



**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING  
(ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)**

**List of Courses for the Academic Year 2023-24**

S.No.	Year/sem.	Course Title
1	I/I	Matrices and Calculus
2		Applied Physics
3		Programming for Problem Solving
4		Engineering Workshop
5		English for Skill Enhancement
6		Elements of Computer Science & Engineering
7		Applied Physics Laboratory
8		Programming for Problem Solving Laboratory
9		English Language and Communication Skills Laboratory
10	I/II	Ordinary Differential Equations and Vector Calculus
11		Engineering Chemistry
12		Computer Aided Engineering Graphics
13		Basic Electrical Engineering
14		Electronic Devices and Circuits
15		Engineering Chemistry Laboratory
16		Basic Electrical Engineering Laboratory
17		Python Programming Laboratory
18		IT Workshop
19	II/I	Discrete Mathematics
20		Data Structures
21		Computer Organization and Architecture
22		Software Engineering
23		Operating Systems
24		Data Structures Lab
25		Operating Systems Lab
26		Software Engineering Lab
27		Skill Development Course (Node JS/React JS/ Django)
28	II/II	Mathematical and Statistical Foundations
29		Automata Theory and Compiler Design

30		Database Management Systems
31		Introduction to Artificial Intelligence
32		Object Oriented Programming through Java
33		Database Management Systems Lab
34		Java Programming Lab
35	III/I	Design and Analysis of Algorithms
36		Machine Learning
37		Computer Networks
38		Compiler Design
39		Introduction To Data Science
40		Information Retrieval Systems
41		Machine Learning Lab
42		Computer Networks Lab
43		Advanced Communication Skills lab
44	III/II	Artificial Intelligence
45		DevOps
46		Natural Language Processing
47		Data Mining
48		Fundamentals of Internet of Things
49		Artificial Intelligence and Natural Language Processing Lab
50		DevOps Lab
51		Data Mining Lab
52	IV/I	Neural Networks & Deep Learning
53		Reinforcement Learning
54		Cloud Computing
55		Social Network Analysis
56		Principles of Entrepreneurship
57		Deep Learning Lab
58		Industrial Oriented Mini Project
59		Seminar
60		Project Stage - I
61	IV/II	Organizational Behaviour
62		Semantic Web
63		Non-Conventional Sources of Energy
64		Project Stage - II

### Course Outcomes for the Academic Year 2023-24

S.NO	YEAR/SEM.	COURSE NAME	COURSE OUTCOME
1	I/I	Matrices And Calculus	1. Write the matrix representation of a set of linear equations and to analyze the solution of the system of equations.
			2. Find the Eigenvalues and Eigen vectors.
			3. Reduce the quadratic form to canonical form using orthogonal transformations.
			4. Solve the applications on the mean value theorems.
			5. Evaluate the improper integrals using Beta and Gamma functions
			6. Find the extreme values of functions of two variables with/ without constraints.
			7. Evaluate the multiple integrals and apply the concept to find areas, volumes
2	I/I	Applied Physics	1. Understand physical world from fundamental point of view by the concepts of Quantum mechanics and visualize the difference between conductor, semiconductor, and an insulator by classification of solids.
			2. Identify the role of semiconductor devices in science and engineering Applications.
			3. Explore the fundamental properties of dielectric, magnetic materials and energy for their applications.
			4. Appreciate the features and applications of Nanomaterials.
			5. Appreciate the features and applications of Nanomaterials.
3	I/I	Programming For Problem Solving	1. To write algorithms and to draw flowcharts for solving problems.
			2. To convert the algorithms/flowcharts to C programs.
			3. To code and test a given logic in the C programming language
			4. To decompose a problem into functions and to develop modular reusable code
			5. To use arrays, pointers, strings and structures to write C programs.

