# Internet of Things (EE)

## Basics of Internet of Things: 220101

**Course Objectives:**

- To familiarize the students to the basics of Internet of things and protocols.
- It expose the students to some of the electrical engineering application areas where Internet of Things can be applied.

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Explain** the function blocks, three-layer model and five-layer model of IoT | Skill Development |
| 2 | **Develop** an understanding of various communication network: HAN, NAN, FAN, WAN and WSNs | Employability |
| 3 | **Describe** privacy, security and design related challenges of IoT | Skill Development |
| 4 | **Select** proper sensor technology for IoT application | Skill Development |
| 5 | **Describe** IoT applications in the field of Electrical Engineering | Employability |

## Basic Electrical & Electronics Engineering: 100022

**Course Objectives:**

- To impart the basic knowledge of the DC and AC circuits and their applications.
- To familiarize the students with the basic knowledge of magnetic circuits and its terminology, the importance of transformers in transmission and distribution of electric power.
- To expose the students to the working of DC Machine, various electronic circuits and its importance.

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Solve** DC& AC circuits by applying fundamental laws & theorems | Skill Development |
| 2 | **Analyze** the response of linear electrical and magnetic circuits for given input | Skill Development |
| 3 | **Explain** the working principle, construction, applications of rotating electrical machines | Skill Development |
| 4 | **Explain** the working principle, constructional details, losses & applications of single phase transformer. | Skill Development |
| 5 | **Select** the logic gates for various applications in digital electronic circuits. | Employability |
| 6 | **Explain** characteristics of Diode and Transistor. | Skill Development |

## Basic Electrical & Electronics Engineering Lab: 100022

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Verify** circuit theorems | Skill Development |
| 2 | **Perform** tests on transformer for determination of losses, efficiency & polarity | Skill Development |
| 3 | **Demonstrate** the constructional features of electrical machines | Skill Development |
| 4 | **Acquire** teamwork skills for working effectively in groups | Employability |
| 5 | **Prepare** an organized technical report on experiments conducted in the laboratory | Employability |

## Linear Algebra: 250100

**Objective of Course**

- To understand the concept Matrices and its applications
- To understand the various aspect of algebraic structures'
- To explore vector space
- To perceive knowledge of linear transformation and their application

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Develop** an understanding of the algebra of matrices i.e. inverses of matrices, determinants and other algebraic operations | Skill Development |
| 2 | **Compute** eigen values and eigenvectors | Skill Development |
| 3 | **Explain** the basic concepts of a vector space, properties and dimension of vector space | Skill Development |
| 4 | **Explain** matrix representation of a linear transformation | Skill Development |
| 5 | **Describe** the concept of Inner product spaces | Skill Development |

## Energy, Ecology, Environment & Society (EEES): 100015

**Course Objectives:**

To create awareness about global energy status, climate issues and sustainable development for development of society using new rand renewable energy resources for power needs, to generate an understanding of human relationships, perceptions and policies towards environment and focus on design and technology for improving environmental quality and to develop moral values and morals to conduct efficiently and ethically in society.

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Describe** various energy resources, their conversion to electrical power and role in technological & economic development. | Employability |
| 2 | **Update** with national/international power status and renewable power development targets & missions. | Employability |
| 3 | **Recognize** the impact of pollution on the ecosystem and control policies adopted at national/international levels. | Employability |
| 4 | **Illustrate** the concepts of ecosystems and their conservation. | Skill Development |
| 5 | **Solve** practical problems of society in a sustainable and ethical manner. | Employability |
| 6 | **Fulfill** professional duties keeping in mind the environmental safety, health, and welfare of public. | Employability |

## Digital Electronics and Logic Design: 220201

**Course Objectives:**

- To familiarize the students with the number representation and conversion between various representations in digital electronic circuits.
- To expose the students to the logical operations using combinational logic circuits, sequential logic circuits and the characteristics of memory and their classification.

