5: Administration and Fine-Tuning

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

Text Books:

1. Sams Teach Yourself PHP, MySQL and Apache All in One, by Julie C. Meloni, Pearson Education, Inc © 2012.
2. Beginning PHP6, Apache, MySQL Web Development, by Timothy Boronczyk, Elizabeth Naramore,

Reference Books:

1. Jason Gerner, Yann Le Scouarnec, Jeremy Stolz, Michael K. Glass, Wiley Publishing, Inc © 2009
2. PHP 6 and MySQL 6 Bible, by Steve Suehring, Tim Converse, Joyce Park, Wiley Publishing, Inc © 2009.
3. PHP & MySQL Web Development All-in-One Desk Reference For Dummies, by Janet Valade with Tricia Ballard and Bill Ballard, Wiley Publishing, Inc © 2008.

Online Learning Resources:

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

Mapping of course outcomes with program outcomes

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

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

AIATS TPT - AIML

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI (AUTONOMOUS)

B. Tech - Artificial Intelligence & Machine Learning

Semester V (Third year)

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P				
1	PC	20APC3315	Computer Networks & Cryptography	3	0	0	3	30	70	100
2	PC	20APC3316	Machine Learning	3	0	0	3	30	70	100
3	PC	20APC3317	Formal Languages And Automata Theory	3	0	0	3	30	70	100
4	OE - 1	20AOE9925	Deterministic and Stochastic Statistical Methods	3	0	0	3	30	70	100
		20AOE0303	Optimization and Techniques	3	0	0				
		20AOE0552	Internet of Things	3	0	0				
5	PE - 1	20APE3301	Big Data Technologies	3	0	0	3	30	70	100
		20APE3302	Real Time Operating Systems	3	0	0				
		20APE3303	Distributed Computing	3	0	0				
		20APE3304	Ethics And Privacy In AI	3	0	0				
6	PC Lab	20APC3318	Computer Networks & Cryptography Lab	0	0	3	1.5	30	70	100
7	PC Lab	20APC3319	Machine Learning Lab	0	0	3	1.5	30	70	100
8	SC	20ASC3303	Conversational AI/ AI Chatbot	1	0	2	2	100	0	100
9	MC	20AMC9901	Biology for Engineers	3	0	0	0	30	0	30
10	CSP	20CSP3301	Evaluation of Community Service Project	0	0	0	1.5	100	0	100
			Total credits				21.5	440	490	930

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

Year: III		Semester: I		Branch of Study: AI & ML			
COURSE CODE	COURSE TITLE	L	T	P	CREDITS		
20APC3315	Computer Networks & Cryptography	3	0	0	3		

Course Outcomes:

After Completion of this course, the student will be able to:

- CO1:** Understand the basics of data communications and networking
- CO2:** Classify the functionalities of two sub layers of Data link Layer
- CO3:** Know briefly about Network Layer through algorithms and protocols
- CO4:** Distinguish the services provided by Transport Layer
- CO5:** Recognize the services offered by Application Layer to the user

Unit -1:

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

Unit -2:

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

Unit -3:

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

Unit -4:

The Transport Layer: The Transport Service, Elements of Transport Protocols, Congestion Control, The internet transport protocols: UDP, TCP, Performance problems in computer networks, Network performance measurement.
The Application Layer: Introduction, Client-Server Programming, WWW and HTTP, FTP, e-mail, TELNET, Secure Shell, Domain Name System, SNMP

Unit -5:

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks.
Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques.
E-Mail Security: Pretty Good Privacy, S/MIME. **IP Security:** IP Security overview, IP Security architecture.

Text Books:

1. Data communications and networking, Behrouz A. Forouzan, Mc Graw Hill Education, 5th edition, 2017.
2. Computer Networks, Andrew S. Tanenbaum, Wetherall, Pearson, 5th edition, 2011.
3. William Stallings, "Cryptography and Network Security", 7th Edition, Pearson Education, 2016.

References:

1. Data Communication and Networks, Bhushan Trivedi, Oxford, 2016
2. Internetworking with TCP/IP – Principles, protocols, and architecture - Volume 1, Douglas E. Comer, 5th edition, PHI, 2015
3. Computer Networks, 5E, Peterson, Davie, Elsevier.
4. Introduction to Computer Networks and Cyber Security, Chawan- Hwa Wu, Irwin, CRC Publications.
5. Computer Networks and Internets with Internet Applications, Comer.

Mapping of course outcomes with program outcomes

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

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

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

Year: III		Semester: I		Branch of Study: AI & ML		
COURSE CODE	COURSE TITLE	L	T	P	CREDITS	
20APC3316	Machine Learning	3	0	0	3	

Course Outcomes

CO1: Ability to understand what is learning and why it is essential to the design of intelligent machines.

CO2: Ability to design and implement various machine learning algorithms in a wide range of real-world applications.

CO3: Acquire knowledge deep learning and be able to implement deep learning models for language, vision, speech, decision making, and more

CO4: Ability to demonstrate feature selection and dimensionality reduction

CO5: Ability to solve decision making problems using SVM(Support Vector Machines) and graphical models

UNIT - 1:

What is Machine Learning?, Examples of machine learning applications,

supervised Learning: learning a class from examples, Vapnik- Chervonenkis dimension, probably approximately correct learning, noise, learning multiple classes, regression, model selection and generalization, dimensions of a supervised machine learning algorithm.

Decision Tree Learning: Introduction, Decisions Tree representation, Appropriate problems for decision tree learning, the basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, issues in decision tree learning,

Artificial Neural Networks: Introduction, Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithm, Remarks on the BACKPROPAGATION Algorithm, An illustrative Example: Face Recognition, Advanced Topics in Artificial Neural Networks.

UNIT - 2:

Evaluating Hypotheses: Motivation, Estimating hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, differences in error of two hypothesis, comparing learning algorithms,

Bayesian Learning: Introduction, Bayes Theorem, Bayes Theorem and Concept Learning, Maximum Likelihood and least squared error hypothesis, Maximum Likelihood hypothesis for predicting probabilities, Minimum Description Length Principle, Bayes Optimal Classifier, Gibbs Algorithm , Naïve Bayes Classifier , Bayesian Belief Network, EM Algorithm

UNIT - 3:

Dimensionality Reduction: Introduction, Subset selection, principle component analysis, feature embedding, factor analysis, singular value decomposition and matrix factorization, multidimensional scaling, linear discriminant analysis, canonical correlation analysis, Isomap, Locally linear embedding, laplacian eigenmaps,

Clustering: Introduction, Mixture densities, K- Means clustering, Expectations- Maximization algorithm, Mixture of latent variable models, supervised learning after clustering, spectral clustering, Hierarchical clustering, Choosing the number of clusters.

UNIT - 4:

Linear Discrimination: Introduction, Generalizing the linear model, geometry of the linear discrimination, pair wise separation, parametric discrimination revisited, gradient descent, logistic discrimination, discrimination by regression, learning to rank,

Multilayer Perceptrons: Introduction, the perceptron, training a perceptron, learning Boolean functions, multilayer perceptrons, MLP as a universal approximator, Back propagation algorithm, Training procedures, Tuning the network size, Bayesian view of learning, dimensionality reduction, learning time, deep learning

UNIT - 5:

Kernel Machines: Introduction, Optimal separating hyperplane, the non separable case: Soft Margin Hyperplane, v-SVM, kernel Trick, Vectorial kernels, defining kernels, multiple kernel learning, multicast kernel machines, kernel machines for regression, kernel machines for ranking, one-class kernel machines, large margin nearest neighbor classifier, kernel dimensionality reduction,

Graphical models: Introduction, Canonical cases for conditional independence, generative models, d separation, belief propagation, undirected Graphs: Markov Random files, Learning the structure of a graphical model, influence diagrams.