			6. Searching and sorting problems.
4	I/I	Engineering Workshop	<p>1. Understand and analyze basic Electrical circuits</p> <p>2. Practice on manufacturing of components using workshop trades including plumbing, fitting, carpentry, foundry, house wiring and welding.</p> <p>3. Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling</p> <p>4. Apply basic electrical engineering knowledge for house wiring practice.</p>
5	I/I	English For Skill Enhancement	<p>1 Understand the importance of vocabulary and sentence structures.</p> <p>2. Choose appropriate vocabulary and sentence structures for their oral and written communication.</p> <p>3. Demonstrate their understanding of the rules of functional grammar.</p> <p>4. Develop comprehension skills from the known and unknown passages.</p> <p>5. Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports in various contexts.</p> <p>6. Acquire basic proficiency in reading and writing modules of English</p>
6	I/I	Elements Of Computer Science And Engineering	<p>1. Know the working principles of functional units of a basic Computer</p> <p>2. Understand program development, the use of data structures and algorithms in problem solving.</p> <p>3. Know the need and types of operating system, database systems.</p> <p>4. Understand the significance of networks, internet, WWW and cyber security.</p> <p>5. Understand Autonomous systems, the application of artificial intelligence.</p>
7	I/I	Applied Physics Laboratory	<p>1. Know the determination of the Planck's constant using Photo electric effect and identify the material whether it is n-type or p-type by Hall experiment.</p> <p>2. Appreciate quantum physics in semiconductor devices and optoelectronics</p> <p>3. Gain the knowledge of applications of dielectric constant.</p> <p>4. Understand the variation of magnetic field and behavior of hysteresis curve.</p>

			5. Carried out data analysis.
8	I/I	Programming For Problem Solving Laboratory	1. formulate the algorithms for simple problems
			2. translate given algorithms to a working and correct program
			3. correct syntax errors as reported by the compilers
			4. identify and correct logical errors encountered during execution
			5. represent and manipulate data with arrays, strings and structures
			6. use pointers of different types
			7. create, read and write to and from simple text and binary files
			8. modularize the code with functions so that they can be reused
9	I/I	English Language And Communication Skills Laboratory	1. Understand the nuances of English language through audio – visual experience activities .
			2. Neutralise their accent for intelligibility.
			3. Speak with clarity and confidence which in turn enhances their employability skills.
10	I/II	Ordinary Differential Equations And Vector Calculus	1. Identify whether the given differential equation of first order is exact or not
			2. Solve higher differential equation and apply the concept of differential equation to real world problems
			3. Use the Laplace transforms techniques for solving ODE's.
			4. Evaluate the line, surface and volume integrals and converting them from one to another
11	I/II	Engineering Chemistry	1. Students will acquire the basic knowledge of electrochemical procedures related to corrosion and its control.
			2. The students are able to understand the basic properties of water and its usage in domestic and industrial purposes
			3. They can learn the fundamentals and general properties of polymers and other engineering materials.
			4. They can predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

12	I/II	Computer Aided Engineering Graphics	1. Apply computer aided drafting tools to create 2D and 3D objects
			2. Sketch conics and different types of solids.
			3. Appreciate the need of Sectional views of solids and Development of surfaces of solids.
			4. Read and interpret engineering drawings
			5. Conversion of orthographic projection into isometric view and vice versa manually and by using computer aided drafting
13	I/II	Basic Electrical Engineering	1. Understand and analyze basic Electrical circuits.
			2. Study the working principles of Electrical Machines and Transformers.
			3. Introduce components of Low Voltage Electrical Installations
14	I/II	Electronic Devices And Circuits	1. Acquire the knowledge of various electronic devices and their use on real life.
			2. Know the applications of various devices.
			3. Acquire the knowledge about the role of special purpose devices and their applications.
15	I/II	Engineering Chemistry Laboratory	1. Determination of parameters like hardness of water and rate of corrosion of mild steel in various conditions
			2. Able to perform methods such as conductometry, potentiometry and pH metry in order to find out the concentrations or equivalence points of acids and bases
			3. Students are able to prepare polymers like bakelite and nylon-6.
			4. Estimations saponification value, surface tension and viscosity of lubricant oils.
16	I/II	Basic Electrical Engineering Laboratory	1. Verify the basic Electrical circuits through different experiments.
			2. Evaluate the performance calculations of Electrical Machines and Transformers through various testing methods.
			3. Analyze the transient responses of R, L and C circuits for different input conditions.
17	I/II	Python Programming Laboratory	1. Develop the application specific codes using python.
			2. Understand Strings, Lists, Tuples and Dictionaries in Python

