Department of

Computer Science and Engineering (AIML)

CURRICULUM

Second Year B.Tech. Engineering Program
With effect from 2025-26

Institute

Vision

To be a reputed Technological and Management Institute imparting Quality Education and developing Core Human Values (H3).

(H3): Honest - Humble - Human Being

Mission

We are committed for Enrichment of the Institute by disseminating the knowledge to achieve academic excellence and develop industry ready technical manpower

Department

Vision

To achieve excellent standards of learning environment, to meet the needs of industry using the latest tools, to serve the greater cause of society, and to empower students with relevant technical and practical skills.

Mission

1: To educate students with problem-solving and analytical skills in the area of AI & ML for a successful career.

2: To encourage self-learning skills to carry out research, and innovation and pursue higher studies.

3: To impart quality and value-based education and contribute towards the innovation of computing expert systems and to apply new advancements in high-performance computing.

Program Outcomes (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature and analyse complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4).
3. **Design/development of solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5).
4. **Conduct investigations of complex problems:** Conduct investigations of complex engineering problems using research- based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
5. **Modern tool usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6).
6. **The engineer and The world:**Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
7. **Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9).
8. **Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

9. **Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.
10. **Project management and finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
11. **Life-long learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8).

Department of Computer Science and Engineering (AIML)

Program Specific Outcomes (PSOs)

Upon successful completion of UG course, the students will attain following Program Specific Outcomes:

PSO1: An ability to contribute to problem identification, analysis, design and development of systems using principles and concepts of Artificial Intelligence and Machine Learning.

PSO2: To apply the skills in the areas of Health Care, Education, Agriculture, Intelligent Transport, Environment, Smart Systems & in the multi-disciplinary areas of Artificial Intelligence and Machine Learning.

PSO3: Enhance the abilities to qualify for employment, higher studies and research in Al with ethical values.

B.Tech. Program with one Major and one Minor (176 Credits)
Semester wise Indicative Credit Distribution

Semester		I	II	III	IV	V	VI	VII	VIII	Total Credits
Basic Science Course (BSC)	BSC/ESC	08	08	-	-	-	-	-	-	16
Engineering Science Course (ESC)		06	09	-	-	-	-	-	-	15
Programme Core Course (PCC)	ProgrammeCourses	03	-	15	16	07	08	09	08	66
Programme Elective Course (PEC)		-	-	-	-	06	06	03	05	20
Multidisciplinary Minor (MDM)	Multi-disciplinary Courses	-	-	02	02	03	03	04	-	14
Open Elective(OE)		-	-	-	-	02	02	02	-	06
Vocational and Skill Enhancement Course (VSEC)	Skill Courses	01	02	-	-	02	-	-	-	05
Ability Enhancement Course(AEC-01), Modern Indian Language (AEC-02)	Humanities Social Science and Management (HSSM)	03	-	02	01	-	-	-	-	06
Entrepreneurship/Economics/ Management Courses (EEM)		-	-	02	-	-	-	-	-	02
Indian Knowledge System (IKS)		-	-	-	02	-	-	-	-	02
Value Education Course (VEC)		-	-	02	02	-	-	-	-	04
Research Methodology	Experiential Learning Courses (ELC)	-	-	-	-	-	-	-	03	03
Internship / OJT (Int/OJT)		-	-	-	-	-	-	-	02	02
Project (Proj)		-	-	-	-	-	-	04	04	08
Community Engagement Activity (CEA)/Field Project (FP)		-	-	01	-	02	02	-		05
Co-curricular & Extracurricular Activities (CCA)	Liberal Learning Course (LLC)	01	01	-	-	-	-	-	-	02
Total Credits(Major)		22	22	22	22	22	22	22	22	176

Shri Ambabai Talim Sanstha's

SANJAY BHOKARE GROUP OF INSTITUTES, MIRAJ

Teaching and Evaluation Scheme

Program: B. Tech. Computer Science and Engineering (AIML)

Class.: **Second Year, B. Tech.** Semester: **SEM- III** W.E.F.: **2025-2026**

Sr. No.	Course Code	Course Title	Course Category	Teaching Scheme				Course Credits	Evaluation scheme						
									Theory				Practical		Total
									CIE			ESE	CIE	ESE	
				L	T	P	Contact Hrs/wk		CA-I	MSE	CA-II				
01	24AI301T	Applied Mathematics For AI	PCC	**3**			**3**	**3**	15	20	15	**50**			**100**
02	24AI302T	Data Structure	PCC	**3**			**3**	**3**	15	20	15	**50**			**100**
03	24AI303T	Software Engineering	PCC	**2**			**2**	**2**	15	20	15	**50**			**100**
04	24AI304T	Principles of AI	PCC	**3**			**3**	**3**	15	20	15	**50**			**100**
05	24AI305T	MDM-I	MDM	**2**			**2**	**2**	15	20	15	**50**			**100**
06	24UHV306T	Universal Human Values	HSSM-VEC	**2**			**2**	**2**	15	20	15	**50**			**100**
07	24AI307T	Project Management	HSSM-EEM	**2**			**2**	**2**	25		25				**50**
08	24AI302L	Data Structure Lab	PCC			**2**	**2**	**1**	-	-	-	-	**30**	**20****	**50**
09	24AI304L	Artificial Intelligent (AI) lab	PCC			**2**	**2**	**1**	-	-	-	-	**30**	**20****	**50**
10	24AI308L	Programming Lab-1(JAVA)	PCC	**1**		**2**	**3**	**2**			-		**30**	**20****	**50**
11	24AI309L	Seminar-I	ELC			**2**	**2**	**1**			-		**30**	**20$**	**50**
Total				**18**	**-**	**08**	**26**	**22**	**115**	**120**	**115**	**300**	**120**	**80**	**850**

L: Lecture, **T:** Tutorial, **P:** Practical, **CA-I:** Continuous Assessment-I, **MSE**: Mid Semester Examination, **CA-II:** Continuous Assessment-II, **CIE**: Continuous in Semester Evaluation, **ESE**: End Semester Examination, *****: External Oral Exam., ****:** External Oral Practical Exam., **$**: Internal oral Exam.

	BSC/ESC		Program Courses		Multidisciplinary Courses		Skill Courses	HumanitiesSocialScienceandManagement (HSSM)				Experiential Learning Courses (ELC)			Liberal Learning Courses (LLC)	Total
Course Category	BSC	ESC	PCC	PEC	MDM	OE	VSEC	AEC-01, AEC-02	EEM	IKS	VEC	Int/OJT	Proj.	CEA/FP	CCA	
Credits	-	-	15	-	02	-	-	-	02	-	02	-	-	01	--	22
Cum.Sum	**16**	**15**	**18**	**00**	**02**	**00**	**03**	**03**	**02**	**02**	**02**	**00**	**00**	**01**	**02**	**66**

Program Coordinator HoD Dean Engineering Director

Shri Ambabai Talim Sanstha's

SANJAY BHOKARE GROUP OF INSTITUTES, MIRAJ

Teaching and Evaluation Scheme

Program: B. Tech. Computer Science and Engineering (AIML)

Class.: **Second Year, B. Tech.** Semester: **SEM - IV** W.E.F.: **2025-2026**

Sr. No.	Course Code	Course Title	Course Category	Teaching Scheme				Course Credits	Evaluation scheme						
				L	T	P	Contact Hrs/wk		Theory				Practical		Total
									CIE			ESE	CIE	ESE	
									CA-I	MSE	CA-II				
01	24AI401T	Probability and Statistics	PCC	3	-	-	3	3	15	20	15	50	-	-	100
02	24AI402T	Operating Systems	PCC	3	-	-	3	3	15	20	15	50	-	-	100
03	24AI403T	Computer Network	PCC	3	-	-	3	3	15	20	15	50	-	-	100
04	24AI404T	Database management System	PCC	2	-	-	2	2	15	20	15	50	-	-	100
05	24AI405T	MDM-II : Prompt Engineering	MDM	2	-	-	2	2	15	20	15	50	-	-	100
06	24COI406T	Constitution of INDIA	HSSM-VEC	2	-	-	2	2	25	-	25	-	-	-	50
07	24AI402L	Operating Systems Lab	PCC	-	-	2	2	1	-	-	-	-	30	20$	50
08	24AI404L	Database Lab	PCC	-	-	2	2	1	-	-	-	-	30	20**	50
09	24AI407L	Programming Lab-II (Python)	PCC	1	-	2	3	2	-	-	-	-	60	40**	100
10	24AI408L	Web Technology - I	VSEC	-	-	2	2	1	-	-	-	-	60	40**	100
11	24AI409T	Innovation and Entrepreneurship	HSSM-AEC	2	-	-	2	2	25	-	25	-	-	-	50
Total				**18**	**-**	**08**	**26**	**22**	**125**	**100**	**125**	**250**	**180**	**120**	**900**

L:Lecture,**T:**Tutorial,**P:**Practical,**CA-I:** Continuous Assessment-I,**CA-II:** Continuous Assessment-II, **CIE**: Continuous in Semester Evaluation,**ESE**: End Semester Examination

	BSC/ESC		Program Courses		Multidisciplinary Courses		Skill Courses	HumanitiesSocialScienceandManagement (HSSM)				Experiential Learning Courses (ELC)			Liberal Learning Courses (LLC)	Total
Course Category	BSC	ESC	PCC	PEC	MDM	OE	VSEC	AEC-01, AEC-02	EEM	IKS	VEC	Int/OJT	Proj.	CEA/FP	CCA	
Credits			16	-	02	-	-	02			02					22
Cum.Sum	**16**	**15**	**34**	**00**	**04**	**00**	**03**	**05**	**02**	**02**	**04**	**00**	**00**	**01**	**02**	**88**

Program Coordinator HoD Dean Engineering Director

Multidisciplinary Minor (MDM)

- Students should select any one minor, excluding those offered by their parent department, from the diverse range of minors available.
- Students should complete all courses within their selected minor in order to earn credits.