Text Books:

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

Reference Books:

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

Mapping of course outcomes with program outcomes

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

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

AIITS TPT - AIML

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

Year: III

Semester: I

Branch of Study: AI & ML

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC3317	Formal Languages And Automata Theory (Common to: CSE, AIML)	3	0	0	3

COURSE OUTCOMES:

After completion of the course, students will be able:

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

UNIT - 1: Introduction to Finite Automata

Introduction: Alphabet, languages and grammars, productions and derivation, Chomsky hierarchy of languages.

Finite Automata: An Informal picture of Finite Automata, Deterministic Finite Automata (DFA), Non Deterministic Finite Automata (**NFA**), Finite Automata with Epsilon transitions (ϵ -NFA or NFA- ϵ), Finite Automata with output, Conversion of one machine to another, Minimization of Finite Automata, Myhill- Nerode Theorem.

UNIT - 2: Regular Language

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

UNIT - 3: Context Free Grammars and Languages

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

UNIT- 4: Push Down Automata

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

UNIT - 5: Turing Machines and Undecidability

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

Text Books:

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

References

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

Online Learning Resources:

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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	2	3	2									2	
CO2	3	3												
CO3	3	3												
CO4	2	3	3										2	
CO5	3	3	3	3									2	2

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

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

Year: III		Semester: I			Branch of Study: AI & ML		
COURSE CODE	COURSE TITLE			L	T	P	CREDITS
20AOE9925	Deterministic and Stochastic Statistical Methods (Common to: CSE, AIDS, AIML)			3	0	0	3

Course Outcomes:

After completion of the course, students will be able to

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

UNIT - 1: Data Representation

9Hrs

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

UNIT - 2: Single Variable Distribution

9Hrs

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

UNIT - 3: Stochastic Processes and Markov Chains

9Hrs

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

UNIT - 4: Multivariate Distribution Theory

10Hrs

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

UNIT - 5: Optimization

8hrs

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

Text Books:

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

Reference Books:

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

Mapping of course outcomes with program outcomes

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

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

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

Year: III		Semester: I		Branch of Study: AI & ML			
COURSE CODE	COURSE TITLE	L	T	P	CREDITS		
20AOE0303	Optimization Techniques (Common to: CSE, CIC, AIDS, AIML)	3	0	0	3		

Course Outcomes

CO1: Explain the need of optimization of engineering systems

CO2: Understand optimization of electrical and electronics engineering problems

CO3: Apply classical optimization techniques, linear programming, simplex algorithm, transportation problem

CO4: Apply unconstrained optimization and constrained non-linear programming and dynamic programming

CO5: Formulate optimization problems.

UNIT - 1:

9 hrs

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

UNIT - 2:

9 hrs

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

UNIT - 3:

9 hrs

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

UNIT - 4:

9 hrs

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

UNIT - 5:

9 hrs

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

Text Books:

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

Reference Books:

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

Online Learning Resources:

https://www.youtube.com/watch?v=gw_ZEUjI9KM&list=PLYihddLF-CgZGDFVwB1v699kv14FMeAr-

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
C01	2													
C02		1												
C03				3										
C04		3												
C05	2													

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

AIITS TPT - AIML

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

Year: III		Semester: I		Branch of Study: AI & ML			
COURSE CODE	COURSE TITLE	L	T	P	CREDITS		
20AOE0552	Internet of Things (Common to: AIDS, AIML)	3	0	0	3		

Course Outcomes

- CO1:** Able to understand the applications of IOT
- CO2:** Able to understand build blocks of IOT
- CO3:** Apply IOT design methodologies
- CO4:** Able to understand the HADOOP and IEEE standard protocol
- CO5:** Able to understand the Zigbee devices

UNIT-1:

Introduction, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies. Domain Specific IoTs Introduction, Home Automation, cities, Environment, Retail, Agriculture, Industry, Health & Lifestyle.

UNIT-2:

Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT. IoT System Management with NETCONF-YANG Need for IoT Systems Management, Simple Network Management Protocol (SNMP), Network Operator requirements, NETCONF, YANG, IoT System Management with NETCONF-YANG.

UNIT-3:

Introduction, IoT Design Methodology, Case Study on IoT System for Weather Monitoring. Case Studies Illustrating IoT Design: Introduction, Home Automation, Cities, Environment, Agriculture, Productivity Applications.

UNIT-4:

Introduction, Apache Hadoop, Using Hadoop Map Reduce for Batch Data Analysis. IEEE 802.15.4: The IEEE 802 committee family of protocols, The physical layer, The Media Access control layer, Uses of 802.15.4, The Future of 802.15.4: 802.15.4e and 802.15.4g.

UNIT-5:

Development of the standard, ZigBee Architecture, Association, The ZigBee network layer, The ZigBee APS Layer, The ZigBee Devices Object (ZDO) and the ZigBee Device Profile (ZDP), Zigbee Security, The ZigBee Cluster Library (ZCL), ZigBee Applications profiles, The ZigBee Gateway Specifications for network devices.

Text Books:

1. Internet of Things a Hands-on Approach by Arshdeep Bahga and Vijay Madiseti. University Press.
2. The Internet of Things key applications and protocols by Oliver Hersent, David Boswarthick and Omar elloumi, Wiley Student Edition.

Reference Books:

1. Internet of Things: Architecture, Design Principles and Applications by Raj Kamal MCGraw Hill Edition.

Mapping of course outcomes with program outcomes

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

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

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

Year: III	Semester: I	Branch of Study: AI & ML			
COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APE3301	Big Data Technologies (Common to: AIDS, AIML)	3	0	0	3

Course Outcomes:

After completion of the course, students will be able:

- CO1:** To Understand the elements of Big data
- CO2:** To Use different technologies to tame Big Data
- CO3:** To Process Given data using Map Reduce
- CO4:** To Test & Debug map reduce applications
- CO5:** To Develop applications using Hive, NoSQL.

UNIT - 1:

Getting an Overview of Big Data: Introduction to Big Data, Structuring Big Data, Elements of Big Data, Big Data Analytics. Exploring the use of Big Data in Business Context Use of Big Data in Social Networking, Use of Big Data Preventing Fraudulent Activities, Use of Big Data in Retail Industry

UNIT - 2:

Introducing Technologies for Handling Big Data Distributed and Parallel Computing for Big Data, Introducing Hadoop, Cloud Computing and Big Data, In-memory Computing Technology for Big Data.

Understanding Hadoop Ecosystem Hadoop Ecosystem, Hadoop Distributed File System, Map Reduce, Hadoop YARN, Introducing HBase, Combining HBase and HDFS, Hive, Pig and Pig Latin, Sqoop, ZooKeeper, Flume, Oozie.

UNIT - 3:

Understanding Map Reduce Fundamentals and H Base The Map Reduce Framework, Techniques to Optimize Map Reduce Jobs, Uses of Map Reduce, Role of H Base in Big Data Processing. Processing Your Data with Map Reduce Recollecting the Concept of Map Reduce Framework, Developing Simple Map Reduce Application, Points to Consider while Designing Map Reduce.

UNIT - 4:

Customizing Map Reduce Execution and Implementing Map Reduce Program Controlling Map Reduce Execution with Input Format, Reading Data with Custom Record Reader, Organizing Output Data with Output Formats, Customizing Data with Record Writer, Customizing the Map Reduce Execution in Terms of YARN, Implementing a Map Reduce Program for Sorting Text Data.

Testing and Debugging Map Reduce Application Debugging Hadoop Map Reduce Locally, Performing Unit Testing for Map Reduce Applications.

UNIT - 5:

Exploring Hive: Introducing Hive, Hive Service, Built-In Functions in Hive, Hive DDL, Data Manipulation in Hive, Data Retrieval Queries, Using JOINS in Hive.