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Perform** conversion among Different number systems and codes. | Skill Development |
| 2 | **Simplify** the logic expressions using Boolean laws, map method and design them by using logic gates. | Skill Development |
| 3 | **Design** a given digital combinational circuits using basic gates for different applications. | Employability |
| 4 | **Analyze** different types of flip-flops and design a sequential logic circuit. | Skill Development |
| 5 | **Understand** basics of Logic family and converter like A/D and D/A. | Skill Development |

# Internet of Things (EE)

## Sensor Technology: 220202

**Course Objective**s: Introduction to various types of sensors and the design of basic circuit building blocks.

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Explain** fundamentals of Sensors & Transducers | Skill Development |
| 2 | **Describe** physical principles of sensing | Skill Development |
| 3 | **Compare** various sensor materials and technology used in designing sensors | Employability |
| 4 | **Select** appropriate sensor for given application | Skill Development |
| 5 | **Recognize** the latest trends in the field of sensor | Skill Development |

## Sensor Technology Lab: 220202

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Develop** an understanding about the constructional features of sensors & transducers | Skill Development |
| 2 | **Develop** an understanding about the input-output characteristics of sensors & transducers | Skill Development |
| 3 | **Acquire** teamwork skills for working effectively in groups | Employability |
| 4 | **Prepare** an organized technical report on experiments conducted in the laboratory. | Employability |

## Data Structure: 230202

**Course Objectives**

- To be familiar with the use of data structures as the foundational base for computer solutions to problems.
- To understand various techniques of searching and sorting.
- To understand basic concepts about stacks, queues, lists, trees and graphs.

**Course outcomes focused on employability/entrepreneurship and skill development**

| SN | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Explain** the basics of Algorithms and their performance criteria. | Skill Development |
| 2 | **Describe** the working of linear/Non-Linear data structures. | Skill Development |
| 3 | **Select** the appropriate data structure to solve specific problems. | Skill Development |
| 4 | **Analyse** the performance of various Data Structures & their applications. | Skill Development |
| 5 | **Evaluate** the time/space complexities of various data structures & their applications. | Skill Development |
| 6 | **Design** the optimal algorithmic solutions for various problems**.** | Employability |

## Data Structure Lab: 230202

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Implement** algorithms related to data structure in C/C++ | Skill Development |
| 2 | **Analyze** the time/space complexities of various data structures. | Skill Development |
| 4 | **Acquire** teamwork skills for working effectively in groups | Employability |
| 5 | **Prepare** technical report on experiments performed in the lab | Skill Development |

## Object-Oriented Programming and Methodology: 230203

**Course Objectives**

- To study the concept of object-oriented programming.
- To create C++ programs that leverage the object-oriented features of the C++ Language.
- To apply object-oriented or non-object-oriented techniques to solve bigger computing problems.

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Explain** the concepts of classes & objects and their significance in the real world. | Skill Development |
| 2 | **Describe** the benefits of object-oriented design. | Skill Development |
| 3 | **Build** C++ classes using appropriate encapsulation and design principles. | Skill Development |
| 4 | **Analyze** the utilization of inheritance and polymorphism in the solution of problems. | Skill Development |
| 5 | **Choose** appropriate object orient programming concepts for solving real world problems. | Employability |
| 6 | **Develop** solutions to problems demonstrating usage of control structures, modularity, I/O and other standard language constructs. | Employability |

## Fundamentals of Signals & Control Systems: 220301

**Course Objectives:**

- To develop an understanding of fundamental characteristics of signals and systems.
- To develop mathematical skills to solve problems involving convolution, and sampling.
- To understand the concepts of various transforms for signal analysis.
- To learn the basics of system representations, control systems and dynamic system response.