MDM Name	Sr. No	Course Code	Course Name	Sem	Offered by Department
	1				Civil Engineering
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
Artificial Intelligence and Machine Learning	1	24AI305T	Introduction to AI		Computer Science (AIML) Engineering
	2	24AI405T	Prompt Engineering		
	3	24AI505T	Applied Machine Learning With Lab		
	4	24AI605T	Deep Learning with Lab		
	5	24AI705T	Applications of AI with project		
	6				
	7				
	8				
	9				
	10				
	1				Computer Science Engineering
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	1				Electrical Engineering
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	1				Electronics &Telecommuni
	2				

	3				cation Engineering
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	1				Electronics &Computer Engineering
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	1				Mechanical Engineering
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				

SecondYearB. Tech (Computer Science Engineering(AIML)) Semester-III

Course Code	24AI301T	Course Name	Applied Mathematics For AI			
Teaching Scheme			Evaluation Scheme			
L	T	Credits	CA-I	MSE	CA-II	ESE
03		3	15	20	15	50

Course Prerequisites:

Basic Calculus , Ordinary differential equations , algebra

Course Objective:

1. To introduce fund amental concepts of Laplace Transform & Inverse Laplace transform and its applications.
2. To give in sights about the properties, operations and relations on Fuzzy sets.
3. To introduce fundamental concepts of Mathematics and their applications in engineering fields
4. To develop Mathematical skills and enhance thinking power of students.

Course Outcome:

CO-1	ComprehendthefundamentalknowledgeoftheLaplacetransformsanditspropertiesfor elementary functions.
CO-2	UseLaplaceTransformandInverseLaplaceTransformtosolvelineardifferentiableequationswith constant coefficients
CO-3	UnderstandtheconceptofFuzzysetswithcasestudies.
CO-4	Applyinterpolationtechniquesforestimatingunknowndatapointswithinagivenrange.
CO-5	Applynumericalmethodsfordifferentiationandintegrationtosolveengineering problems.

Course Contents

Unit-I	**Laplace Transform**	Hours:09

Definition – conditions for existence ; Transforms of elementary functions ; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by t^n, scale change property, transforms of functions divided by t, transforms of integral of functions, transforms of derivatives ; Evaluation of integrals by using Laplace transform ; Transforms of some special functions- periodic function, Heaviside unit step function, Dirac delta function.

Unit-II	**Inverse Laplace Transform**	Hours:09

Introductoryremarks;Inversetransformsofsomeelementaryfunctions;Generalmethodsof finding inverse transforms; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms; Applications to find the solutions of linear differential equations and simultaneous linear differential equations with constant coefficients

Unit-III	**Fuzzy Sets**	Hours:09

Introduction to characteristics functions, First decomposition theorem, Fuzzy relations,examples, Fuzzy equations, Operations on Fuzzy sets.

Unit-IV	**Interpolation and Approximation**	Hours:9

Lagrange's interpolation formula, forward and backward difference interpolation formula, Newton's divided difference interpolation formula, Hermite interpolation formula.

Unit-V	**Numerical Differentiation and Integration**	Hours:9

Numericaldifferentiation, methodsbasedoninterpolation, Erroranalysis, numericalintegration methods based on interpolation, Newton cotes methods, Error estimates for trapezoidal and Simpson's rule.

Text Books:

1. HigherEngineeringMathematicsbyB.S.Grewal, KhannaPublishers,NewDelhi.
2. HigherEngineeringMathematicsbyH.K.DasandEr.RajnishVerma,S.Chand&CO.Pvt. Ltd., New Delhi.
3. AcourseinEngineeringMathematics(VolIII)byDr.B.B.Singh,SynergyKnowledgeware, Mumbai.
4. "A Text Book of Applied Mathematics", P. N. and J. N. Wartikar, Vol I and II", VidyarthiGrihaPrakashan, Pune, 2006.
5. "FuzzySetsandFuzzyLogic:TheoryandApplications",GeorgeJ.KlirandBoYuan, Pearson Education Services Pvt. Ltd., 4th edition, 2017.
6. "AnIntroductiontoprobabilityandStatistics",V.K.Rohatgi,WileyPublication,2nd Edition, 2008.
7. "IntroductoryMethodsofNumericalAnalysis",S.S.Sastry,3rdedition,PrenticeHallof India, 1999.

Reference Books:

1. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley &Sons,NewYork.
2. "Advanced Engineering Mathematics", WylieC.R,Tata McGraw HillPublication,8th Edition, 1999.
3. "Numerical Analysis",EBalguruswamy.TataMcGrawHillPublications.
4. "Introduction to Probability and Statistics for Engineers and Scientists",SheldonM.Ross, Academic Press, (2009).
5. "Fundamentals of Mathematical Statistics", Gupta and Kapoor,S.Chand&Sons Publishers, 10th Edition, 2000.

6. "Numerical methods for scientific and Engineering Computation" ,M. K. Jain, S.R.K. Iyengar, R. K. Jain, New Age International Limited Publishers.
7. H.A.Taha,"Operations Research",8th Edition,Pearson.

MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:

SecondYearB. Tech(Computer Science Engineering(AIML))Semester-III

Course Code	24AI302T	Course Name	Data Structures			
Teaching Scheme			Evaluation Scheme			
L	T	Credits	CA-I	MSE	CA-II	ESE
3		3	15	20	15	50

Course Prerequisites:

Basic programming Skills C

Course Objective:

1. Understand and implement fundamental data structures
2. Apply object-oriented programming concepts such as classes, inheritance, and polymorphism in data structure implementations.
3. Analyze the time and space complexity of algorithms to evaluate their efficiency.
4. Develop problem-solving skills by applying appropriate data structures and algorithms to real-world scenarios.

Course Outcome:

CO-1	Understand the fundamental concepts of data structures, algorithm efficiency and abstract data types
CO-2	Implement and analyze stack and queue data structures including circular and priority queues
CO-3	Implement various types of linked lists (singly, doubly, circular) and perform operations such as insertion, deletion, inversion, and concatenation.
CO-4	Construct and traverse binary trees and graphs using standard algorithms
CO-5	Compare and analyze various searching and sorting algorithms

Course Contents

Unit-I	**Introduction to Data Structure**	Hours:09

Primitive and non-primitive data structures, Abstract Data Types, Array of structure, Nested Structure , Passing structure to Function , Algorithm and its efficiency, Asymptotic Notations, Recursion: Direct and Indirect recursion, analysis of recursive function..

Unit-II	**Stack and Queue**	Hours:09

Fundamentals stack and queue as ADT, Representation and Implementation of stack and queue, Application of stack for expression evaluation and for expression conversion, Priority queue , Doubly Ended Queue, circular queue.

Unit-III	**Linked Lists**	Hours:09

Concept of linked list ,Singly linked list, doubly linked list and dynamic storage management, circular linked list, Operations such as insertion, deletion, inversion, concatenation, Applications.

Unit-IV	**Trees and Graphs**	Hours:9

Trees Basic terminology, binary trees and its representation, binary tree traversals , AVL Tree, Binary Search Trees, Heaps and its operations, Graph Terminologies, Representation of the Graph- Adjacency Matrix and Adjacency List, Graph Traversal Techniques- BFS and DFS, Warshall's Algorithm

Unit-V	**Searching & Sorting Technique**	Hours:9

Searching: Importance of searching, Linear search, Binary search, Sorting: Internal and External Sorts, Insertion, Heap, Quick sort, Merge sort, bubblesort, Hashing – concept, hashing methods, hash collision, hash collision resolution methods

Text Books:

1. Data Structure using C- A. M. Tanenbaum, Y. Langsam, M. J. Augenstein (PHI)
2. Data Structures- A Pseudo code Approach with C – Richard F. Gilberg and Behrouz A. Forouzon, Cengage Learning, Second Edition.
3. Schaum's Outlines Data Structures – Seymour Lipschutz (MGH), Tata McGraw-Hill.
4. Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures, A Pseudocode Approach With C",Cengage Learning, Second Edition, 2014

Reference Books:

N. B. Venkateshwarlu, E. V. Prasad, "C and Data Structures", S. Chand and Company, 2010

MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:

1. https://nptel.ac.in/courses/106102064 Data Structures and Algorithms, IIT Delhi Prof. Naveen Garg Date of Reference 18-4-2024
2. https://nptel.ac.in/courses/106103069 Date of Reference 18-4-2024

SecondYearB. Tech(Computer Science Engineering(AIML))Semester-III

Course Code	24AI303T	Course Name	Software Engineering			
Teaching Scheme			Evaluation Scheme			
L	T	Credits	CA-I	MSE	CA-II	ESE
2		2	15	20	15	50

Course Prerequisites:

None

Course Objective:

1. Process of software engineering life-cycle.
2. To apply software requirements engineering techniques, software design principles, modelling and software testing techniques.
3. To study fundamental concepts in software testing, including software testing objectives, processes, criteria, strategies, and methods.
4. To learn planning of a test project, designing test cases and test data, conducting test operations, managing software problems and defects, and generating a test report.

