Savitribai Phule Pune University

Second Year of Artificial Intelligence and Machine Learning (2020 Course)

(With effect from Academic Year 2021-22)

Semester-III

Course Code	Course Name	Course Outcomes *(On completion of the course, learner will be able to–)*
218541	Discrete Mathematics	**CO1:** Formulate and apply formal proof techniques and solve the problems with logical reasoning. **CO2:** Analyze and evaluate the combinatorial problems by using probability theory. **CO3:** Apply the concepts of graph theory to devise mathematical models. **CO4:** Analyze types of relations and functions to provide solutions to computational problems. **CO5:** Identify techniques of number theory and its application. **CO6:** Identify fundamental algebraic structures.
218542	Data Structure & Algorithms	**CO1:** Perform basic analysis of algorithms with respect to time and space complexity. **CO2:** Select appropriate searching and/or sorting techniques in application development. **CO3:** Implement abstract data type (ADT) and data structures for given application. **CO4:** Design algorithms based on techniques like brute -force, divide and conquer, greedy, etc. **CO5:** Apply implement algorithm design techniques and data structures to solve problems. **CO6:** Design different hashing functions and use files organizations.
218543	Computer Networks	**CO1:** Understand data/signal transmission over communication media. **CO2:** Understand basics of computer networking and compare functions of OSI and TCP/IP model using concepts of communication theory. **CO3:** Analyze data link layer services, different access techniques, and Ethernet standards. **CO4:** Understand the network layer services, apply skills of subnetting, super-netting and routing mechanisms. **CO5:** Illustrate services and protocols used at transport layers. **CO6:** Understand and learn the different application layer protocols.
218544	Object Oriented Programming	**CO1:** Differentiate various programming paradigms. **CO2:** Identify classes, objects, methods, and handle object creation, initialization, and destruction to model real-world problems. **CO3:** Identify relationship among objects using inheritance and polymorphism principles. **CO4:** Handle different types of exceptions and perform generic programming. **CO5:** Use of files for persistent data storage for real world application. **CO6:** Apply appropriate design patterns to provide object-oriented solutions.
218545	Software Engineering	**CO1:** Classify various software application domains. **CO2:** Analyze software requirements by using various modeling techniques. **CO3:** Translate the required models into design models. **CO4:** Apply planning and estimation to any project. **CO5:** Use quality attributes and testing principles in software development life cycle. **CO6:** Discuss recent trends in Software engineering by using CASE and agile tools.
218546	Data Structure & Algorithms Laboratory	**CO1:** Analyze algorithms and determine algorithm correctness and time efficiency class. **CO2:** Implement abstract data type (ADT) and data structures for given application. **CO3:** Design algorithms based on techniques like brute -force, divide and conquer, greedy, etc.). **CO4:** Solve problems using algorithmic design techniques and data structures. **CO5:** Analyze algorithms with respect to time and space complexity.
218547	Object Oriented Programming Laboratory	**CO1:** Differentiate various programming paradigms. **CO2:** Identify classes, objects, methods, and handle object creation, initialization, and destruction to model real-world problems. **CO3:** Identify relationship among objects using inheritance and polymorphism. **CO4:** Handle different types of exceptions and perform generic programming. **CO5:** Use file handling for real world application. **CO6:** Apply appropriate design patterns to provide object-oriented solutions.

218548	Computer Networks Laboratory	**CO1:** Implement small size network and its use of various networking commands. **CO2:** Understand and apply networking and simulation tool i.e. packet tracer. **CO3:** Configure the various routing and switching protocols using packet tracer. **CO4:** Configure various client/server environments to use application layer protocols. **CO5:** Explore use of protocols in various wired applications.
218549	Humanities & Social Sciences	**CO1:** Aware of the various issues concerning humans and society. **CO2:** Aware about their responsibilities towards society. **CO3:** Sensitized about broader issues regarding the social, cultural, economic and human aspects, involved in social changes. **CO4:** Able to understand the nature of the individual and the relationship between self and the community. **CO5:** Able to understand major ideas, values, beliefs, and experiences that have shaped human history and cultures.
218550	Soft Skill Laboratory	**CO1:** Introspect about individual's goals, aspirations by evaluating one's SWOC and thinking creatively. **CO2:** Develop effective communication skills including Listening, Reading, Writing and Speaking. **CO3:** Constructively participate in group discussion, meetings and prepare and deliver Presentations. **CO4:** Write precise briefs or reports and technical documents. **CO5:** Practice professional etiquette, present oneself confidently and successfully handle personal interviews. **CO6:** Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of teamwork, Inter-personal relationships, conflict management and leadership quality.
218551 (A)	Mandatory Audit Course 3	**CO1:** Adapt the global ethical principles and modern ethical issues. **CO2:** Apprehend ethics in the business relationships and practices of IT. **CO3:** Implement trustworthy computing to manage risk and security vulnerabilities. **CO4:** Analyze concerns of privacy, privacy rights in information-gathering practices in IT.