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Describe** the elementary characteristics of the signals and systems. | Skill Development |
| 2 | **Analyze** the spectral characteristics of periodic signals using Fourier Transforms. | Skill Development |

| | | |
|---|---|---|
| 3 | **Explain** the sampling process and discrete transforms for the analysis of discrete time-signals and systems. | Skill Development |
| 4 | **Apply** the Laplace transform for the analysis of continuous-time signals and systems. | Skill Development |
| 5 | **Explain** the concepts of control system and system representation using transfer function and state variables. | Skill Development |
| 6 | **Evaluate** the time domain and frequency domain behavior of the dynamic response of systems. | Skill Development |

## Design & Analysis of Algorithms: 220302

**Course Objective:**

- To introduce the topic of algorithms as a precise mathematical concept.
- To demonstrate the familiarity with major algorithm design paradigms and methods of analysis.
- To design efficient algorithms for common computer engineering problems.

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Define** the basic features of Algorithms | Skill Development |
| 2 | **Outline** major Algorithms and Data Structures | Skill Development |
| 3 | **Apply** various algorithmic design paradigms | Skill Development |
| 4 | **Analyze** the asymptotic performance of Algorithms | Skill Development |
| 5 | **Compare** different design techniques to develop algorithms for computational problems | Skill Development |
| 6 | **Design** algorithms using greedy strategy, divide and conquer approach, dynamic programming, backtracking, branch and bound approach | Skill Development |

## Design and Analysis of Algorithm Lab: 220302

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Relate** the principles of algorithm design in solving problems | Skill Development |
| 2 | **Demonstrate** basic algorithms and different problem solving strategies | Skill Development |
| 3 | **Design** and implement optimization algorithms in specific applications | Employability |

## Operating Systems: 220303

**Course Objectives:**

- Provide basic knowledge of computer operating system structures and functioning.
- Compare several different approaches to memory management, file management and process management
- Understand various problems related to concurrent operations and their solutions.

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Outline** the basic concept of operating systems | Skill Development |
| 2 | **Analyze** the working of operating system | Skill Development |
| 3 | **Examine** the working of various scheduling/allocation approaches | Skill Development |
| 4 | **Measure** the performance of various scheduling/allocation approaches | Skill Development |
| 5 | **Analyze** the various operating system problems/issues | Skill Development |

## Analog Electronics: 220304

**Course Objectives:**

The course intends to provide an understanding of the principles, operation and application of the analog building blocks like diodes, BJT, FET etc. for performing various functions, use of simple models and equations to illustrate the concepts involved, an overview of different amplifiers and oscillators and the knowledge about practical analog circuits.

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Explain** working principles of electronic devices e.g. Diode, Zener Diode, LED, Rectifiers, Transistor, Power Amplifier, Oscillator and Op-Amp. | Skill Development |
| 2 | **Categorize** the different types of diode, Power Amplifier, Oscillators and Op-Amp and transistor Biasing. | Skill Development |
| 3 | **Explain** the different types of characteristics of Diode, Transistor, Power Amplifier and Op-amp. | Skill Development |
| 4 | **Describe** the various mathematical model of transistor e.g. Hybrid model, re model. | Skill Development |
| 5 | **Develop** an ability and skill to design different types of diode rectifier, transistor biasing, oscillators and timer circuit. | Employability |
| 6 | **Apply** the various principles of electronics to design different types of Analog Electronics circuits for various applications | Employability |

## Analog Electronics Lab: 220304

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Develop** the understanding of diode biasing conditions. | Skill Development |
| 2 | **Investigate** the operation of half-wave and full wave rectifier and find their performance curves. | Skill Development |
| 3 | **Examine** transistor configurations and investigate common emitter configuration input-output characteristics. | Skill Development |
| 4 | **Develop** teamwork skills for working effectively in groups | Employability |
| 5 | **Prepare** technical report on experiments conducted in the lab | Skill Development |

## Programming & Simulation lab: 220305

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Familiar** with Arduino environment and its applications and to understand Arduino programming with C++. | Skill Development |
| 2 | **Learn** about any new IDE, compiler, and MCU chip in Arduino compatible boards or similar types | Skill Development |
| 3 | **Develop** teamwork skills for working effectively in groups | Employability |
| 4 | **Prepare** technical report on experiments conducted in the lab | Skill Development |

## Database Management System: 220401

**Course Objectives**

- To understand the fundamental concepts of a database management system.
- To analyses database requirements and determine the entities involved in the system and their relationship to one another.
- To develop the logical design of the database using data modelling concepts & normalization.
- To manipulate a database using SQL commands.