Course Outcome:

CO-1	To use the techniques, skills, and modern engineering tools necessary for engineering practice.
CO-2	To apply software design principles and SDLC practices for effective engineering solutions.
CO-3	To apply software testing knowledge and its processes to software applications
CO-4	To identify various software testing problems and solving software testing problems by designing and selecting software test models, criteria, strategies and methods.
CO-5	To apply the techniques learned to improve the quality of software development

Course Contents

Unit-I		Hours:09

Software crisis and myths, Software process and development: Software life cycle and models, Analysis and comparison of varies models, an agile view of process. Requirements engineering tasks, Initiating requirement engineering process, developing use-cases, Building the analysis model, Building the analysis model.

Unit-II		Hours:09

Design process and design quality, Design concepts, Design model, Pattern based software design, Architectural design, User interface design. Software Development Life Cycle (SDLC) models (Waterfall, Iterative, Spiral, Agile), Requirement analysis, System design, Testing strategies (unit, integration, system, acceptance), Deployment methods, Maintenance and evolution, Importance of documentation and code reviews

Unit-III		Hours:09

Principles of Testing Software development life cycle model: Phases of software project, Quality, Quality assurance and quality control, Testing, Verification and validation, Process models to represent various phases, Life cycle models, Software testing life cycle. White Box Testing (WBT) and Black Box Testing: Static testing, Structural testing, Challenges in WBT. Black box testing: Black box testing process

Unit-IV		Hours:9

Integration Testing: Definition, As a type of testing: Top-down integration, Bottom-up integration, Bidirectional integration, System integration, Scenario testing: System scenarios, Use case scenarios, Defect bash. System and Acceptance Testing, Functional Vs non Functional, Functional system testing, Non- functional system testing, Acceptance testing.

Unit-V		Hours:9

Performance testing, Regression testing, Internationalization testing, Adhoctesting.Factors governing performance of testing, Methodology tools and process for performance testing. Regression Testing: Introduction, Types of Regression testing, Regression testing process

Text Books:

1. Roger S. Pressman, "Software Engineering", Tata McGraw-Hill, 6th Edition, 2006.
2. G. Booch, J. Rambaugh, and I. Jacobson, "The Unified Modeling Language User Guide", Addison Wesley, 2nd Edition, 2005.
3.Srinivasan Desikan, Gopalaswamy Ramesh, "Software Testing: Principles and Practices", Pearson publication, 2nd Edition, 2006.

Reference Books:

1. Shari Pfleeger, "Software Engineering", Pearson Education, 3rd Edition, 2008.
2. Ian Sommerville, "Software Engineering", Pearson Higher Education, 10th Edition, 2016.
3. PankajJalote, "An Integrated Approach to Software Engineering", Springer New York, 2nd Edition, 2013.
4. LoiseTamres, "Introducing Software Testing", Pearson publication, 2002.
5. Boris Beizer, "Software Testing Techniques", Dreamtech press, 2nd Edition, 2014

MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:

SecondYearB. Tech (Computer Science Engineering(AIML)) Semester-III

Course Code	24AI304T	Course Name	Principles of Artificial Intelligence			
Teaching Scheme			Evaluation Scheme			
L	T	Credits	CA-I	MSE	CA-II	ESE
3		3	15	20	15	50

Course Prerequisites:

Mathematics, programming skill , python, R, C

Course Objective:

- Study about uninformed and Heuristic search techniques.
- Learn techniques for reasoning under uncertainty
- Introduce Machine Learning and supervised learning algorithms
- Study about end sampling and unsupervised learning algorithms
- Learn the basics of deep learning using neural networks

Course Outcome:

CO-1	Understand the Fundamentals of Artificial Intelligence.
CO-2	Apply Uninformed Search Strategies to Solve Problems
CO-3	Implement Informed Search Techniques for Optimization and Game Playing.
CO-4	Analyze Logical Reasoning in Knowledge-Based Systems.
CO-5	Design Basic Planning Strategies for Problem Solving.

Course Contents

Unit-I	**Introduction**	Hours:09

Definitions, historical perspectives, foundations, state-of-the-art applications. Intelligent Agents: Agents and environments, rationality, nature of environments, structure, simple reflex, model-based reflex, goal-based, utility-based, learning agents, PEAS descriptions (e.g., Vacuum World example).

Unit-II	**Uninformed Search Methods**	Hours:09

DFS, BFS, Depth Limited Search, Iterative Deepening DFS, Bidirectional Search, comparison with examples (e.g., maze solving).

Unit-III	**Informed Search Methods**	Hours:09

Hill Climbing, Best First Search, A* Algorithm, Minimax Search, Alpha-Beta Cutoffs (with tic-tac-toe example). Omit AO*, Constraint Satisfaction, and Waiting for Quiescence for simplicity.

Unit-IV	**Logical Agents**	Hours:9

Knowledge-Based Agents, Wumpus World (simplified), Propositional Logic. (Representation, Inference, Forward/Backward Chaining). Omit First Order Logic, Backtracking, and PROLOG.

Unit-V	**Planning**	Hours:9

Introduction to Planning, Blocks World, State Space Search (Forward/Backward), Goal Stack. Omit

STRIPS, Partial Order Planning, and Planning Graph.
Text Books:
1. Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter 2. Introduction to Artificial Intelligence" by Philip C. Jackson Jr.
Reference Books:
MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:

SecondYearB. Tech(Computer Science Engineering(AIML))Semester-III

Course Code	24AI306T	Course Name	UNIVERSAL HUMAN VALUES			
Teaching Scheme			Evaluation Scheme			
L	T	Credits	CA-I	MSE	CA-II	ESE
2		2	15	20	15	50

Course Prerequisites:

Foundational human concept, Ethical awareness

Course Objective:

1. Describe the need, basic guidelines, content and process for value education.
2. Associate the role of harmony in family and society leading to Undivided Society/ Universal Order.
3. Identify engineering ethics, theories and strategies to resolve moral dilemmas.
4. Illustrate global issues related to multinational corporations, environmental ethics, and computer ethics.
5. Utilize the value-based essays with their moral/ethical principles in personal/professional contexts.

Course Outcome:

CO-1	Define the terms like Natural Acceptance, Happiness and Prosperity
CO-2	Identifyone'sself, and one'ssurroundings(family, society nature)
CO-3	Applywhattheyhavelearnttotheirownselfindifferentday-to-daysettingsin real life
CO-4	Relatehuman values with human relationship and human society.
CO-5	Justify the need for universal human values and harmonious existence

Course Contents

Unit-I		Hours:09

•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 fulfil 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 forliving 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!	Hours:09

• 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		Hours:09

• Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment 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. Gratitudeasa universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Unit-IV		Hours:9

• Understanding the harmony in the Nature

• Interconnectedness and mutual fulfilment 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.

Unit-V		Hours:9

• 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. RRGaur,RAsthana,GPBagaria,AFoundationCourseinHumanValuesandProfessionalEthics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

2. RRGaur,RAsthana,GPBagaria,TeachersmanualforA 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. A.N.Tripathi, HumanValues,NewAgeIntl.Publishers,NewDelhi,2004.

2.Mohandas Karamchand Gandhi - The Story of My Experiments with Truth

MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:

1.https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw

2.https://fdp-si.aicte-india.org/UHV-I%20Class%20Notes%20&%20Handouts/UHV%20Handout%20l-Introduction%20to%20Value%20Education.pdf

3.https://fdo-si.aicte-india.org/UHV-Harmony%20in%20the%20Human%20Being.pdf

SecondYearB. Tech (Computer Science Engineering(AIML)) Semester-III

Course Code	24AI307T	Course Name	PROJECT MANAGEMENT			
Teaching Scheme			Evaluation Scheme			
L	T	Credits	CA-I	MSE	CA-II	ESE
2	-	2	15	20	15	50

Course Prerequisites:

Educational background , Basic Skills,

Course Objective:

1. Understand key concepts and terminology in project management
2. Develop comprehensive project plans that include scope, schedule, and budget
3. Implement effective communication strategies with stakeholders
4. Utilise tools and techniques for monitoring and controlling project performance
5. Identify and mitigate risks throughout the project lifecycle

Course Outcome:

CO-1	Provide students with a basic understanding of project management principles and practices.
CO-2	Demonstrate competency in creating and managing project plans.
CO-3	Understand the impact of scope, time, and cost management.
CO-4	Understand the role of quality metrics and quality assurance.
CO-5	Develop strategies to evaluate and calculate risk factors in IT projects.

Course Contents

Unit-I	**Introduction to Project Management**	Hours:09

Project and Project Management(PM),Role of project Manager, System view of PM, Organization, Stakeholders, Project phases and lifecycle, Context of IT projects, process groups, mapping groups to Knowledge areas.

Unit-II	**Project Integration Management**	Hours:09

Strategic planning and project selection, Developing a Project Management Plan, Directing and Managing Project Work, Monitoring and Controlling Project Work, Performing Integrated Change Control, Closing Projects or Phases.