NoSQL Data Management Introduction to NoSQL, Types of NoSQL Data Models, Schema-Less Databases, Materialized Views, Distribution Models, Sharding.

Text Books:

1. Big Data Black Book, DT Editorial services ,Dreamtech Press

Reference Books:

1. Data Science for Business by F. Provost and T. Fawcett, O'Reilly Media.
2. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced
3. Hadoop: The Definitive Guide by Tom White, O'Reilly Media.
4. Big Data and Business Analytics by Jay Liebowitz, Auerbach Publications, CRC Press.

Mapping of course outcomes with program outcomes

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

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

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

Year: III

Semester: I

Branch of Study: AI & ML

COURSE CODE	COURSE TITLE	Branch of Study: AI & ML			CREDITS
		L	T	P	
20APE3302	Real Time Operating Systems	3	0	0	3

COURSE OUTCOMES:

After completion of the course, students will be able:

CO1: Characterize real-time systems and describe their functions.

CO2: Design and implement a real-time system.

CO3: Apply formal methods to the analysis and design of real-time systems.

CO4: Apply formal methods for scheduling real-time systems.

CO5: Characterize and describe reliability and fault tolerance issues and approaches.

UNIT - I

Typical Real time Applications: Digital control, High-level control, Signal processing, other Real-time Applications.

Hard versus Soft Real-Time Systems: Jobs and processors, Release time, deadlines and Timing constraints, Hard and soft timing constraints, Hard Real time systems, Soft Real-time Systems.

A Reference Model of Real Time Systems: Processors and resources, Temporal parameters of Real time workload, periodic task model, precedence constraints and data dependency, Functional parameter, Resource Parameters of Jobs and Parameters of Resources, Scheduling Hierarchy.

Commonly used Approaches to real time Scheduling: Clock-Driven Approach, Weighted Round-Robin Approach, Priority driven Approach, Dynamic vs Static Systems, Effective release time and deadlines, Optimality of the EDF and LST algorithms, Nonoptimality of the EDF and LST algorithms, Challenges in validating timing constraints in priority driven System, Off line vs On line scheduling, summary.

UNIT - II

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

UNIT - III

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

UNIT - IV

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

UNIT - V

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

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

Textbooks:

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

Reference Books:

1. Real-Time Systems: Scheduling, Analysis, and Verification, Cheng, A. M. K.: Wiley, 2002.

2. Z.: Scheduling in Real-Time Systems, by Cottet, F., Delacroix, J., Kaiser, C., Mammeri John Wiley & Sons, 2002.

3. Real-Time Systems, C. M., Shin, K. G. McGraw-Hill, Krishna 1997.

Online Learning Resources:

https://www.youtube.com/watch?v=dHsHP9RrXBw&list=PLJ5C_6qdAvBH-JNRilupFb44miyx9M8JD

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2													
C02		3	2										3	3
C03		2	3										2	2
C04			3											2
C05	2													

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

AIITS TPT - AIMML

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

Year: III	Semester: I	Branch of Study: AI & ML			
COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APE3303	Distributed Computing	3	0	0	3

Course Outcomes:

After completion of the course, students will be able to :

- CO1:** To Explain the foundations of distributed systems.
- CO2:** To Solve synchronization and state consistency problems.
- CO3:** To Use resource sharing techniques in distributed systems.
- CO4:** To Apply working model of consensus and reliability of distributed systems.
- CO5:** To Explain the fundamentals of cloud computing.

UNIT - 1: INTRODUCTION

Introduction: Definition-Relation to Computer System Components – Motivation – Message - Passing Systems versus Shared Memory Systems – Primitives for Distributed Communication – Synchronous versus Asynchronous Executions – Design Issues and Challenges; A Model of Distributed Computations: A Distributed Program – A Model of Distributed Executions – Models of Communication Networks – Global State of a Distributed System.

UNIT - 2: LOGICAL TIME AND GLOBAL STATE

Logical Time: Physical Clock Synchronization: NTP – A Framework for a System of Logical Clocks – Scalar Time – Vector Time; Message Ordering and Group Communication: Message Ordering Paradigms – Asynchronous Execution with Synchronous Communication – Synchronous Program Order on Asynchronous System – Group Communication – Causal Order – Total Order; Global State and Snapshot Recording Algorithms: Introduction – System Model and Definitions – Snapshot Algorithms for FIFO Channels.

UNIT - 3: DISTRIBUTED MUTEX AND DEADLOCK

Distributed Mutual exclusion Algorithms: Introduction – Preliminaries – Lamport’s algorithm – Ricart- Agrawala’s Algorithm – Token-Based Algorithms – Suzuki-Kasami’s Broadcast Algorithm; Deadlock Detection in Distributed Systems: Introduction – System Model – Preliminaries – Models of Deadlocks – Chandy-Misra-Haas Algorithm for the AND model and OR Model.

UNIT - 4: CONSENSUS AND RECOVERY

Consensus and Agreement Algorithms: Problem Definition – Overview of Results – Agreement in a Failure-Free System(Synchronous and Asynchronous) – Agreement in Synchronous Systems with Failures; Checkpointing and Rollback Recovery: Introduction – Background and Definitions – Issues in Failure Recovery – Checkpoint-based Recovery – Coordinated Checkpointing Algorithm -- Algorithm for Asynchronous Checkpointing and Recovery

UNIT - 5: CLOUD COMPUTING

Definition of Cloud Computing – Characteristics of Cloud – Cloud Deployment Models – Cloud Service Models – Driving Factors and Challenges of Cloud – Virtualization – Load Balancing – Scalability and Elasticity – Replication – Monitoring – Cloud Services and Platforms: Compute Services – Storage Services – Application Services

Text Books:

1. Kshemkalyani Ajay D, Mukesh Singhal, “Distributed Computing: Principles, Algorithms and Systems”, Cambridge Press, 2011.
2. Mukesh Singhal, Niranjan G Shivaratri, “Advanced Concepts in Operating systems”, McGraw Hill Publishers, 2001.

Reference Books:

1. George Coulouris, Jean Dollimore, Time Kindberg, “Distributed Systems Concepts and Design”, Fifth Edition, Pearson Education, 2012.
2. Pradeep L Sinha, “Distributed Operating Systems: Concepts and Design”, Prentice Hall of India, 2007.
3. Tanenbaum A S, Van Steen M, “Distributed Systems: Principles and Paradigms”, Pearson Education, 2007.
4. Liu M L, “Distributed Computing: Principles and Applications”, Pearson Education, 2004.
5. Nancy A Lynch, “Distributed Algorithms”, Morgan Kaufman Publishers, 2003.
6. Arshdeep Bagga, Vijay Madiseti, “ Cloud Computing: A Hands-On Approach”, Universities Press, 2014.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	2	3	3	1				2	1	3	3	2	2
C02	1	3	2	1	2				2	2	2	2	2	2
C03	2	2	1	3	3				3	2	1	1	2	2
C04	1	2	2	3	1				3	3	3	1	2	2
C05	3	3	1	2	3				3	3	3	1	2	2

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

AIITS TPT - AIML

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

Year: III	Semester: I	Branch of Study: AI & ML			
COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APE3304	Ethics And Privacy In AI	3	0	0	3

Course Outcomes:

After completion of the course, students will be able :

CO1: To Understand the ethical issues in the development of AI agents

CO2: To Learn the ethical considerations of AI with perspectives on ethical values

CO3: To Apply the ethical policies in AI based applications and Robot development

CO4: To implement the AI concepts to societal problems by adapting the legal concepts by securing fundamental rights.

CO5: To This study will help to overcome the evil genesis in the concepts of AI.

UNIT - 1: Introduction, What Do We Need to Understand About Ethics?