Semester-IV

Course Code	Course Name	Course Outcomes *(On completion of the course, learner will be able to–)*
207003	Applied Mathematics	**CO1:** Solve Linear differential equations, essential in modelling and design of computer-based systems. **CO2:** Apply concept of Fourier transform and Z-transform and its applications to continuous and discrete systems and image processing. **CO3:** Apply Statistical methods like correlation& regression analysis and probability theory for data analysis and predictions in machine learning. **CO4:** Solve Algebraic & Transcendental equations and System of linear equations using numerical techniques. **CO5:** Obtain Interpolating polynomials, numerical differentiation and integration, numerical solutions of ordinary differential equations used in modern scientific computing.
218552	Operating Systems	**CO1:** Describe the role of Modern Operating Systems and make use of shell commands to build shell scripts. **CO2:** Describe the concept of thread and process management, compare different process scheduling algorithms, and justify what algorithm to use in given scenario. **CO3:** Explain synchronization and deadlock; analyze classical IPC problems, also infer the existence of deadlock in the system. **CO4:** Apply the concepts of various memory management techniques. **CO5:** Make use of concept of I/O management and File system. **CO6:** Understand the concepts of different system software.
218553	Fundamentals of Artificial Intelligence and Machine Learning	**CO1:** Evaluate Artificial Intelligence (AI) methods and describe their foundations. **CO2:** Analyze and illustrate how search algorithms play a vital role in problem solving, inference, perception, knowledge representation and learning. **CO3:** Demonstrate knowledge of reasoning and knowledge representation for solving real world problems **CO4:** Recognize the characteristics of machine learning that make it useful to real-world problems **CO5:** Apply different supervised learning methods of supporting vector machine and tree-based models. **CO6:** Use different linear methods for regression and classification with their optimization through different regularization techniques.

218554	Database Management System	**CO1:** Apply fundamental elements of database management systems. **CO2:** Design ER-models to represent simple database application scenarios. **CO3:** Formulate SQL queries on data for relational databases. **CO4:** Improve the database design by normalization & incorporate query processing. **CO5:** Apply ACID properties for transaction management and concurrency control. **CO6:** Analyze various database architectures and technologies.
218555	Computer Graphics	**CO1:** Apply mathematical and logical aspects for developing elementary graphics operations like scan conversion of points, lines, circle, and apply it for problem solving. **CO2:** Employ techniques of geometrical transformation to produce, position and manipulate Objects in 2 dimensional and 3-dimensional space respectively. **CO3:** Describe mapping from a world coordinate to device coordinates, clipping, and projections to produce 3D images on 2D output device. **CO4:** Apply concepts of rendering, shading, animation, curves and fractals using computer graphics tools in design, development and testing of 2D, 3D modeling applications. **CO5:** Perceive the concepts of virtual reality.
218556	Operating System Laboratory	**CO1:** To apply the basics of Linux commands. **CO2:** To build shell scripts for various applications. **CO3:** To implement basic building blocks like processes, threads under the Linux. **CO4:** To develop various system programs for the functioning of OS concepts in user space like concurrency control, CPU Scheduling, Memory Management and Disk Scheduling in Linux. **CO5:** To develop system programs for Inter Process Communication in Linux.
218557	Computer Graphics Laboratory	**CO1:** Apply line & circle drawing algorithms to draw the objects. **CO2:** Apply polygon filling methods for the object. **CO3:** Apply polygon clipping algorithms for the object. **CO4:** Apply the 2D transformations on the object. **CO5:** Implement the curve generation algorithms. **CO6:** Demonstrate the animation of any object using animation principles.
218558	Database Management System Laboratory	**CO1:** Install and configure database systems. **CO2:** Analyze database models & entity relationship models. **CO3:** Design and implement a database schema for a given problem-domain **CO4:** Implement relational database systems. **CO5:** Populate and query a database using SQL DDL / DML / DCL commands. **CO6:** Design a backend database of any one organization: CASE STUDY
218559	Project Based Learning – II	**CO1:** Design solutions to real life problems and analyze their concerns through shared cognition. **CO2:** Apply learning by doing approach in PBL to promote lifelong learning. **CO3:** Tackle technical challenges for solving real world problems with team efforts. **CO4:** Collaborate and engage in multi-disciplinary learning environments.
218560	Code of Conduct	**CO1:** Understand the basic perception of profession, professional ethics, various moral and social issues, industrial standards, code of ethics and role of professional ethics in engineering field. **CO2:** Aware of professional rights and responsibilities of an engineer, responsibilities of an engineer for safety and risk benefit analysis. **CO3:** Understand the impact of the professional Engineering solutions in societal and Environmental contexts, and demonstrate the knowledge of, and need for sustainable development. **CO4:** Acquire knowledge about various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise in their professional lives.
218561 (A)	Mandatory Audit Course 4	**CO1:** Relate the relations between the environment and ecology, estimating water requirements for public water supply scheme. **CO2:** Assess the quality of water as per BIS and select the appropriate treatment method required for the water source. **CO3:** Analyze the suitable distribution system for a locality and know the appurtenances used. **CO4:** Summarize the arrangement of water supply and fittings in a building. **CO5:** Determine the need for conservation of water and rural water supply. **CO6:** Identify the sources of water pollution and suitable control measures.