Unit-III	**Project Scope, Time and Cost management**	Hours:09

Planning Scope Management, Collecting Requirements, Defining Scope, Creating the Work Breakdown Structure, Validating Scope, Controlling Scope Planning Schedule Management,DefiningActivities,SequencingandEstimating Activity, Resources & Duration, Developing & Controlling Schedule Basic Principles of Cost Management, Planning Cost Management, Estimating Costs, Determining the Budget, Controlling Costs.

Unit-IV	**Quality and Human Resource Management**	Hours:9
Importance, Planning Quality Management, Performing Quality Assurance, Controlling Quality, Tools and Techniques for Quality Control, Human Resource management: Importance, keys to Managing people, human resource planning, acquiring, developing and managing project team.		
Unit-V	**Risk management**	Hours:9
Importance, risk management planning, sources of risk, risk identification, qualitative and quantitative risk analysis, risk response planning, risk monitoring and control.		
Text Books:		
1. Information Technology Project Management KathySchwalbe Cengage Learning 7E 2. Software Project Management Bob Huges, Mike Cotterell, Rajib Mall McGrawHill Edu		
Reference Books:		
MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:		

Second Year B.Tech (Computer Science Engineering (AIML)) Semester-III

Course Code	24AI302L	Course Name	Data Structure Lab	
Teaching Scheme			Evaluation Scheme	
P	Credits		CIE	ESE
2	1		30	20

Course Prerequisites:

C Programming

Course Objective:

01 To Understand different data structures and operations on it
02 To Analyze the given problem
03 To Apply suitable data structure and algorithms to solve given problem
04 To Develop and Evaluate the Program to solve the given problem

Course Outcome:

CO-1	Describe the terminologies of various data structures and their associated operations.
CO-2	Analyze computational problems to identify suitable requirements.
CO-3	Apply appropriate data structures and algorithms to develop effective solutions.
CO-4	Develop programs by implementing data structures and algorithms for problem solving.
CO-5	Evaluate the correctness, efficiency, and performance of the implemented solutions.

Course Contents

Exp. No.	Experiment Title	CO
1	Implement stack using array.	
2	Implement Queue using array.	
3	Implement basic operations on Singly/Doubly linked lists, such as insertion, deletion, and traversal.	
4	Implement basic operations on Circular linked lists, such as insertion, deletion, and traversal.	
5	Implement a stack /Queue using a linked list.	
6	Implement a searching algorithm (binary search, linear search).	
7	Implement a hash table.	
8	Implement a sorting algorithm (quicksort, bubble sort).	
9	Implement a binary search tree.	
10	Implement a graph traversal algorithm (e.g., depth-first search, breadth-first search	

Second Year B.Tech (Computer Science Engineering (AIML)) Semester-III

Course Code	24AI304L	Course Name	Artificial Intelligent (AI) lab	
Teaching Scheme			Evaluation Scheme	
P	Credits		CIE	ESE
2	1		30	20

Course Prerequisites:

C programming, R programming

Course Objective:

1. To introduce basic machine learning techniques.
2. To develop the skills in using recent machine learning software for solving practical problems in high-performance computing environment.
3. To develop the skills in applying appropriate supervised, semi-supervised or unsupervised learning algorithms for solving practical problems.
4. Identify innovative research directions in Artificial Intelligence, Machine Learning and Big Data analytics

Course Outcome:

CO-1	Apply uninformed search strategies to solve AI problems.
CO-2	Use informed search algorithms for problem-solving and optimization
CO-3	Design intelligent agents for classical AI environments.
CO-4	Implement knowledge representation and reasoning using propositional logic.
CO-5	Integrate search, reasoning, and planning techniques in real-world AI scenarios.

Course Contents

Exp. No.	Experiment Title	CO
1	Design a Vacuum Cleaner World Agent (Reflex and Model-based)	1
2	Solve the Water Jug Problem using Depth First Search (DFS)	2
3	Construct a Tic-Tac-Toe Search Tree using Breadth First Search (BFS)	2
4	Apply Bidirectional Search to Find the Shortest Path in a Graph	3
5	Solve the 8-Puzzle Problem using Best First Search	3
6	Apply Hill Climbing Algorithm to the N-Queens Problem	3
7	Find the Shortest Path using A* Algorithm	4
8	Develop a Wumpus World Agent	4
9	Apply Propositional Logic using Forward and Backward Chaining	5
10	Solve the Monkey and Banana Problem using State-Space Search	5

Second Year B.Tech (Computer Science Engineering(AIML))Semester-III

Course Code	24AI308L	Course Name	Programming Lab-1(JAVA)	
Teaching Scheme			Evaluation Scheme	
L	P	Credits	CIE	ESE
1	2	2	30	20

Course Prerequisites:

Basic programming knowledge ,OOP, C programming

Course Objective:

To write programs using abstract classes.
- To write programs for solving real world problems using java collection frame work.
- To write multithreaded programs.
- To write GUI programs using swing controls in Java.
- To introduce java compiler and eclipse platform

Course Outcome:

CO-1	Able to write programs for solving real world problems using java collection frame work..
CO-2	Able to write programs using abstract classes
CO-3	Able to write multithreaded programs
CO-4	Able to write GUI programs using swing controls in Java
CO-5	Able to write impart hands on experience with java programming.

Course Contents

Unit-I	**Introduction to Java Applications**	Hours:09

Introduction, Java Class Libraries, Typical Java Development Environment, Memory Concepts, Arithmetic. Introduction to Classes and Objects: Introduction, Classes, Objects, Methods and Instance Variables, declaring a Class with a Method and Instantiating an Object of a Class, declaring a Method, Instance variables, set Methods and get Methods, Primitive Types vs. Reference type double Types, Initializing Objects with Constructors, floating point numbers.

Unit-II	**Control Statements**	Hours:09

Control structures if single-selection statement, if…. else double-selection statement, while repetition statement, do…. while repetition statement, switch multi-selection statement, break and continue statements, logical operators. Methods: Introduction, Program modules in Java, static methods, static Fields and Class Math, declaring methods with multiple parameters, scope of declaration, method overloading, overriding and Java API packages.

Unit-III	**Arrays**	Hours:09

Arrays, declaring and creating arrays in java, examples using arrays, passing arrays to methods, multidimensional arrays, variable-length argument lists, using command-line arguments.

Unit-IV	**Inheritance and Polymorphism in Java**	Hours:9

Inheritance: Super classes and Subclasses, protected members, relationship between super classes and subclasses, constructors in subclasses, object class. Polymorphism: Abstract classes and methods, final

methods and classes, polymorphism examples and Interfaces.

Unit-V	**Exception-handling**	Hours:9

Exception-handling overview, handling Arithmetic Exceptions and Input Mismatch Exceptions, when to use exception handling, java exception hierarchy, finally block

Text Books:

1. Paul Deitel and Harvey Detail, Java: How to Program, Pearson's Publication, 9thEdition.

Reference Books:

2. 1. Joel Murach and Michael Urban, Murach's Beginning Java with Eclipse, Murach's Publication, 1st Edition, 2016. Doug Lowe, Java All-in-One For Dummies, Wiley Publication, 4th Edition,2014.
3. 2. Herbert Schildt, Java The Complete Reference, McGraw-Hill Publication, 9thEdition.

MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:

Exp. No.	Experiment Title	CO
1	Classes & Objects	
2	Constructors & Destructors	
3	Methods Overloading	
4	Inheritance	
5	Interface	
6	Multithreading	
7	Package	
8	Creating Java Applets	

SecondYearB. Tech (Computer Science Engineering (AIML)) Semester-III

Course Code	24AI309L	Course Name	Seminar-I	
Teaching Scheme			Evaluation Scheme	
P	Credits		CIE	ESE
2	1		30	20

Course Prerequisites:

- Preparation of requirements , Presentation skill

Course Objective:

- Awareness of how to use values in improving your own professionalism
- Implement values for bridging and harmonising your employees
- Learning about personal and communication styles for team building
- Learning from history, art and music from natural human life
- Learning management of values

Course

A seminar courses on topics of current interest. Students as well as the instructor will be actively involved in running the course/class. This course cannot be counted toward an elective

- Block chain Technology & Cryptocurrency: Apart from digital currencies, block chain is transforming the supply chain, secure transactions, and decentralized applications.
- Quantum Computing: Study quantum algorithms and advancements in quantum hardware, like cryptography and complex problem solutions.
- Cybersecurity & Ethical Hacking: Debate zero trust security, privacy, and ethical hacking methodologies, as well as newer ways of dealing with advanced persistent threats.
- Cloud Computing & Edge Computing: Discuss cloud infrastructure and edge AI in IoT and distributed systems, and their effects.
- Internet of Things (IoT) &IoT Security: Discuss smart devices and networked sensors as well as security in the modern connected world.
- Augmented Reality (AR) & Virtual Reality (VR): Discuss immersive technologies with particular interest in their use in education, health care, and amusement.
- Analyzing Data Science & Big Data: Talk about big data, data mining, its impact on business intelligence, decision-making, and predictive analytics.
- NLP & AI Generative: Aiming at sentiment analysis, large language models NLP for low-resource languages.