Introduction: Artificial Intelligence and Ethics, Why Ethics in AI? Why Now? Current Initiatives in AI and Ethics, Codes of Ethics in Context: Other Approaches to Ethical Questions in AI What Do We Need to Understand About Ethics?: A Preliminary Plea: Ethics Is Not About ' Banning' Things, Normative Ethical Theories, Ethics and Empirical Evidence, So Why Do We Even Need Ethics?, So, With What Sort of Issues Is Ethics Concerned?, Who(orWhat) Is The Proper Object of Moral Concerns, and How Widely Should Our Concerns Extend?, Four Domains of Ethics: Self, Friend, Stranger, World, What Counts as Adequate Justification and Argument in Ethics?, Moral Relativism, Moral Justification and AI, A Distributed Morality?, MoralAgents, Moral Motivation, AI, Codes of Ethics and the Law

UNIT - 2: Does AI Raise Any Distinctive Ethical Questions? Codes of Professional Ethics

Does AI Raise Any Distinctive Ethical Questions? Methodology: Focusing in on Ethical Questions, Many Ethical Issues in AI Are Shared with Other Rapidly Developing Technology, Ethical Questions Arise from AI's Typical Use to Enhance, Supplement, or Replace the Work of Humans, We Also Need to Consider the Methods of Production of AI, Hype in AI and Implications for Methodology in Ethics Codes of Professional Ethics: Introduction: The Varieties of Ethical Codes, Professional Codes of Ethics Tend to Have Certain Commonalities, Codes of Ethics and Institutional Backing, The Context of Codes of Ethics, Can Codes of Ethics Make the Situation Worse? Yes

UNIT - 3: How AI Challenges Professional Ethics, Developing Codes of Ethics Amidst Fast Technological Change

How AI Challenges Professional Ethics: AI Professional Organisations and Companies, and the Nature of Its Development and Production, Gradients of Professional Power and Vulnerability in AI, A Third Layer of Complexity in Codes of Professional Ethics for AI: The Behaviour of Machines, The Authority of Any Resulting Codes.

Developing Codes of Ethics Amidst Fast Technological Change: Social, Cultural and Technological Change and Ethics, Social, Cultural, Economic and Technological Change: The Example of AI and Employment, Regulating for Whom? The Global Reach of AI, Universalism, and Relativism, Diversity in Participation as Part of the Solution.

UNIT - 4: Some Characteristic Pitfalls in Considering the Ethics of AI, and What to Do About Them, Some Suggestions for How to Proceed

Some Characteristic Pitfalls in Considering the Ethics of AI, and What to Do About Them: The Idealisation of Human and of Machine Agency, Building Ethics into AI and the Idealisation of Moral Agency, Replacing and Enhancing Human Agency, Boundaries and AI, Addressing the Increased Gradient of Vulnerability, Common Language, Miscommunication and the Search for Clarity.

Some Suggestions for How to Proceed: Organisations and Codes, Procedures for Drawing Up and Implementing Codes, The Content of Codes, Thinking About Ethical Issues in Developing and Implementing Codes of Ethics, Asilomar AI Principles

UNIT - 5: An Introduction to Privacy Aspects of Information and Communication Technologies, Data Mining in Large Databases

Introduction, Privacy and the Internet, Privacy in Databases, Privacy in Ubiquitous Computing.

Data Mining in Large Databases — Strategies for Managing the Trade-Off Between Societal Benefit and Individual Privacy: Introduction, Examples of data-collecting institutions and data users, Strategies for controlling privacy, Measures of the utility of published data sets and outputs.

Text Books:

1. Paula Boddington, "Towards a Code of Ethics for Artificial Intelligence", Springer.
2. Agusti Solanas & Antoni Martínez-Ballesté "Advances in Artificial Intelligence for Privacy Protection and Security" World Scientific

Reference Books:

1. "Oxford Handbook of Ethics of AI", Markus D. Dubber, Frank Pasquale, Sunit Das, Oxford University Press.

Online Learning Resources:

1. Coursera: Ethics of Artificial Intelligence
2. Coursera: Artificial Intelligence Privacy and Convenience

Mapping of course outcomes with program outcomes

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

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

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

Year: III

Semester: I

Branch of Study: AI & ML

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC3318	Computer Networks & Cryptography Lab	0	0	3	1.5

Course Outcomes (CO):

After completion of the course, students will be able:

CO1: To Deal with Error detection/ correction techniques.

CO2: To Simulate Data link layer protocols.

CO3: To Simulate Network layer protocols.

CO4: To Implement Congestion Control Algorithms.

CO5: To Implement the Cipher techniques.

List of Experiments:

1. Implementation of Error Detection / Error Correction Techniques
2. Implementation of Stop and Wait Protocol and sliding window
3. Implementation and study of Goback-N and selective repeat protocols
4. Implementation of High Level Data Link Control
5. Write a socket Program for Echo/Ping/Talk commands.
6. To create scenario and study the performance of network with CSMA / CA protocol and compare with CSMA/CD protocols.
7. Implementation of Link state routing algorithm
8. Implement the data link layer framing methods such as character, character-stuffing and bitstuffing.
9. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP
10. Develop a simple data link layer that performs the flow control using the sliding window protocol, and Loss recovery using the Go-Back-N mechanism.
11. Implement Dijkstra's algorithm to compute the shortest path through a network
12. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
13. Implement distance vector routing algorithm for obtaining routing tables at each node.
14. Write a program for congestion control using Leaky bucket algorithm.
15. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should XOR each character in this string with 0 and displays the result.
16. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should AND or and XOR each character in this string with 127 and display the result.
17. Write a Java program to perform encryption and decryption using the following algorithms
 - a. Ceaser cipher
 - b. Substitution cipher
 - c. Hill Cipher

References:

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

Online Learning Resources/Virtual Labs:

https://onlinecourses.nptel.ac.in/noc21_cs16/preview

Mapping of course outcomes with program outcomes

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

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

AIITS TPT - AIMML

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

Year: III

Semester: I

Branch of Study: AI & ML

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC3319	Machine Learning Lab	0	0	3	1.5

COURSE OUTCOMES:**CO1:** Implement procedures for the machine learning algorithms**CO2:** Design Python programs for various Learning algorithms**CO3:** Apply appropriate data sets to the Machine Learning algorithms**CO4:** Identify and apply Machine Learning algorithms to solve real world problems**List of Experiments:**

- Exercises to solve the real-world problems using the following machine learning methods:
 - Linear Regression
 - Logistic Regression.
- Write a program to Implement Support Vector Machines.
- Exploratory Data Analysis for Classification using Pandas and Matplotlib.
- Implement a program for Bias, Variance, and Cross Validation.
- Write a program to simulate a perception network for pattern classification and function approximation.
- Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
- Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
- Write a program to implement the naïve Bayesian classifier for Iris data set. Compute the accuracy of the classifier, considering few test data sets.
- Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
- Apply EM algorithm to cluster a Heart Disease Data Set. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
- Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.
- Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.
- For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
- Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

15. Solve optimal relay coordination as a linear programming problem using Genetic Algorithm.

Text Books:

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

Reference Books:

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

Mapping of course outcomes with program outcomes

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

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES:: TIRUPATI AUTONOMOUS)**Year: III****Semester: I****Branch of Study: AI & ML**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20ASC3303	Conversational AI / AI Chatbot (Common to: AIDS, AIML)	1	0	2	2

COURSE OUTCOMES:

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

CO1: Develop a fair understanding of AI applications and to know where and how to apply these tools to improve productivity.