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Develop** the understanding about different type of database system i.e terminology, features, classifications, and characteristics embodied in database systems. | Skill Development |
| 2 | **Identify** different issues involved in the design and implementation of database system. | Skill Development |
| 3 | **Analyze** database schema for a given problem domain. | Skill Development |

| | | |
|---|---|---|
| 4 | **Justify** principles for logical design of databases, including the E-R modelling and Normalization approach. | Skill Development |
| 5 | **Apply** transaction processing concepts and recovery methods over real time data. | Skill Development |
| 6 | **Formulate**, using relational algebra and SQL, solutions to a broad range of query problems. | Skill Development |

## Database Management System Lab: 220401

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Acquire** practical knowledge on designing and creating relational database systems. | Skill Development |
| 2 | **Understand** various advanced queries execution such as relational constraints, joins, set operations, aggregate functions, trigger, views and embedded SQL. | Skill Development |
| 3 | **Design** and build ER Diagrams, UML, Flowcharts for related database systems. | Skill Development |
| 4 | **Design** and implement database applications on their own | Employability |

## Computer Networks and Protocols: 220402

**Course Objectives:**

- Familiarize the student with the basic taxonomy and terminology of the computer networking & Protocols.
- Provide detail knowledge about various layers, protocols and devices that facilitate networking.
- Enable students to deal with various networking problems such as flow control, error control and congestion control.

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Explain** the fundamental concepts of computer network | Skill Development |
| 2 | **Illustrate** the basic taxonomy & terminologies of computer network protocols | Skill Development |
| 3 | **Develop** a concept for understanding advance computer network | Skill Development |
| 4 | **Develop** the skill of IP addressing and routing mechanism | Skill Development |

## Power Electronics: 220403

**Course Objective:**

- To introduce the students, the basic theory of power semiconductor devices and passive components.
- their practical application in power electronics and to familiarize the operation principle of AC-DC, DC-DC, DC-AC conversion circuits and their applications.

- To provide the basis for further study of power electronics circuits and systems.

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Develop** an understanding of power electronics devices (i.e. Diode SCR, BJT, MOSFET and IGBT. etc) and explain their static/ dynamic characteristics. | Skill Development |
| 2 | **Analyze** the configuration of AC to DC converter, Dual converter, chopper, cyclo-converter | Skill Development |
| 3 | **Classify** converters and identify their applications. | Skill Development |
| 4 | **Develop** different model of different converters to calculate their performance parameter | Skill Development |
| 5 | **Identify** the problems/limitations of power electronics devices, converters and suggest solution | Skill Development |

## Microprocessors & Embedded Systems: 220404

**Course Objective:**

- To provide fundamental operating concepts of microprocessors and microcontrollers.
- This course aims to provide students with a solid theoretical basis as well as comprehensive professional understanding of Arduino and Raspberry Pi.

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Distinguish** various types of processor architectures. | Skill Development |
| 2 | **Describe** architecture, memory organization of 8085 and 8051. | Skill Development |
| 3 | **Create** sketches, libraries and Arduino development environment. | Skill Development |
| 4 | **Design** Raspberry Pi hardware and implement program. | Skill Development |
| 5 | **Develop** interfacing between different sensors and Arduino/ Raspberry Pi | Skill Development |

## Microprocessor & Embedded Systems Lab (220404)

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Implement** and test the program on 8085 kit | Skill Development |
| 2 | **Develop** the programs for 8051 interfacing | Skill Development |
| 3 | **Design** the hardware for different IoT applications using Arduino/Raspberry PI and Sensors | Employability |
| 4 | **Develop** teamwork skills for working effectively in groups. | Employability |
| 5 | **Prepare** technical report on experiments conducted in the lab | Skill Development |

## Network & Web Security: 220405

**Course Objectives**

- To provide conceptual understanding of network security principles, issues, challenges and mechanisms.
- To understand how to apply encryption techniques to secure data in transit across data networks.
- To explore the requirements of real-time communication security and issues related to the security of web services.