Second Year B. Tech (Computer Science Engineering (AIML))Semester-III

Course Code	24AI305T	Course Name	Introduction to AI-ML (MDM-I)			
Teaching Scheme			Evaluation Scheme			
L	T	Credits	CA-I	MSE	CA-II	ESE
2	-	2				

Course Prerequisites:

None

Course Objective:

1.Artificial Intelligence history ,scope
2.Fundamental of machine learning types of learning
3. Data structure and algorithm essential for designing efficient AImodals/ML
Knowledge representation and reasoning ,problem solving methods

Course Outcome:

CO-1	Elucidate the basic concepts of Artificial Intelligence
CO-2	Analyze Artificial Intelligence techniques, such as search algorithms, for problem solving
CO-3	Formulate a well defined machine learning problem with clear Metrics
CO-4	Familiarize with techniques for Dimensionality reduction and Computational Efficiency
CO-5	Understand the notions of Hypotheses Space, Hypotheses Structure and Search

Course Contents

Unit-I	**Introduction to AI**	Hours:09

Definition, Terminology and history of AI, Software Agents, Types of Agents, Agents andenvironments, The concept of rationality, The nature of environments, The structure of agents,Applications of AI in various domains

Unit-II	**Problem Solving by Searching**	Hours:09

Problem-solving agents, Example problems, Searching for solutions, Uninformed search,strategy, Informed search strategy, Heuristic Functions, Local search algorithms andoptimization problems, Alpha-beta pruning, Imperfect real-life decisions.

Unit-III	**Constraint Satisfaction Problem**	Hours:09

Defining constraint satisfaction problems, Constraint propagation, Backtracking search,ForCSPs, Local search for CSPs, The structure of the problem.

Unit-IV	**Basics of ML**	Hours:9

Idea of Machines learning from data, Types of Machine Learning, Classification of problem, Regression and Classification, Supervised and Unsupervised learning. Elements of a machinelearningsystem.

Unit-V	**Regression**	Hours:9

Simple regression – hypothesis, cost function, parameter learning with gradient descent, learning rate, Gradient Descent for linear regression, examples, simple regression in matrixform. Multivariate Linear,

Regression – multiple features, hypothesis functions, GradientDescent for multiple variables, Feature scaling, polynomial regression
Text Books:
1. "Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig 2. Machine Learning with Python- an approach to applied ML, by Abhishek Vijayvargia, BPB publications.
Reference Books:
MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:

Second Year B. Tech (Computer Science Engineering(AIML))Semester-IV

Course Code	24AI401T	Course Name	Probability and statistics			
Teaching Scheme			Evaluation Scheme			
L	T	Credits	CA-I	MSE	CA-II	ESE
3	-	3	15	20	15	50

Course Prerequisites:

NIL

Course Objective:

1. To familiarize the students with the foundations of probability and Statistical methods.
2. To impart probability concepts and Statistical methods in various applications in Engineering.

Course Outcome:

CO-1	Elucidate the basic principles of statistics
CO-2	Apply the correlation and regression analysis to engineering problem
CO-3	Apply the principles of probability to thermodynamic problems
CO-4	Explain probability distribution and solve problems
CO-5	Explain the sampling, error and its applications

Course Contents

Unit-I	Probability	Hours:09
Probability: Introduction, Definition of probability, sample space and events, Addition and multiplication theorems, conditional probability, Bayes' Theorem, Properties of probabilities with proofs.		
Unit-II	Probability Distributions	Hours:09
Probability Distributions: Random variables (discrete and continuous), probability mass/density function, Binomial, Poisson, Exponential and normal distributions- problems (no derivations for mean and standard deviation).		
Unit-III	Correlation and Regression	Hours:09
Correlation and Regression-Karl Pearson's,correlation coefficient, Spareman's Rank correlation problems, regression analysis-lines of regression, problems , Properties Of Karl Pearson's correlation, coefficient And Spareman's Rank correlation coefficient.		
Unit-IV	Principles of Statistics	Hours:9
Basic Statistics: Measures of central tendency, measures of dispersion, range quartile deviation, mean Deviation, standard deviation, coefficient of variation, Skewness and Kurtosis, problems.		
Unit-V	Sampling Theory	Hours:9
Sampling theory: Introduction to sampling distributions, standard error,Large Sample Estimation Of		

Population ,Small Sample Estimation Of Population,Chi-square distribution as a test of goodness of fit .
Text Books:
1. G. V. Kumbhojkar, Probability and Random Processes, C. Jamnadas and Co., 14th Edition, 2010
Reference Books:
1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:
• https://www.mooclab.club/resources/probability-the-science-of-uncertainty-and- data.1450/?utm source • https://onlinecourses.nptel.ac.in/noc24_ma39/preview?utm_source.

SecondYearB.Tech(Computer Science Engineering(AIML))Semester-IV

Course Code	24AI402T	Course Name	Operating Systems			
Teaching Scheme			Evaluation Scheme			
L	T	Credits	CA-I	MSE	CA-II	ESE
3	-	3	15	20	15	50

Course Prerequisites:

Basic of computer ,hardware

Course Objective:

- To understand the basics and functions of operating systems.
- To understand processes and threads
- To analyze scheduling algorithms and process synchronization.
- To understand the concept of deadlocks.
- To analyze various memory management schemes.
- To be familiar with I/O management and file systems

Course Outcome:

CO-1	Understand the fundamental concepts, design principles, and architecture of operating systems.
CO-2	Analyze and compare various process scheduling, synchronization, and deadlock-handling techniques.
CO-3	Apply memory management schemes and page replacement algorithms to optimize system performance.
CO-4	Demonstrate the ability to implement file and disk management strategies used in modern operating systems.
CO-5	Develop basic shell scripts and implement operating system functionalities such as process creation, thread management, and inter-process communication.

Course Contents

Unit-I	**Introduction to Operating Systems**	Hours:09

Von Neumann vs. Harvard architecture, CPU, Memory, I/O Devices, Buses, Basic OS Concepts: Purpose and functions, OS operations, computing environments, Types of Operating Systems: Batch, Time-sharing, Real-time, Embedded, Distributed, OS Structure and Services: System components, services, system calls, system programs, OS Design and Implementation: Monolithic, Microkernel, Layered, Modules, Virtual Machines, OS Generations, and Booting Process.

Unit-II	**Process and Thread Management**	Hours:09

Process Concepts: Process states, Process Control Block (PCB), operations on processes, Threads and Multithreading: Threading models, multithreading in Unix/Linux, multicore programming, Process Scheduling: Scheduling queues, context switching, scheduling criteria, Scheduling Algorithms: FCFS,

SJF, Round Robin, Priority Scheduling, Multi-processor Scheduling, Interprocess Communication: Direct/indirect communication, Pipes, Shared memory, Message queues.

Unit-III	**Concurrency and Synchronization**	Hours:09

Critical Section Problem and Solutions: Peterson's algorithm, Synchronization hardware, Semaphores and Mutexes: Usage and implementation, Classical Problems: Readers-Writers, Dining Philosophers, Producer-Consumer, Monitors and Synchronization examples (e.g., Solaris), Deadlocks: System model, characterization, necessary conditions, Deadlock Handling: Prevention, Avoidance (Banker's Algorithm), Detection and Recovery, Security and Protection: Access control, ACLs, Security threats, Malware, OS security models.

Unit-IV	**Memory and Storage Management**	Hours:9

Main Memory Management: Contiguous allocation, fragmentation, segmentation, Paging: Page table structure, TLB, protection and sharing, Virtual Memory: Demand paging, page faults, overlays, working set model, Page Replacement Algorithms: FIFO, Optimal, LRU, NRU, Second Chance, Thrashing and Frame Allocation Policies, Secondary Storage: Disk structure, disk scheduling algorithms (FCFS, SSTF, SCAN), disk management, Swap-Space and RAID.

Unit-V	**File Systems**	Hours:9

File types, attributes, operations, access methods, Directory Structures: Single-level, two-level, tree, DAG, File System Implementation: Allocation methods (contiguous, linked, indexed), directory implementation, free space management (bit vector, linked list, grouping), Protection and File Sharing: Mounting, access rights.

Text Books:

1. Abraham Silberschatz, Peter B. Galvin and Greg Gagne, Operating System Concepts, Wiley Publication, 8th Edition, 2008.
2. Andrew S. Tanenbaum, Modern Operating System, PHI Publication, 1995

Reference Books:

1. Andrew S. Tanenbaum, Modern Operating System, PHI Publication, 4th Edition, 2015.
2. D. M. Dhamdhere, Systems Programming and Operating Systems, McGraw-Hill, 2nd Edition, 1996.
3. Garry Nutt, Operating Systems Concepts, Pearson Publication, 3rd Edition, 2003.
4. Thomas W. Doeppner, Operating System in Depth: Design and Programming, Wiley Publication, 2011.
5. Harvey M. Deitel, An Introduction to Operating Systems, Addison Wesley Publication, 2 nd Edition, 1990.

MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:
1. Introduction to Operating Systems Specialization (Duke University)

SecondYearB. Tech(Computer Science Engineering(AIML)) Semester-IV

Course Code	24AI403T	Course Name	Computer Network			
Teaching Scheme				Evaluation Scheme		
L	T	Credits		CA-I	MSE	CA-II	ESE
3	-	3		15	20	15	50

Course Prerequisites:

Computer Fundamentals, Fundamentals of Digital Communication

Course Objective:

• To learn the details of the abstractions, interfaces provided by the OS for program execution and execution requirements, processes, threads, memory management, files. To analyse concurrency and related synchronization based solutions.