CO2: Understand AI as a tool pretty much like they treat calculator as a tool for simple calculation

CO3: Apply methods for different training and testing assistance

CO4: Design classifier for voice assistants

CO5: Deploying Chatbot into the application

UNIT – 1:

Introduction to Chatbots, Setting Up the Developer Environment, What are chatbots? Journey of Chatbots, Rise of Chatbots, Messaging Platforms, Botframework, Local Installation

UNIT – 2:

Basics of Bot Building, Advanced Bot Building, Intents, Entities, Design principles, showing product results, saving messages, Building your own intent classifier

UNIT – 3:

Building Chatbots the easy way, Introduction to dialog flow, building a food ordering chatbot, deploying dialog flow chatbot on the web, Integrate dialog flow chatbot on Facebook messenger, Fulfilment

UNIT – 4:

Building Chatbots the hard way, What is Rasa NLU? Training and building a chatbot from scratch, Dialog management using Rasa core, writing custom actions of chatbot, Data preparing for training the bot, Testing the bot

UNIT – 5:

Deploying your chatbot, First steps, Rasa’s credential management, Deploying the chatbot on Facebook, Deploying the chatbot on slack, Deploying the chatbot on your own

Textbooks:

1. Rashid Khan, Anik Das “Build Better Chatbots”, Apress, 2018.
2. Sumit Raj “Building Chatbots with Python”, Apress, 2019.

Reference Books:

1. Conversational AI: Chatbots that workBy Andrew Freed,2021

Mapping of course outcomes with program outcomes

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

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

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

Year: III	Semester: I	Branch of Study: AI & ML			
COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AMC9901	Biology for Engineers (Common to: CSE, CIC, AIDS, AIML)	3	0	0	0

Course Outcomes

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

CO1: Explain about cells and their structure and function. Different types of cells and basics for classification of living Organisms.

CO2: Explain about biomolecules, their structure, function and their role in the living organisms. How biomolecules are useful in Industry.

CO3: Brief about human physiology.

CO4: Explain about genetic material, DNA, genes and RNA how they replicate, pass and preserve vital information in living Organisms.

CO5: Know about application of biological principles in different technologies for the production of medicines and pharmaceutical molecules through transgenic microbes, plants and animals.

UNIT - 1: Introduction to Basic Biology (10 hrs)

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

UNIT - 2: Introduction to Biomolecules (10 hrs)

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

UNIT - 3: Human Physiology (08 hrs)

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

UNIT - 4: Introduction to Molecular Biology and recombinant DNA Technology (08 hrs)

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

UNIT - 5: Application of Biology (10 hrs)

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

Text Books:

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

Reference Books:

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

Mapping of course outcomes with program outcomes

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

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

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

**B. Tech - Artificial Intelligence & Machine Learning
Semester VI (Third year)**

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P				
1	PC	20APC3320	Deep Learning Techniques	3	0	0	3	30	70	100
2	PC	20APC3321	Speech and Language Processing	3	0	0	3	30	70	100
3	PC	20APC3322	Big Data Analytics	3	0	0	3	30	70	100
4	PE - 2	20APE3304	Robotic Process Automation	3	0	0	3	30	70	100
		20APE3305	Automation of Model Building	3	0	0				
		20APE3306	Computer Vision	3	0	0				
5	PC Lab	20APC3323	Deep Learning Techniques Lab	0	0	3	1.5	30	70	100
6	PC Lab	20APC3324	Speech and Language Processing Lab	0	0	3	1.5	30	70	100
7	PC Lab	20APC3325	Big Data Analytics Lab	0	0	3	1.5	30	70	100
8	SC	20ASA0502	Soft Skills	1	0	2	2	100	0	100
9	MC	20AMC9904	Professional Ethics and Human Values	2	0	0	0	30	0	30
Total credits							21.5	340	490	830
Industrial/Research Internship (Mandatory) 2 Months during summer vacation										

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

Year: III

Semester: II

Branch of Study: AI & ML

Course Code	Deep Learning Techniques	L	T	P	C
20APC3320		3	0	0	3

Course Outcomes :

After completion of the course, students will be able:

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

UNIT - I A Review of Machine Learning

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

UNIT - II Foundations of Neural Networks and Deep Learning

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

UNIT - III Fundamentals of Deep Learning

Fundamentals of Deep Learning: Definition of Deep Learning, Common Architecture Principles of Deep Networks, Building Blocks of Deep Learning.

Architectures of Deep Learning: Unsupervised Pre trained Networks, Convolution Neural Networks (CNN's), Recurrent Neural Networks, and Recursive Neural Networks

UNIT - IV Deep Learning Research

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

UNIT - V Deep Generating Models

Deep Generating Models: Boltzmann Machines, Restricted Boltzmann Machines, Deep Belief Networks, Deep Boltzmann Machines, Convolution Boltzmann Machines, Backpropagation through Random Operations, Directed Generative Nets, Generating Static Networks.

Applications: Large Scale Deep Learning, Image Recognition, Speech Recognition, Natural Language Processing, Other Applications.

Textbooks:

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

Reference Books:

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

Mapping of course outcomes with program outcomes

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

Year: III

Semester: II

Branch of Study: AI & ML

Course Code	Speech and Language Processing	L	T	P	C
20APC3321		3	0	0	3

Course Outcomes :

After completion of the course, students will be able:

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

UNIT - I Introduction to Natural language

9 Hrs

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

UNIT - II Grammars and Parsing

9Hrs

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

UNIT - III Grammars for Natural Language

9 Hrs

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

UNIT - IV Semantic Interpretation

9 Hrs

Semantic Interpretation: Semantic & Logical form, Word senses & ambiguity, The basic logical form language, Encoding ambiguity in the logical Form, Verbs & States in logical form, Thematic roles, Speech acts & embedded sentences, Defining semantics structure model theory.

Language Modeling: Introduction, n-Gram Models, Language model Evaluation, Parameter Estimation, Language Model Adaption, Types of Language Models, Language-Specific Modeling Problems, Multilingual prediction.

UNIT - V Machine Translation Survey

9 Hrs

Machine Translation Survey: Introduction, Problems of Machine Translation, Is Machine Translation Possible, Brief History, Possible Approaches, Current Status. Anusaraka or Language Accessor: Background, Cutting the Gordian Knot, The Problem, Structure of Anusaraka System, User Interface, Linguistic Area, Giving up Agreement in Anusarsaka Output, Language Bridges.

Multilingual Information Retrieval: Introduction, Document Preprocessing, Monolingual Information Retrieval, CLIR, MLIR, Evaluation in Information Retrieval, Tools, Software and Resources.

Multilingual Automatic Summarization: Introduction, Approaches to Summarization, Evaluation, How to Build a Summarizer, Competitions and Datasets.

Textbooks:

1. Jurafsky D, Martin J H, Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition, 2nd edition, Pearson Education, 2013.
2. James Allen, Natural Language Understanding, 2nd Edition, 2003, Pearson Education.
3. Multilingual Natural Language Processing Applications : From Theory To Practice Daniel M. Bikel and Imed Zitouni, Pearson Publications.
4. Natural Language Processing, A paninian perspective, Akshar Bharathi, Vineet chaitanya, Prentice –Hall of India.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	2	2	2	2								3	2
CO2	3	3	2	2	2								3	2
CO3	2	3	2	2	2							2		3
CO4	3	2	3	2	1								2	
CO5	2	2											3	

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

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

Year: III		Semester: II			Branch of Study: AI & ML	
COURSE CODE	COURSE TITLE	L	T	P	CREDITS	
20APC3322	Big Data Analytics (Common to: AIDS, AIML)	3	0	0	3	

Course Outcomes:

After completion of the course, students will be able:

- CO1:** To Understand the concepts and challenges of big data
- CO2:** To Outline the operations viz. Collect, manage, store, query, and analyze various forms of big data.
- CO3:** To Apply large-scale analytic tools to solve some of the open big data problems.
- CO4:** To Analyze the impact of big data for business decisions and strategies.
- CO5:** To Design different big data applications.