			3. Verify programs using modular approach, file I/O, Python standard library
			4. Implement Digital Systems using Python
18	I/II	IT Workshop	1. Perform Hardware troubleshooting
			2. Understand Hardware components and inter dependencies
			3. Safeguard computer systems from viruses/worms
			4. Document/ Presentation preparation
			5. Perform calculations using spreadsheets
19	II/I	Discrete Mathematics	1. Understand and construct precise mathematical proofs
			2. Apply logic and set theory to formulate precise statements
			3. Analyze and solve counting problems on finite and discrete structures
			4. Describe and manipulate sequences
			5. Apply graph theory in solving computing problems
20	II/I	Data Structures	1. Ability to select the data structures that efficiently model the information in a problem.
			2. Ability to assess efficiency trade-offs among different data structure implementations or combinations.
			3. Implement and know the application of algorithms for sorting and pattern matching.
			4. Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.
21	II/I	Computer Organization And Architecture	1. Understand the basics of instruction sets and their impact on processor design.
			2. Demonstrate an understanding of the design of the functional units of a digital computer system.

			3. Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory
			4. Design a pipeline for consistent execution of instructions with minimum hazards
			5. Recognize and manipulate representations of numbers stored in digital computers
22	II/I	Software Engineering	1. Ability to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD).
			2. Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.
			3. Will have experience and/or awareness of testing problems and will be able to develop a simple testing report
23	II/I	Operating Systems	1. Will be able to control access to a computer and the files that may be shared
			2. Demonstrate the knowledge of the components of computers and their respective roles in computing.
			3. Ability to recognize and resolve user problems with standard operating environments.
			4. Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively
24	II/I	Data Structures Lab	1. Ability to develop C programs for computing and real-life applications using basic elements like control statements, arrays, functions, pointers and strings, and data structures like stacks, queues and linked lists
			2. Ability to Implement searching and sorting algorithms



25	II/I	Operating Systems Lab	1. Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management.
			2. Able to implement C programs using Unix system calls
26	II/I	Software Engineering Lab	1. Ability to translate end-user requirements into system and software requirements
			2. Ability to generate a high-level design of the system from the software requirements
			3. Will have experience and/or awareness of testing problems and will be able to develop a simple testing report
27	II/I	Skill Development Course(Node JS/ React JS / Django)	1. Build a custom website with HTML, CSS, and Bootstrap and little JavaScript.
			2. Demonstrate Advanced features of JavaScript and learn about JDBC
			3. Develop Server – side implementation using Java technologies like
			4. Develop the server – side implementation using Node JS.
			5. Design a Single Page Application using React.
28	II/II	Mathematical And Statistical Foundations	1. Apply the number theory concepts to cryptography domain
			2. Apply the concepts of probability and distributions to some case studies
			3. Correlate the material of one unit to the material in other units
			4. Resolve the potential misconceptions and hazards in each topic of study.

29	II/II	Automata Theory And Compiler Design	1. Able to employ finite state machines for modeling and solving computing problems.
			2. Able to design context free grammars for formal languages.
			3. Able to distinguish between decidability and undecidability.
			4. Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.
			5. Acquire skills in using lex tool and design LR parsers
30	II/II	Database Management Systems	1. Gain knowledge of fundamentals of DBMS, database design and normal forms
			2. Master the basics of SQL for retrieval and management of data.
			3. Be acquainted with the basics of transaction processing and concurrency control.
			4. Familiarity with database storage structures and access techniques
31	II/II	Introduction To Artificial Intelligence	1. Learn the distinction between optimal reasoning Vs human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.
			2. Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
			3. Learn different knowledge representation techniques
			4. Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities
			5. Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.

			6. Analyze Supervised Learning Vs. Learning Decision Trees
32	II/II	Object Oriented Programming Through Java	1. Demonstrate the behavior of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.
			2. Demonstrate the implementation of inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords
			3. Use multithreading concepts to develop inter process communication.
			4. Understand the process of graphical user interface design and implementation using AWT or swings.
			5. Develop applets that interact abundantly with the client environment and deploy on the server
33	II/II	Database Management Systems Lab	1. Design database schema for a given application and apply normalization
			2. Acquire skills in using SQL commands for data definition and data manipulation.
			3. Develop solutions for database applications using procedures, cursors and triggers
34	II/II	Java Programming Lab	1. Able to write the programs for solving real world problems using Java OOP principles.
			2. Able to write programs using Exceptional Handling approach.
			3. Able to write multithreaded applications.
			4. Able to write GUI programs using swing controls in Java.
35	III/I	Design and Analysis of Algorithms	1. Ability to analyze the performance of algorithms
			2. Ability to choose appropriate data structures and algorithm design methods for a specified application