Course Outcome:

CO-1	Gain the knowledge of the basic computer network technology.
CO-2	Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model
CO-3	Obtain the skills of subnetting and routing mechanisms.
CO-4	Familiarity with the essential protocols of computer networks, and how they can be applied in network design and implementation
CO-5	Student can understand easily the concepts of network security.

Course Contents

Unit-I		Hours:09
Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet. Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless transmission.		
Unit-II		Hours:09
Data Link Layer - Design issues, Error Detection & Correction, Elementary Data Link LayerProtocols, sliding window protocolsMultiple Access Protocols - ALOHA, CSMA, CSMA/CD, CSMA/CA, Collision free protocols, Ethernet- Physical Layer, Ethernet Mac Sub layer, Data link layer switching: Use of bridges, learning bridges, spanning tree bridges, repeaters, hubs, bridges, switches, routers andgateways.		
Unit-III		Hours:09
Network Layer: Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, , Count to Infinity Problem, Link State Routing, Path Vector Routing, Congestion Control AlgorithmsIP addresses, CIDR, Subnetting, Super Netting, IPv4, Packet Fragmentation, IPv6 Protocol, Transition from IPv4 to IPv6, ARP,RARP.		
Unit-IV		Hours:9

Transport Layer: Services provided to the upper layers elements of transport protocoladdressing connection establishment, Connection release, Error Control & Flow Control, Crash Recovery. The Internet Transport Protocols: UDP, Introduction to TCP, The TCP Service Model, The TCP Segment Header, The Connection Establishment, The TCP Connection Release, The TCP Sliding Window, The TCP Congestion Control Algorithm.

Unit-V		Hours:9

Application Layer –Domain name system, SNMP, Electronic Mail; the World WEB, HTTP, Streaming audio and video.

Text Books:

1.Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. PearsonEducation/PHI

2. Data Communications and Networking - Behrouz A. Forouzan, Fifth Edition TMH, 2013.

Reference Books:

1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education

2. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TM

MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:

SecondYearB. Tech(Computer Science Engineering(AIML)) Semester-IV

Course Code	24AI404T		Course Name	Database Management system			
Teaching Scheme				Evaluation Scheme			
L	T	Credits		CA-I	MSE	CA-II	ESE
2	-	2		15	20	15	50

Course Prerequisites:

Programming Languages, Data Structures and Algorithms, Computer Organization and Architecture

Course Objective:

- To learn the fundamentals of data models, relational algebra and SQL
- To represent a database system using ER diagrams and to learn normalization techniques
- To understand the fundamental concepts of transaction, concurrency and recovery

•processing To understand the internal storage structures using different file and indexing techniques

• which will help in physical DB design To have an introductory knowledge about the Distributed databases, NOSQL and databasesecurity

Course Outcome:

CO-1	Illustrate the database design for applications
CO-2	Write database queries
CO-3	Apply normalization techniques to improve database design
CO-4	Apply concurrency control & recovery mechanism for database problems
CO-5	Implement, analyze and evaluate the project developed for an application

Course Contents

Unit-I	**Introduction to DBMS**	Hours:06

Purpose and Benefits of Database Systems, Characteristics of DBMS vs. File System, Data Abstraction, Data Independence, Three-level Schema Architecture, Database Users and Administrators (DBA) responsibilities, Relational, Hierarchical, Network, and Object-oriented models, Relational Algebra: Select, Project, Union, Set Difference, Cartesian Product, and Rename.

Unit-II	Structured Query Language (SQL) & PL/SQL)	Hours:07

Data Definition Language (DDL), Data Manipulation Language (DML), Joins: Inner, Outer, Self, Set Operations, Nested and Correlated Sub queries, Views, Indexes, and Sequences, PL/SQL block structure, Variables, Control Structures (Loops/Conditionals), Stored Procedures, Functions, Exception Handling, and Triggers.

Unit-III	Database Design and Data Modelling	Hours:07

Steps in designing a database application, ER Model: Entities, Relationships, Attributes, and Constraints, EER Concepts: Specialization, Generalization (ISA), and Aggregation, Mapping ER/EER Diagrams into Relational Schema, Entity Integrity, Referential Integrity, and Foreign Key constraints.

Unit-IV	Relational Design and Normalization	Hours:9

Features of Good Relational Designs, Pitfalls in Design, Functional Dependencies, Closure of Attribute Sets, Canonical Cover, Dependency Preservation, Normal Forms: 1NF, 2NF, 3NF, BCNF, Multivalued Dependencies and 4NF.

Unit-V	Transactions, Concurrency, and Recovery	Hours:6

ACID Properties, Transaction States and Lifecycle, Schedules and Serializability (Conflict & View), Lock-Based Protocols, Two-Phase Locking (2PL), Timestamp-Based Protocols, Types of Failures, Log-Based Recovery (Undo/Redo), Checkpoints, Deferred and Immediate Update Methods.

Text Books:

1. "Database System Concepts", Abraham Silberschatz, Henry F. Korth, S. Sudarshan, 7th edition, McGraw- Hill.
2. "Database Systems - A Practical Approach to Design, Implementation and Management", Thomas Connolly, Carolyn Begg, 4th Edition, Addison Wesley.

Reference Books:

1. "Fundamentals of Database Systems", Ramez, Elmasri, Shamkant B. Navathe, 6th Edition, Addison Wesley.
2. RaghuRamakrishnan, Johannes Gehrke, Database Management Systems, McGraw-HillPublication, 3rd Edition, 2003

MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:

Second Year B.Tech (Computer Science Engineering(AIML))Semester-IV

Course Code	24AI406T	Course Name	Constitution of India			
Teaching Scheme				Evaluation Scheme		
L	T	Credits		CA-I	MSE	CA-II	ESE
2	-	2		15	20	15	

Course Prerequisites:

NIL

Course Objective:

1. To realise the significance of constitution of India to students from all walks of life and help them to understand the basic concepts of Indian constitution.
2 To identify the importance of fundamental rights aswell as fundamental duties.
3 To understand the functioning of Union, State and Local Governments in Indian federal system.
4 To learn procedure and effects of emergency, composition and activities of election commission and amendment procedure.

Course Outcome:

CO-1	Understand and explain the significance of Indian Constitution as the fundamental law of the land.
CO-2	Exercise his fundamental rights in proper sense at the same time identifies his responsibilities in national building.
CO-3	Analyse the Indian political system, the powers and functions of the Union, State and Local Governments in detail
CO-4	Understand Electoral Process, Emergency provisions and Amendment procedure.
CO-5	Explain the functions and responsibilities of election commission of india and union public service commission

Course Contents

Constitution of India –

Basic features and fundamental principles The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the “basic structure” of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of “Constitutionalism” – a modern and progressive concept historically developed by the thinkers of “liberalism” – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The AICTE Model Curriculum for Mandatory Courses

& Activities (Non-Credit) for Undergraduate Degree in Engineering & Technology 116 | Page historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of "constitutionalism" in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America. The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of "diversity". It has been said that Indian constitution reflects ideals of its freedom movement, however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be "static" and therefore the Constitution of India has also been amended more than one hundred.

These amendments reflect political, social and economic developments sincethe year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has beenprotecting not only basic ideals of the Constitution but also strengthenedthe same through progressive interpretations of the text of the Constitution.

The judicial activism of the Supreme Court of India and its historiccontributions has been recognized throughout the world and it graduallymade it "as one of the strongest court in the world".

Course content:

1. Meaning of the constitution law and constitutionalism.
2. Historical perspective of the Constitution of India.
3. Salient features and characteristics of the Constitution of India.
4. Scheme of the fundamental rights.
5. The scheme of the Fundamental Duties and its legal status.
6. The Directive Principles of State Policy – Its importance andimplementation.
7. Federal structure and distribution of legislative and financial powers between the Union and the States.
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India.
9. Amendment of the Constitutional Powers and Procedure.
10. The historical perspectives of the constitutional amendments in India.
11. Emergency Provisions: National Emergency, President Rule, FinancialEmergency.
12. Local Self Government – Constitutional Scheme in India.
13. Scheme of the Fundamental Right to Equality.
14. Scheme of the Fundamental Right to certain Freedom under Article 19.

15. Scope of the Right to Life and Personal Liberty under Article 21.

Text Books:

1. M.V. Pylee, Indian Constitution DurgaDasBasu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd. New Delhi

2. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

3.The constitution of India, P.M.Bakshi, Universal Law Publishing Co.,

4.The Constitution of India, 1950 (Bare Act), GovernmentPublication.

5.Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition,2015.

Reference Books:

1. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis,2014.

2. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis,2015.