UNIT - 1:

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

UNIT - 2:

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

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

UNIT - 3:

How MapReduce Works: Anatomy of a MapReduce, Job Run, Failures, Shuffle and Sort, Task Execution.

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

UNIT - 4:

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

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

UNIT - 5:

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

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

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

Text Books:

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

Reference Books:

1. Glenn J. Myatt, Making Sense of Data , John Wiley & Sons, 2007 Pete Warden,Big Data Glossary, O'Reilly, 2011.
2. Michael Berthold, David J.Hand, Intelligent Data Analysis, Spingers, 2007.
3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos,Uderstanding Big Data : Analytics for Enterprise Class Hadoop and Streaming Data, McGraw Hill Publishing, 2012.
4. Anand Rajaraman and Jeffrey David Uilman, Mining of Massive Datasets Cambridge University Press, 2012.

Mapping of course outcomes with program outcomes

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

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

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

Year: III

Semester: II

Branch of Study: AI & ML

Course Code		L	T	P	C
20APE3304	Robotic process Automation	3	0	0	3

Course Outcomes :

After completion of the course, students will be able:

- **CO1:** To Outline the benefits of RPA and various platforms available on the market.
- **CO2:** To Describe RPA, where it can be applied and how it's implemented.
- **CO3:** To Identify and understand different types of variables, Image, Text and Data Tables Automation.
- **CO4:** To Understand the Deployment of the Robot and to maintain the connection.
- **CO5:** To Explore the features of RPA.

UNIT - I RPA Foundations& RPA Skills

8Hrs

What Is RPA? Flavors of RPA History of RPA, The Benefits of RPA, The Downsides of RPA, RPA Compared to BPO, BPM, and BPA, Consumer Willingness for Automation, The Workforce of the Future. RPA Skills: On-Premise Vs. the Cloud, Web Technology, Programming Languages and Low Code, OCR (Optical Character Recognition), Databases, APIs (Application Programming Interfaces), AI (Artificial Intelligence), Cognitive Automation, Agile, Scrum, Kanban, and Waterfall, DevOps, Flowcharts

UNIT - II Process Methodologies & Planning

9Hrs

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

UNIT - III RPA Vendor Evaluation & Center of Excellence (CoE)

8 Hrs

Be Realistic, Check Out Third Parties, Minimum Capabilities, Who Is the User?, Funding, Ecosystem, Costs, Training and Education, Support, Best-of-Breed vs. End-to-End, Thought Leadership and Vision, Industry Expertise, Security, Monitoring, and Deployment, What Type of RPA?, The Design, Next-Generation Technologies Center of Excellence (CoE): What Is the CoE? Why Have a CoE? Forming the Team, Business Analyst, Developer, RPA Solution Architect, RPA Supervisor, What Should a CoE Do? Communication, Change Management, CoE Case Study: Intuit

UNIT - IV Bot Development, Deployment and Monitoring & Data Preparation

10 Hrs

Preliminaries, Installation of UiPath, Getting Started, Activities, Flowcharts and Sequences, Log Message, Variables, Loops and Conditionals, For Each Loop, Do While Loop and While Loop, IF/THEN/ELSE Conditionals, Switch, Debug, Common UiPath Functions, The UiPath Orchestrator, Best Practices for Bot Development Deployment and Monitoring: Testing, Going into Production, Monitoring, Security, Scaling Data Preparation: Types of Data, Big Data, The Issues with Big Data, The Data Process, Types of Algorithms, The Perils of the Moonshot, Bias

UNIT - V Open Source RPA, Process Mining & Future of RPA

9 Hrs

What Is Open Source Software?, The Business Model of Open Source?, The Pros and Cons of Open Source Software, Open RPA, UI. Vision, Robot Framework, Robocorp, Orchestra, TagUI Process Mining: Old Way Vs. Process Mining, Backgrounder on Process Mining, How Process Mining Works, Celonis, ProM, Signavio, Fluxicon, ABBYY, The Future of Process Mining Future of RPA: Consolidation and IPOs, Microsoft, Attended Automation, Vertical-Specific Companies, Hype Factor, Software-as-a-Service (SaaS) and Open Source, Chatbots, Artificial Intelligence, Privacy and Ethics.

Textbooks:

1. Tom Taulli, "The Robotic Process Automation Handbook", Apress, 2020

Reference Books:

1. Alok Mani Tripathi, "Learning Robotic Process Automation", March 2018
2. Robotic process and Cognitive Automation by, Mary C Lacity & Leslie P Willcocks, 2018.

Online Learning Resources:

1. <https://www.uipath.com/rpa/robotic-process-automation>
2. <https://www.academy.uipath.com>

Mapping of course outcomes with program outcomes

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

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

AIITS TPT - AIMML

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

Year: III

Semester: II

Branch of Study: AI & ML

Course Code	Automation of Model Building	L	T	P	C
20APE3305		3	0	0	3

Course Outcomes :

After completion of the course, students will be able:

- **CO1:** To acquire, demonstrate and apply advanced knowledge in the area of Automation engineering.
- **CO2:** To identify problems in the field of Automation engineering, formulate them and solve by using advanced techniques.
- **CO3:** To Apply engineering and scientific principles for the effective management of Automation systems.
- **CO4:** To Explore Hyper parameter optimization techniques.
- **CO5:** To create data science projects.

UNIT - I

9Hrs

Introduction to AutoML: Scope of machine learning, what is AutoML? Why use AutoML and how does it help? When do you automate ML? What will you learn? Core components of AutoML system, Building prototype subsystems for each component. Putting it all together as end & end AutoML System Overview of AutoML libraries.

UNIT - II

9Hrs

Introduction to Machine Learning Using Python: Technical requirements, Machine learning, Linear regression, What is linear regression? important evaluation metrics regression algorithms, Logistic regression, Important evaluation metrics, classification algorithms, Decision trees, Support Vector Machines, k-Nearest Neighbours, Ensemble methods, Comparing the results of classifiers, Crossvalidation: Clustering.

UNIT - III

9 Hrs

Data Preprocessing: Technical requirements, Data transformation, Numerical data transformation, Categorical data transformation, Text Preprocessing, Feature selection, Feature generation. Automated Algorithm Selection: Technical requirements, Computational complexity, Differences in training and scoring time, Linearity versus non-linearity, Necessary feature transformations, supervised ML, Unsupervised AutoML

UNIT - IV

8 Hrs

. Hyperparameter Optimization: Technical requirements, Hyperparameters, Warm start, Bayesianbased hyperparameter tuning, An example system Creating AutoML Pipelines: Technical requirements, An introduction to machine learning pipelines, A simple pipeline, Function Transformer, A complex pipeline.

UNIT - V

8 Hrs

Dive into Deep Learning: Technical requirements, Overview of neural networks, Neuron, Activation functions, A feed-forward neural network using Keras: Autoencoders, Convolutional Neural Networks. Critical Aspects of ML and Data Science Projects: Machine learning as a search, Trade-offs in machine learning, Engagement model for a typical data science project, The phases of an engagement model.

Textbooks:

1. Sibanjan Das, UmitMertCakmak “Hands-On Automated Machine Learning” Packt Publishing, 2018.

Reference Books:

1. EthernAlpaydin, “Introduction to Machine Learning”, MIT Press,2004.
2. Stephen Marsland, “Machine Learning -An Algorithmic Perspective”, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series,2014.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	2	2	2	2								2	
CO2	3	2	2	2									2	
CO3	3	2	2	2								2		
CO4	3	2	2	2										
CO5	2	3	2	2	2	2						2		2

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

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

Year: III	Semester: II	Branch of Study: AI & ML			
COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APE3306	Computer Vision	3	0	0	3

Course Outcomes:

After completion of the course, students will be able:

CO1: To Understand theory and models in Image and Video Processing.

CO2: To Explain the need of spatial and frequency domain techniques for image compression.