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Explain** cryptographic algorithms, hash algorithms and authentication mechanisms | Skill Development |
| 2 | **Illustrate** fundamentals of number theory, attacks and security principles | Skill Development |
| 3 | **Apply** number theory and various algorithms to achieve principles of security | Employability |
| 4 | **Analyze** the cause for various existing network attacks and describe the working of available security controls | Skill Development |
| 5 | **Examine** the vulnerabilities in IT infrastructure | Skill Development |
| 6 | **Predict** the attacks and controls associated with IP, transport-level, web and e-mail security. | Employability |

## Programming with Python: 220406

**Course Objectives**

- To understand components of Python Program
- To learn the basic construct of python programming for solving real world research-based problems.
- To visualize and analyze data using python libraries

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Write** basic Python programs to solve real world problem | Skill Development |
| 2 | **Demonstrate** the use of loops & conditional statements in Python | Skill Development |
| 3 | **Demonstrate** the use of “list” & “dictionary” type of built-in data structure | Skill Development |
| 4 | **Prepare** technical report on experiments conducted in the lab | Skill Development |

## IoT in Microgrid: 220501

**Course Objective:**

- To provide the basic concepts of Microgrid, its configuration, operation and control.
- To familiarize the students with energy storage devices, smart metering and IoT application in Microgrid.

**Course outcomes focused on employability/entrepreneurship and skill development**

| SN | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Identify** the role and significance of microgrid in future power systems | Skill Development |
| 2 | **Describe** different types and modes of operation of Microgrids | Skill Development |
| 3 | **Explain** the different control strategies available for Microgrid. | Skill Development |
| 4 | **Select** proper energy storage devices for smooth operation of microgrid | Skill Development |
| 5 | **Describe** applications of IoT in Microgrid | Employability |

## Cloud Computing: 220502

**Course Objectives**

- To understand Cloud Computing concepts, technologies, architecture and applications.
- To understand the underlying principle of cloud virtualization, cloud storage, data management and data visualization.
- To understand different cloud programming platforms and tools to develop and deploy applications on cloud.

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Define** various basic concepts related to cloud computing. | Skill Development |
| 2 | **Identify** the architecture, infrastructure and delivery models of cloud computing. | Skill Development |
| 3 | **Apply** suitable virtualization concepts. | Skill Development |
| 4 | **Choose** the appropriate programming models and public cloud platforms. | Skill Development |
| 5 | **Analyse** various security issues in cloud computing. | Skill Development |
| 6 | **Compose** virtualization, security and programming modules in cloud computing solutions | Skill Development |

## Embedded Control of Electrical Machines: 220503

**Course Objective:** To expose the students to the construction, principle of operation and performance of Special Electrical Machines. In addition, students will able to control the different types of motor by using microcontrollers.

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Describe** the need of transformer in various electric applications | Skill Development |
| 2 | **Explain** the constructional features of Motors | Skill Development |
| 3 | **Select** a suitable drive for specific application | Employability |
| 4 | **Describe** microcontroller based control of a dc motor, universal motor and stepper motor | Skill Development |

## Embedded Control of Electrical Machine Lab: 220503

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Understand** the construction of transformers and rotating electrical machines. | Skill Development |
| 2 | **Perform** the tests on transforms and special electrical machine for determination of losses & efficiency. | Skill Development |
| 3 | **Perform** the IOT based control of special purpose rotating electrical machines. | Skill Development |
| 4 | **Acquire** teamwork skill for working effectively in groups | Skill Development |
| 5 | **Prepare** an organized technical report on experiments conducted in the laboratory. | Skill Development |

## IoT Architecture and Protocols: 220504

**Course Objective:**
The main objective of the course is to teach students the fundamental concepts and architecture of the Internet of Things, as well as the various protocols that are utilized in IoT applications.