3. Indian constitution at work, NCERT

4. SubashKashyap, Indian Constitution, National Book Trust

5. J.A. Siwach, Dynamics of Indian Government & Politics

6. D.C. Gupta, Indian Government and Politics

MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

Second Year B.Tech(Computer Science Engineering(AIML))Semester-IV

Course Code	24AI407L	Course Name	Web technology –I	
Teaching Scheme			Evaluation Scheme	
L	P	Credits	CIE	ESE
-	2	1	30	20

Course Prerequisites:

HTML Basic knowledge of design

Course Objective:

- To introduce the fundamentals of Internet, and the principles of web design.
- To construct basic websites using HTML and Cascading Style Sheets.
- To build dynamic web pages with validation using Java Script objects and by applying different event handling mechanisms.
- To develop modern interactive web applications using PHP, XML and MySQL

Course Outcome:

CO-1	Adapt HTML and CSS syntax and semantics to design and develop structured and visually appealing web pages.
CO-2	Construct and visually format complex tables and web forms using HTML and CSS styling principles.
CO-3	Develop dynamic and interactive web applications using Client-Side scripting (JavaScript) and Server-Side scripting (PHP).
CO-4	Apply object-oriented programming concepts in PHP to create modular, reusable, and maintainable web components.
CO-5	Inspect and utilize JavaScript frameworks like jQuery and Backbone.js to streamline development and enhance user experience.

Course Contents

Unit-I	**Website Development Essentials**	Hours:09
Web Design Concepts, Project Management, Development Process. HTML includes Basic Tags, Page Layout, Hyperlinks, Tables, Forms, and Frames. Use of GUI Editors, Metadata, and Accessibility considerations.		
Unit-II	**Cascading style sheets**	Hours:09
CSS Syntax, Rules, Selectors, Box Model, Fonts, and Text Styling. Embedding Styles and External Stylesheets. CSS with Tables for Styling and Sorting, including Responsive Design techniques.		
Unit-III	**JavaScript Programming**	Hours:09
JavaScript Basics such as Variables, Data Types, Operators, Strings, and Arrays. Programming Fundamentals including Loops, Conditionals, Switch Statements, and Functions. DOM Access, JavaScript Events, and Form Validation.		
Unit-IV	**PHP Programming**	Hours:9
PHP Syntax, Variables, Data Types, Operators, and Expressions. Handling HTML Forms with GET and POST methods, Session Management, and Cookies. File Handling, Error Handling, Arrays.		

Unit-V	**Advanced Web Technologies**	Hours:9

Query Syntax, DOM Manipulation, Event Handling, and Form Validation. AJAX introduction and integration with PHP. MySQL Database connection and basic DML operations such as Insert, Delete, Update, and Select. Introduction to Basic Web Services including JSON, Web APIs, and MVCarchitecture.

Text Books:

1. *HTML5 Black Book*, DT Editorial Services, 2nd Edition.
2. *Learning PHP, MySQL & JavaScript* – Robin Nixon, O'Reilly.
3. *Head First HTML & CSS* – E. Robson, E. Freeman, O'Reilly.

Reference Books:

MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:

Exp. No.	Experiment Title	CO
1	Design a Personal Webpage using HTML5 with Semantic Tags, Structured Layout, and Metadata.	
2	Create an HTML Page with a Table for Student Data and a Form for User Input.	
3	Apply CSS3 for Styling Webpages using Selectors, Box Model, Fonts, and Text Formatting.	
4	Design a Responsive Webpage using External Stylesheets and Media Queries.	
5	Write a JavaScript Program for Basic Form Validation (Name, Email, Phone Number).	
6	Develop a Simple Calculator using JavaScript Functions and Event Handling.	
7	Create a PHP Script to Process HTML Form Submissions and Display the Entered Data.	
8	Develop a PHP Program using Sessions and Cookies to Implement a User Login System.	
9	Design a MySQL Database for Student Registration and Create a PHP Script to Insert Data into the Database.	
10	Develop a Web Application that Retrieves, Displays, and Sorts Student Records from a MySQL Database using PHP and AJAX.	

Second Year B.Tech(Computer Science Engineering(AIML))Semester-IV

Course Code	24AI409T		Course Name	Innovation and Entrepreneurship			
Teaching Scheme				Evaluation Scheme			
L	T	Credits		CA-I	MSE	CA-II	ESE
2	-	2		15	20	15	50

Course Prerequisites:

NIL

Course Objective:

1. Develop innovative thinking and the development of ideas to practice
2. The ability to recognise the value proposition in an idea and make it marketable
3. To provide an overview of the skills required to successfully develop an entrepreneurial venture
4. To appreciate the challenge of creating sustainability in a venture

Course Outcome:

CO-1	Think creatively and come up with innovative ideas.
CO-2	Develop prototypes and test their feasibility.
CO-3	Understand the different types of innovation and their potential impact.
CO-4	Apply entrepreneurial principles to solve real-world problems.
CO-5	Protect their intellectual property.

Course Contents

Unit-I	**Introduction to Innovation and Entrepreneurship**	Hours:09

Defining innovation, Types of innovation: incremental, radical, disruptive, The innovation process, Factors that drive innovation, Defining entrepreneurship, The entrepreneurial process, Characteristics of successful entrepreneurs, Brainstorming, Design thinking process.

Unit-II	**Idea Generation and Prototyping**	Hours:09

Techniques for brainstorming and generating ideas - Criteria for evaluatinginnovative ideas, Market research and feasibility analysis, identifyingpotential customers and partnersDeveloping and Testing Prototypes - The purpose and importance ofprototyping, Different prototyping methods and tools, Creating low-fidelityand high-fidelity prototypes, User testing and feedback collection, Iteratingand refining prototypes based on feedback.

Unit-III	**Entering into market**	Hours:09

Attaining Market-Product Fit: Prototype Designing Process and Tools forDevelopment of Minimum Viable Product (MVP), Application of DesignThinking Tools and Approach for Right Problem Identification and SolutionDevelopment.

Unit-IV	**Understanding the process**	Hours:9

Transaction Processing – Concept, ACID properties, Transaction model, Schedule, Serializability –

conflict and view Serializability, Concurrency Control Mechanisms – Lock based protocols, Multiple Granularity,Timestamp based protocols, Thomas's Write Rule, Validation based protocols.

Unit-V	**Business plans and execution, Start-up**	Hours:9

Business Plan Development: Components and Stages in Business PlanDevelopment, Validation of Business Opportunity: Application of MarketResearch Tools at the Early Stage of Start-up. Generation and Management ofIP at the Early Stage of Innovation and Start-up Development, Legal Structuresand Ethical Steps in Establishing Startups.Start-ups, Definition, requirements, company act, opportunities and schemes, benefits of start-up formation, start-up registration process., fundingopportunities, incubators and accelerators- roles, responsibilities andpartnership, infrastructure. Funding, government schemes.

Text Books:

1. 8 Steps To Innovation: Going From Jugaad To Excellence, Collins India, 2013. ISBN: 9789350293584
2. National Student and Faculty Startup Policy 2019. Government of India.
3. PavanSoni, "Design Your Thinking - The Mindsets, Toolsets and Skill Sets For Creative Problem Solving", Penguin Random House India Pvt. Ltd. 2020, ISBN: 9780670094097.
4. Intellectual Property, A primer for academia, Prof.Rupinder Tiwari, MamtaBharadwaj, Publication Bureau Panjab University Chandigarh. https://dst.gov.in/sites/default/files/E-BOOK%20IPR.pdf

Reference Books:

1. Innovation and Entrepreneurship, Peter F. Drucker, Harper Business; Reprint, 2006, ISBN: 9780060851132.
2. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses, Crown Currency; Illustrated, 2011. ISBN: 9780307887894.
3. Innovator's DNA, Updated, with a New Preface: Mastering the Five Skills of Disruptive Innovators, Harvard Business Review Press; Revised, 2019. ISBN: 1633697207.
4. Wiley Innovation Black Book Enterprise 4.0, 2020.
5. Problem-Solving", Penguin Random House India Pvt. Ltd. 2020, ISBN: 9780670094097
6. HBS series on Innovation and Entrepreneurship
7.https://www.startupindia.gov.in/content/dam/investindia/Templates/public/Startup%20India%20Kit_Digital_Jan19.pdf
8. https://www.startupindia.gov.in/

MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:

1. Innovation and Start-up Policy ByProf. Rahul K. Mishra | IILM Institute for Higher Education https://onlinecourses.swayam2.ac.in/imb20_mg22/preview

2. Innovation, Business Models and Entrepreneurship, By Prof .Rajat Agrawal and Prof. Vinay Sharma | IIT Roorkee https://onlinecourses.nptel.ac.in/noc19_mg55/preview

3. Design Thinking - A Primer, By Prof.AshwinMahalingam&Prof.BalaRamadurai | IIT Madras, https://onlinecourses.nptel.ac.in/noc19_mg60/preview

4. Introduction to Intellectual Property By KAPILA IPR committee | IIT Kharagpur, https://onlinecourses.swayam2.ac.in/aic21_ge20/preview

Second Year B.Tech(Computer Science Engineering(AIML))Semester-IV

Course Code	24AI404L	Course Name	Database Lab	
Teaching Scheme			Evaluation Scheme	
P	Credits		CIE	ESE
2	1		30	20

Course Prerequisites:

NIL

Course Objective:

- To learn and implement important commands in SQL
- To learn the usage of nested and joint queries.
- To understand functions, procedures and procedural extensions of databases.
- To understand design and implementation of typical database applications.
- To be familiar with the use of a front end tool for GUI based application development.