CO3: To Understand the concept of Image Restoration & Multiresolution processing.

CO4: To Illustrate quantitative models of image and video segmentation.

CO5: To Apply the process of image enhancement for optimal use of resources.

UNIT - 1:

Digital image fundamentals

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

UNIT - 2:

Image Enhancement (spatial domain)

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

Image Enhancement (frequency domain)

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

UNIT - 3:

Image restoration

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

Wavelet and Multiresolution processing

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

UNIT - 4:

Image compression

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

Image Morphology: Fundamental operations, Morphological Algorithms.

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

UNIT - 5:

Feature Extraction

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

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

Text Books:

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

Reference Books:

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

Mapping of course outcomes with program outcomes

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

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

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC3323	Deep Learning Techniques LAB	0	0	3	1.5

Course Outcomes (CO):

After completion of the course, students will be able:

- **CO1:** To Learn the fundamental principles of deep learning.
- **CO2:** To Identify the Deep learning algorithms which are more appropriate for various types of learning tasks in various domains
- **CO3:** To Implementing Deep learning algorithms and solve real-world problems.
- **CO4:** To Implement Autoencoder algorithms for any real world data.
- **CO5:** To Implement Generative Adversial Networks for generation and unsupervised tasks.

List of Experiments:

1. Installing Keras and packages in Keras.
2. Setting up the Spyder IDE Environment and Executing a Python Program.
3. Installing, Tensorflow and Pytorch libraries and making use of them.
4. Train the model to add two numbers and report the result.
5. Train the model to multiply two matrices and report the result using keras.
6. Train the model to print the prime numbers using Keras.

Recurrent Neural Network

7. Recurrent Neural Network
 - a. Numpy implement of a simple recurrent neural network
 - b. Create a recurrent layer in keras
 - c. Prepare IMDB data for movie review classification problem.
 - d. Train the model with embedding and simple RNN layers.
 - e. Plot the Results
8. Consider temperature-forecast as one the example for recurrent neural network and implement the following.
 - a. Inspect the data of the weather dataset
 - b. Parsing the data
 - c. Plotting the temperature timeseries
 - d. Plotting the first 10 days of the temperature timeseries
9. Train a sentiment analysis model on IMDB dataset, use RNN layers with LSTM/GRU notes.

Convolutional Neural Networks

10. Convolutional Neural Networks
 - a. Preparing the IMDB data
 - b. Train and evaluate a simple 1D convnet on IMDB Data
 - c. Train and evaluate a simple 1D convnet on temperature prediction data
11. Applying the Convolution Neural Network on computer vision problems.
12. Image classification on MNIST dataset (CNN model with Fully connected layer).

Long short-term memory network

13. Long short-term memory network
 - a. Implement LSTM using LSTM layer in keras
 - b. Train and evaluate using reversed sequences for IMDB data
 - c. Train and evaluate a bidirectional LSTM for IMDB data
14. Develop a traditional LSTM for sequence classification problem.

Autoencoders

15. Applying the Autoencoder algorithms for encoding the real-world data.

Generative Adversial Networks

16. Applying Generative Adversial Networks for image generation and unsupervised tasks.

PROJECTS:

- 1) Write a program for Multilabel Movie Poster Classification.
- 2) Write a program for Predicting Bike-Sharing patterns

Textbooks:

1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press
2. Deep Learning A practitioner's approach- Josh Patterson and Adam Gibson, OREILLY
3. The Elements of statistical learning by T.Hastie, R Tibshirani, and J.Friedman, Springer.
4. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press

Reference Books:

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

References:

Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning (Adaptive Computation and Machine Learning series)", MIT Press, 2016.

Online Learning Resources/Virtual Labs/ Extensive Reading:

- 1) Introduction to Deep Learning Course | Introduction to Deep Learning Course (rses-dlcourse.github.io)
- 2) Deep Learning | Introduction to Long Short Term Memory – GeeksforGeeks
- 3) <http://www.deeplearning.net/>
- 4) <https://www.deeplearningbook.org>
- 5) <https://developers.google.com/machinelearning/crash-course/ml-intro>
- 6) www.cs.toronto.edu/~fritz/absps/imagenet.pdf
- 7) <http://neuralnetworksanddeeplearning.com>

Mapping of course outcomes with program outcomes

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

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

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

Year: III

Semester: II

Branch of Study: AI & ML

Course Code	Speech Language Processing Lab	L	T	P	C
20APC3324		0	0	3	1.5

Course Outcomes :

After completion of the course, students will be able:

- **CO1:** To Understand approaches to syntax and semantics in NLP.
- **CO2:** To Analyse grammar formalism and context free grammars
- **CO3:** To Apply the statistical estimation and statistical alignment models
- **CO4:** To Apply Rule based Techniques, Statistical Machine translation (SMT), word alignment, phrasebased translation
- **CO5:** To have the skills (experience) of solving specific NLP tasks, which may involve programming in Python, as well as running experiments on textual data.

List of Experiments:

1. Word Analysis
2. Word Generation
3. Morphology
4. N-Grams
5. N-Grams Smoothing
6. POS Tagging: Hidden Markov Model
7. POS Tagging: Viterbi Decoding
8. Building POS Tagger
9. Chunking
10. Building Chunker

Refer: <https://nlp-iiith.vlabs.ac.in/List%20of%20experiments.html>

References:

1. Jurafsky D, Martin J H, Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition, 2nd edition,
2. James Allen, Natural Language Understanding, 2nd Edition, 2003, Pearson Education.
3. Natural Language Processing, A paninian perspective, Akshar Bharathi, Vineet Chaitanya, Prentice –Hall of India.

Online Learning Resources/Virtual Labs:

1. Natural Language Processing in TensorFlow | Coursera

Mapping of course outcomes with program outcomes

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

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

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

Year: III		Semester: II			Branch of Study: AI & ML	
COURSE CODE	COURSE TITLE	L	T	P	CREDITS	
20APC3325	Big Data analytics Lab (Common to: AIDS, AIML)	0	0	3	1.5	

Course Outcomes:

After completion of the course, students will be able:

CO1: To Configure Hadoop and perform File Management Tasks

CO2: To Apply MapReduce programs to real time issues like word count, weather dataset and sales of a company

CO3: To Critically analyze huge data set using Hadoop distributed file systems and MapReduce

CO4: To Apply different data processing tools like Pig, Hive and Spark.

List of Tasks

1. Install Apache Hadoop
2. Develop a MapReduce program to calculate the frequency of a given word in a given file.
3. Develop a MapReduce program to find the maximum temperature in each year.
4. Develop a MapReduce program to find the grades of student's.
5. Develop a MapReduce program to implement Matrix Multiplication.
6. Develop a MapReduce to find the maximum electrical consumption in each year given electrical consumption for each month in each year.
7. Develop a MapReduce to analyze weather data set and print whether the day is shinny or cool day.
8. Develop a MapReduce program to find the number of products sold in each country by considering sales data containing fields like

Tranction _Date	Prod uct	Price	Payment _Type	Name	City	State	Country	Account _ Created	Last _Login	Latitude	Longi tude
--------------------	-------------	-------	------------------	------	------	-------	---------	-------------------------	----------------	----------	---------------

9. Develop a MapReduce program to find the tags associated with each movie by analyzing movie lens data.
10. XYZ.com is an online music website where users listen to various tracks, the data gets collected which is given below. The data is coming in log files and looks like as shown below.

Userld	TrackId	Shared	Radio	Skip
111115	222	0	1	0
111113	225	1	0	0
111117	223	0	1	1
111115	225	1	0	0

11. Develop a MapReduce program to find the frequency of books published each year and find in which year maximum number of books were published using the following data.