			3. Ability to understand how the choice of data structures and the algorithm design methods Impact the performance of programs
36	III/I	Machine Learning	1. Understand the concepts of computational intelligence like machine learning
			2. Ability to get the skill to apply machine learning techniques to address the real time problems in different areas
			3. Understand the Neural Networks and its usage in machine learning application.
37	III/I	Computer Networks	1. Understand the Neural Networks and its usage in machine learning application.
			2. Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
			3. Obtain the skills of subnetting and routing mechanisms
			4. Familiarity with the essential protocols of computer networks, and how they can be applied in network design and implementation.
38	III/I	Compiler Design	1. Demonstrate the ability to design a compiler given a set of language features.
			2. Demonstrate the the knowledge of patterns, tokens & regular expressions for lexical analysis.
			3. Acquire skills in using lex tool & yacc tool for developing a scanner and parser.
			4. Design and implement LL and LR parsers
			5. Design algorithms to do code optimization in order to improve the performance of a program in terms of space and time complexity.
			6. Design algorithms to generate machine code.

39	III/I	Introduction To Data Science	1. Understand basic terms what Statistical Inference means.
			2. Identify probability distributions commonly used as foundations for statistical modelling. Fit a model to data
			3. Describe the data using various statistical measures
			4. Utilize R elements for data handling
			5. Perform data reduction and apply visualization techniques.
40	III/I	Information Retrieval Systems	1. Ability to apply IR principles to locate relevant information large collections of data
			2. Ability to design different document clustering algorithms
			3. Implement retrieval systems for web search tasks
			4. Design an Information Retrieval System for web search tasks.
41	III/I	Machine Learning Lab	1. Understand complexity of Machine Learning algorithms and their limitations.
			2. Understand modern notions in data analysis-oriented computing.
			3. be capable of confidently applying common Machine Learning algorithms in practice and implementing their own.
			4. Be capable of performing experiments in Machine Learning using real-world data.
42	III/I	Computer Networks Lab	1. Implement data link layer farming methods
			2. Analyze error detection and error correction codes.
			3. Implement and analyze routing and congestion issues in network design.

			4. Implement Encoding and Decoding techniques used in presentation layer
			5. To be able to work with different network tools
43	III/I	Advance Communication Skills Lab	1.Acquire vocabulary and use it contextually
			2. Listen and speak effectively
			3. Develop proficiency in academic reading and writing
			4. Increase possibilities of job prospects
			5. Communicate confidently in formal and informal contexts
44	III/II	Artificial Intelligence	1. Ability to formulate an efficient problem space for a problem expressed in natural language.
			2. Select a search algorithm for a problem and estimate its time and space complexities
			3. Possess the skill for representing knowledge using the appropriate technique for a given problem.
			4. Possess the ability to apply AI techniques to solve problems of game playing, and machine learning
45	III/II	DevOps	1. Identify components of Devops environment
			2. Describe Software development models and architectures of DevOps
			3. Apply different project management, integration, testing and code deployment tool.
			4. Investigate different DevOps Software development models.
			5. Assess various Devops practices
			6. Collaborate and adopt Devops in real-time projects.

46	III/II	Natural Language Processing	1. Show sensitivity to linguistic phenomena and an ability to model them with formal grammars
			2. Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
			3. Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
			4. Able to design, implement, and analyze NLP algorithms
			5. Able to design different language modeling Techniques.
47	III/II	Data Mining	1. Ability to understand the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system.
			2. Apply preprocessing methods for any given raw data.
			3. Extract interesting patterns from large amounts of data.
			4. Discover the role played by data mining in various fields.
			5. Choose and employ suitable data mining algorithms to build analytical applications
			6. Evaluate the accuracy of supervised and unsupervised models and algorithms.
48	III/II	Fundamentals of Internet of Things	1. Known basic protocols in sensor networks
			2. Program and configure Arduino boards for various designs
			3. Python programming and interfacing for Raspberry Pi
			4. Design IoT applications in different domains.