Course Outcome:

CO-1	Create databases with different types of key constraints
CO-2	Construct simple and complex SQL queries using DML and DCL commands
CO-3	Use advanced features such as stored procedures and triggers and incorporate in GUI based application development
CO-4	Create an XML database and validate with meta-data (XML schema)
CO-5	Create and manipulate data using NOSQL database

Course Contents

Exp. No.	Experiment Title	CO
1	Installation and Demonstration of DBMS (MySQL/Oracle) and understanding the Three-level Schema Architecture and Data Independence.	
2	Database Security and Authorization featuring the creation of users, defining roles, and implementing Grant/Revoke privileges.	
3	Requirement Analysis and E-R Modeling for a real-world organization including identification of entities, attributes, and key constraints.	
4	Converting E-R Diagrams into Relational Schema and enforcing referential integrity through Primary and Foreign key mapping.	
5	Implementation of Data Definition Language (DDL) Queries including Create, Alter, Drop, Rename, and Truncate.	
6	Implementation of Data Manipulation Language (DML) Queries featuring Insert, Update, Delete, and basic Select operations.	

7	Implementation of SQL Clauses for data filtration and sorting using Where, Order By, and Distinct keywords.	
8	Implementation of SQL Aggregation using Group By and Having clauses for statistical data summarization.	
9	Implementation of Advanced SQL Joins including Inner, Left, Right, Full Outer, and Self Joins across multiple tables.	
10	Implementation of Nested and Correlated Sub-queries along with the creation and management of Database Views.	
11	PL/SQL Programming focusing on the implementation of Stored Procedures, Functions, and Exception Handling blocks.	
12	Implementation of Database Triggers and Cursors for automated audit trails and row-level data processing.	
13	Relational Database Design Assignment involving the normalization of a redundant dataset into 1NF, 2NF, 3NF, and BCNF.	

Second Year B.Tech(Computer Science Engineering(AIML))Semester-IV

Course Code	24AI402L	Course Name	Operating systems Lab	
Teaching Scheme			Evaluation Scheme	
P	Credits		CIE	ESE
2	1		30	20

Course Prerequisites:

NIL

Course Objective:

To write programs in Linux environment using system calls.
- To implement the scheduling algorithms.
- To implement page replacement algorithms
- To implement file allocation methods

Course Outcome:

CO-1	Ability to develop application programs using system calls in Unix•. •
CO-2	Ability to implement interprocess communication between two processes.
CO-3	Ability to design and solve synchronization problems
CO-4	Ability to simulate and implement operating system concepts such as scheduling,
CO-5	Ability to deadlock management, file management, and memory management.

Course Contents

Exp. No.	Experiment Title	CO
1	Introduction to System Calls and Process Creation.	
2	Study of Process States and Process Control Block (PCB).	
3	Implementation of CPU Scheduling Algorithms.	
4	To Study Inter-Process Communication using Pipes and FIFOs.	
5	Implementation of Message Queues and Shared Memory .	
6	Study Process Synchronization using Semaphores .	
7	Implementation of Page Replacement Algorithms.	
8	Study of Deadlock Creation and Resolution.	

Second YearB.Tech (Computer Science Engineering(AIML))Semester-I

Course Code	24AI408L	Course Name	Programming Lab-II (Python)	
Teaching Scheme			Evaluation Scheme	
L	P	Credits	CIE	ESE
1	2	2	30	20

Course Prerequisites:

Basic Programming in C

Course Objective:

To learn the fundamentals of the Python programming language.
2. To create Python list tuple to represent compound data. solving, and learning methods in solving engineering problems.
3. To write and execute simple as well as complex Python programs.
4. To analyze the concepts of procedural as well as object-oriented Python programs.
5. To perform files handling operations and handle exceptions using Python.

Course Outcome:

CO-1	Understand the basic concepts of programming, algorithms, and Python environment setup.
CO-2	Apply variables, operators, control flow statements, and functions to solve computational problems.
CO-3	Demonstrate proficiency in string processing, exception handling, file operations, and I/O handling.
CO-4	Implement object-oriented programming concepts and use Python data structures such as lists, tuples, sets, and dictionaries effectively.
CO-5	Connect Python programs with databases, perform SQL operations, and develop applications integrating multiple data sources.

Course Contents

Unit-I	**Introduction to Python Programming**	Hours:09
Informal introduction to programming, algorithms and data structures, downloading and installing Python, run a simple program on Python interpreter.		
Unit-II	**Variables, Control Flow, and Functions**	Hours:09
Variables, operations, control flow – assignments, conditionals, loops, functions: optional arguments, default values, passing functions as arguments.		
Unit-III	**Strings, Exceptions, and File Handling**	Hours:09
Statements, Expressions, Strings: String processing. Exception handling, Basic input/output, handling files.		
Unit-IV	**Object-Oriented Programming and Data Structures in Python**	Hours:9

Class and Object, Data Structure: List, Tuple and Sequences, Set, Dictionaries.

Unit-V	**Database Programming with Python**	Hours:9

Using Database and Structured Query Languages (SQL): SQLite manager, Spidering Twitter using a Database, Programming with multiple tables, JOIN to retrieve data.

Text Books:

1. Michael Urban and Joel Murach, Murach's Python Programming, Murach's Publication, 2016

Reference Books:

1. Charles Severance, Python for Informatics: Exploring Information, University of Michigan, Version 2.7.0, 2014.
2. Dr. R. Nageswara Rao, Core Python Programming, Dreamtech Press, 1st Edition, 2016.
3. Mark Lutz, Learning Python, O'Reilly Media, 5th Edition, 2013.
4. Mark Pilgrim, Dive into Python 3, A press Publication, 2nd Edition, 2009.
5. Allen B. Downey, Think Python, O'Reilly Media, 2nd Edition, 2012.
6. Jon Kleinberg and Eva Tardos, Algorithm Design, Pearson Education, 1st Edition, 2006.

MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:

1. https://www.w3schools.com/python/
2. https://www.learnpython.org/

Exp. No.	Experiment Title	CO
1	Program to calculate the area of a triangle, rectangle, and circle.	
2	Program to run a simple algorithm (e.g., factorial or Fibonacci).	
3	Program to check if a substring is present in a given string.	
4	Program to find the length of a list using recursion.	
5	Program to count the occurrences of each word in a given sentence using functions.	
6	Program to remove the i-th occurrence of a word in a list where words repeat.	
7	Program to read a file and capitalize the first letter of every word.	
8	Program to compute the diameter, circumference, and volume of a sphere using a class.	
9	Program to find the union and intersection of two lists.	
10	Program to map two lists into a dictionary.	
11	Program to create a dictionary with the first character as key and words starting with that character as values.	
12	Program to count the frequency of words in a string using a dictionary.	

SecondYearB. Tech(Computer Science Engineering(AIML)) Semester-IV

Course Code	24AI405T		Course Name	MDM –II Prompt Engineering			
Teaching Scheme				Evaluation Scheme			
L	T	Credits		CA-I	MSE	CA-II	ESE
2	-	2		15	20	15	50

Course Prerequisites:

None

Course Objective:

1. Understand the fundamental concepts of **Generative AI and Large Language Models (LLMs)**, including their architecture and working principles.
2. Develop the ability to design and refine effective prompts for interacting with LLMs.
3. Learn various prompting techniques and reasoning strategies to improve AI-generated outputs.
4. Apply prompt engineering skills to real-world applications such as text generation, code generation, and conversational systems.
5. Analyze ethical considerations, safety issues, and evaluation techniques in Generative AI systems.

Course Outcome:

CO-1	Explain the core concepts of Generative AI, LLM architecture, tokens, embeddings, and context handling.
CO-2	Design and implement effective prompts using zero-shot, one-shot, and few-shot prompting techniques.
CO-3	Apply advanced prompt patterns and reasoning techniques such as Chain-of-Thought, Self-Ask, and ReAct.
CO-4	Develop applications using prompt engineering for text generation, summarization, question answering, and code-related tasks.
CO-5	Evaluate AI-generated outputs for accuracy, bias, and safety, and apply ethical practices in prompt engineering.

Course Contents

Unit-I Introduction to Generative AI and LLMs Hours: 06

Definitions and overview of Generative AI, evolution of NLP to Large Language Models, fundamentals of LLMs, anatomy of LLMs: tokens, embeddings, context window, overview of popular LLMs (GPT, Claude, PaLM, Mistral), applications of LLMs in AI/ML systems.

Unit-II Fundamentals of Prompt Engineering Hours: 06

Definition and importance of prompt engineering, structure and components of a prompt, characteristics of effective prompts, types of prompting: Zero-shot, One-shot, Few-shot, prompting vs fine-tuning, basic prompt refinement techniques.

Unit-III Prompt Patterns and Reasoning Techniques Hours: 06

Prompt patterns: Instructional, role-based, delimiting, and Socratic prompts, reasoning-based prompting techniques: Chain-of-Thought, Self-Ask, ReAct (Reason + Act), prompt debugging and iterative improvement.

Unit-IV Applications of Prompt Engineering Hours: 06

Prompt engineering for text generation, summarization, and question answering, code generation and debugging prompts, conversational agents and dialogue design, introduction to multimodal prompting (text-to-image), domain-specific prompting overview.

Unit-V Prompt Evaluation, Safety, and Ethics Hours: 06

Evaluation of AI-generated outputs: accuracy, relevance, hallucination, bias and toxicity in LLM outputs, adversarial prompting and safe prompt design practices, ethical considerations in prompt engineering, future trends: tool usage, function calling, retrieval-augmented generation (RAG