Title	Author	Published year	Author country	Language	No of pages
-------	--------	-------------------	-------------------	----------	-------------

12. Develop a MapReduce program to analyze Titanic ship data and to find the average age of the people (both male and female) who died in the tragedy. How many persons are survived in each class.

The titanic data will be..

- Column 1 :PassengerId Column 2 : Survived (survived=0 &died=1)
- Column 3 :Pclass Column 4 : Name
- Column 5 : Sex Column 6 : Age
- Column 7 :SibSp Column 8 :Parch
- Column 9 : Ticket Column 10 : Fare
- Column 11 :Cabin Column 12 : Embarked

13. Develop a MapReduce program to analyze Uber data set to find the days on which each basement has more trips using the following dataset.

The Uber dataset consists of four columns they are

dispatching_base_number	date	active_vehicles	trips
-------------------------	------	-----------------	-------

- 14. Develop a program to calculate the maximum recorded temperature by yearwise for the weather dataset in Pig Latin
- 15. Write queries to sort and aggregate the data in a table using HiveQL.
- 16. Develop a Java application to find the maximum temperature using Spark.

Text Books:

- 1. Tom White, "Hadoop: The Definitive Guide" Fourth Edition, O'reilly Media, 2015.

Reference Books:

- 1. Glenn J. Myatt, Making Sense of Data , John Wiley & Sons, 2007
- 2. Pete Warden, Big Data Glossary, O'Reilly, 2011.
- 3. Michael Berthold, David J.Hand, Intelligent Data Analysis, Spingers, 2007.
- 3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, Uderstanding Big Data : Analytics for Enterprise Class Hadoop and Streaming Data, McGrawHill Publishing, 2012.
- 4. AnandRajaraman and Jeffrey David Ullman, Mining of Massive Datasets Cambridge University Press, 2012

Mapping of course outcomes with program outcomes

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

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

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

Year: III	Semester: II	Branch of Study: AI & ML			
COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20ASA0502	SOFT SKILLS (Common to: CSE, AIDS, AIML)	1	0	2	2

Course Outcomes:

After completion of the course, students will be able:

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

UNIT – I: OVERVIEW OF COMPUTER GRAPHICS SYSTEM

Grammar: Articles, Prepositions, Antonyms, Synonyms.

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

Articles:

Web links: <https://learnenglish.britishcouncil.org/grammar/a1-a2-grammar/articles-1>
<https://www.youtube.com/watch?v=ueEp6U8td1I>

Prepositions:

Web links: <https://www.grammarbook.com/grammar/probPrep.asp>

Antonyms, Synonyms.

Web links: <https://www.youtube.com/watch?v=-mLRoxWM8dI>
<https://www.youtube.com/watch?v=IEOrOPVMxiM>

https://www.it.iitb.ac.in/~vijaya/ssrvn/worksheetscd/getWorksheets.com/Language%20Arts/syn_ant.pdf

Basics of Communication (Definition , Types of communication).

Web links: https://wikieducator.org/INTRODUCTION_TO_COMMUNICATION

Importance of body language in Corporate culture

Web links:

<https://www.forwardfocus.com/consciously-communicate/the-importance-of-body-language-in-the-workplace/>

Body language (Facial expressions – eye contact – posture – gestures – Proxemics – Haptics – Dress Code – Paralanguage –Tone, pitch, pause & selection of words)

Web links: <https://open.lib.umn.edu/communication/chapter/4-2-types-of-nonverbal-communication/>
https://en.wikipedia.org/wiki/Nonverbal_communication

Impromptu speeches.

Web links: <https://www.write-out-loud.com/impromptu-public-speaking-topics.html>;
<https://faculty.washington.edu/mcgarrit/COM220/online%20readings/sample%20critique.pdf>

UNIT – II: OUTPUT PRIMITIVES AND ATTRIBUTES

Grammar: Tenses, Idioms and Phrases, One word substitutes.

Vocabulary: Public speaking - Oral presentations, writing skills – Short Essay writing and E- mail writing.

Tenses

Web links: https://www.english-hilfen.de/en/grammar/english_tenses.htmj; <https://onlymyenglish.com/tenses/>;
<https://www.englishpage.com/verbpage/verbtenseintro.html>;
<https://www.englishclub.com/grammar/verb-tenses.htm>

Idioms and Phrases:

Web links: <https://www.britannica.com/list/7-everyday-english-idioms-and-where-they-come-from>
<https://eslexpat.com/english-idioms-and-phrases/>;
<https://onlineteachersuk.com/english-idioms/>;

One word substitutes:

Web links: <https://www.careerpower.in/one-word-substitution.html>;
<https://www.hitbullseye.com/Vocab/One-Word-Substitute-List.php>;
<https://englishan.com/one-word-substitution-set-1/>;

Public speaking - *Oral presentations*

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

Writing skills – *Short Essay writing and E-mail writing.*

Web links: <https://www.kibin.com/essay-writing-blog/important-essay-writing-skills/>;
https://www.scribendi.com/academy/articles/academic_essay_writing_skills.en.html ;
<https://www.microsoft.com/en-us/microsoft-365/business-insights-ideas/resources/improve-email-writing-skills>;

UNIT – III: TWO DIMENSIONAL GRAPHICS TRANSFORMATIONS AND VIEWING

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

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

Direct and Indirect speeches:

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

Active and Passive voice,

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

Drawing inferences (reading comprehensions and listening comprehensions)

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

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

Leadership Skills – Negotiation skills - Team-building

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

Debate:

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

UNIT – IV: THREE DIMENSIONAL GRAPHICS AND VIEWING

Grammar: Common errors, Rearrangement of sentences.

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

Common errors, Rearrangement of sentences:

Web links: <https://www.letsstudytogether.co/sentence-arrangement-questions-pdf-for-banking-exams-ibps-sbi-po-and-clerk/>
<https://www.youtube.com/watch?v=e8nO3zZkZs>

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

Web links: <https://www.youtube.com/watch?v=PfJg-67smf4>
<https://www.youtube.com/watch?v=-IXjbph22Fk>

UNIT – V: REMOVAL OF HIDDEN SURFACES

Grammar : Verbal ability tests.

Vocabulary: Mock interviews, Post interview Etiquette.

Verbal ability tests.

Web links: <https://prepinsta.com/infosys-english-verbal-questions/>
<https://www.indiabix.com/online-test/verbal-ability-test/random>

Vocabulary: Mock interviews, Post interview Etiquette.

Web links: <https://www.youtube.com/watch?v=ZOLCma2QbdE>
<https://www.ziprecruiter.com/blog/the-right-way-to-follow-up-after-a-job-interview/>
<https://www.youtube.com/watch?v=KI0D19uoxT8>

Textbooks:

1. Robert M Sheffield, “Developing Soft Skills”, Pearson, 2010.

Reference Books:

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

Online Learning Resources:

https://www.youtube.com/watch?v=DUlsNJtg2L8&list=PLLy_2iUCG87CQhELCytvXh0E_y-b001_q

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO 6: 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	6.1	6.1.1
CO2	PO 9: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings	9.2	9.2.1
CO3	PO 10: Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.1	10.1.1
CO4	PO 9: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings	9.2	9.2.1

Mapping of course outcomes with program outcomes

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

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

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

Year: III	Semester: II	Branch of Study: AI & ML			
COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AMC9904	Professional Ethics and Human values (Common to: CSE,CIC, AIDS, AIML)	3	0	0	0

Course Outcomes:

After completion of the course, students will be able to:

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

UNIT - 1:

12Hrs

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

UNIT - 2:

12Hrs

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

UNIT - 3:

12Hrs

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

UNIT - 4:

15Hrs

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

UNIT - 5:

12Hrs

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

Text Books:

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

Reference Books:

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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01								3						
C02								3						
C03								3						
C04								3						
C05								3						

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

AITS TPT - ALWAYS