49	III/II	Artificial Intelligence and Natural Language Processing Lab	1. Apply basic principles of AI in solutions that require problem solving, knowledge representation, and learning.
			2. Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
			3. Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
			4. Able to design, implement, and analyze NLP algorithms
50	III/II	DevOps	1. Identify components of Devops environment
			2. Apply different project management, integration, testing and code deployment tool
			3. Investigate different DevOps Software development, models
			4. Demonstrate continuous integration and development using Jenkins.
51	III/II	Data Mining Lab	1. Apply preprocessing statistical methods for any given raw data
			2. Gain practical experience of constructing a data warehouse.
			3. Implement various algorithms for data mining in order to discover interesting patterns from large amounts of data.
			4. Apply OLAP operations on data cube construction.
52	IV/I	Neural Networks & Deep Learning	1. Ability to understand the concepts of Neural Networks
			2. Ability to select the Learning Networks in modeling real world systems
			3. Ability to use an efficient algorithm for Deep Models



			4. Ability to apply optimization strategies for large scale applications
53	IV/I	Reinforcement Learning	1. Understand basics of RL.
			2. Understand RL Framework and Markov Decision Process.
			3. Analyzing ning through the use of Dynamic Programming and Monte Carlo
			4. Understand TD(0) algorithm, TD( $\lambda$ ) algorithm.
54	IV/I	Cloud Computing	1. Ability to understand various service delivery models of a cloud computing architecture.
			2. Ability to understand the ways in which the cloud can be programmed and deployed.
			3. Understanding cloud service providers.
55	IV/I	Social Network Analysis	1. Ability to construct social network maps easily
			2. Gain skills in tracking the content flow through the social media
			3. Use NodeXL to perform social network analysis
56	IV/I	Principles of Entrepreneurship	1. Identify qualities of entrepreneurs
			2. Think creative and innovative
			3. Understand various schemes supporting entrepreneurship
			4. Write project proposal
57	IV/I	Deep Learning Lab	1. Upon the Successful Completion of the Course, the Students would be able to:
			2. Learn the Fundamental Principles of Deep Learning.
			3. Identify the Deep Learning Algorithms for Various

			Types of Learning Tasks in various domains.
			4. Implement Deep Learning Algorithms and Solve Real-world problems.
58	IV/I	Industrial Oriented Mini Project	1. Discover potential research areas in the field of Computer Science and Engineering
			2. Survey of several available literature in the preferred field of study and contrast the several existing solutions for research challenge
			3. Demonstrate an ability to work in teams and manage the conduct of the research study
			4. Formulate and propose a plan for creating a solution for the research plan identified
			5. To present and report the findings of the study conducted in the preferred domain
59	IV/I	Seminar	1. Recall the knowledge in basic engineering Courses.
			2. Prepare the report of technical seminar
			3. Develop professional skills and communication skills.
			4. Explain existed methodology
			5. Assess the understanding ability in core Courses.
60	IV/I	Project Stage - I	1. Identify the problem by applying acquired knowledge.
			2. Analyze and categorize executable project modules after considering risks.
			3. Choose efficient tools for designing project modules.
			4. Combine all the modules through effective team work after efficient testing
			5. Elaborate the completed task and compile the project report.

61	IV/II	Organizational Behaviour	1. Demonstrate the applicability of analyzing the complexities associated with management of individual behavior in the organization
			2. Analyze the complexities associated with management of the group behavior in the organization.
			3. Demonstrate how the organizational behavior can integrate in understanding the motivation (why) behind behavior of people
62	IV/II	Semantic Web	1. Understand the characteristics of Semantic Web.
			2. Apply SOAP and UDDI to web services.
			3. Handle multiple web services using Orchestration.
			4. Create documents using XML
			5. Construct and use Ontologies.
63	IV/II	Non-Conventional Sources of Energy	1. Identify renewable energy sources and their utilization. Understand the basic concepts of solar radiation and analyze the working of solar and thermal systems
			2. Understand principles of energy conversion from alternate sources including wind, geothermal, ocean, biomass, biogas and hydrogen
			3. Understand the concepts and applications of fuel cells, thermoelectric converter and MHD generator.
			4. Identify methods of energy storage for specific applications
64	IV/II	Project Stage - II	1. Identify the problem by applying acquired knowledge.
			2. Analyze and categorize executable project modules after considering risks.
			3. Choose efficient tools for designing project modules.

			4. Combine all the modules through effective team work after efficient testing.
			5. Elaborate the completed task and compile the project report