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Explain** various concepts, terminologies, and architecture of IoT systems | Skill Development |
| 2 | **Describe** the architectural views of IoT and various design challenges | Skill Development |
| 3 | **Discuss** about data link and network layer protocols. | Skill Development |

| | | |
|---|---|---|
| 4 | **Analyze** various transport and session layer Protocols | Skill Development |
| 5 | **Explain** the need of IoT service layer protocols | Skill Development |

## IoT Architecture and Protocols Lab: 220504

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Distinguish** various types of IoT protocols | Skill Development |
| 2 | **Design** a project using Arduino and Zigbee protocol | Skill Development |
| 3 | **Develop** interfacing between different sensors, protocols and Arduino | Skill Development |
| 4 | **Create** a webserver and publish MQTT packets to servers | Skill Development |
| 5 | **Acquire** team work skills for working effectively in groups | Skill Development |

## Data Sciences in IoT: 220505

**Course objectives:**

- To understand the key technologies in analytics for IoT.
- To understand the IoT data and requirement of analysis.
- To gain practical, hands-on experience with statistics programming languages, tools.

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Define** the fundamentals of data science and its importance. | Skill Development |
| 2 | **Classify** the evolution, roles, stages in data science projects. | Skill Development |
| 3 | **Analyze** the pre-processing and data reduction strategies. | Skill Development |
| 4 | **Explain** the different data visualization and representation techniques. | Skill Development |
| 5 | **Evaluate** the performance of algorithms in data science. | Skill Development |
| 6 | **Design** the different real time applications of data science in IoT. | Employability |

## Soft Computing Techniques: 220601

**Course Objective:**

- To provide the student with the basic understanding of neural networks and fuzzy logic fundamentals, Program the related algorithms and design the required and related systems.
- To understand the basics of an evolutionary computing paradigm known as genetic algorithms and its application to engineering optimization problems

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Define** basic concepts of neural network and fuzzy systems | Skill Development |

| | | |
|---|---|---|
| 2 | **Develop** and train different supervised and unsupervised learning | Skill Development |
| 3 | **Classify** various nature inspired algorithms according to their application aspect | Skill Development |
| 4 | **Analyze** and compare the efficiency of various hybrid systems | Skill Development |
| 5 | **Design** a soft computing model for solving real world problems | Employability |

## Soft Computing Techniques Lab: 220601

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Train** different supervised and unsupervised learning. | Skill Development |
| 2 | **Design** a soft computing model for solving real world problems | Employability |
| 3 | **Prepare** technical report on experiments conducted in the lab. | Skill Development |

## Software Engineering: 220602

### Course Objective:

- To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.
- To know basics of testing and understanding concept of software quality assurance and software configuration management process.

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Explain** the various fundamental concept of software engineering | Skill Development |
| 2 | **Describe** the concepts related to software design and analysis | Skill Development |
| 3 | **Compare** the techniques for software project management and estimation | Skill Development |
| 4 | **Design** the software using modern tools and techniques | Employability |
| 5 | **Develop** and test the software through different approaches | Employability |

## Software Engineering Lab: 220602

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Design** the software using modern tools and techniques | Skill Development |
| 2 | **Develop** and test the software through different approaches | Skill Development |
| 3 | **Prepare** technical report on experiments conducted in the lab | Skill Development |

## Artificial Intelligence & Machine Learning: 220603

**Course Objectives:**

- To provide the fundamental knowledge of Artificial Intelligence, Neural Network and Machine Learning.
- To present the basic representation and reasoning paradigms used in AI &ML.
- To understand the working of techniques used in AI &ML.

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Define** basic concepts of Artificial Intelligence & Machine Learning. | Skill Development |
| 2 | **Illustrate** various techniques for search and processing. | Skill Development |
| 3 | **Identify** various types of machine learning problems and techniques. | Skill Development |
| 4 | **Analyse** various techniques in Artificial Intelligence, ANN & Machine Learning. | Skill Development |
| 5 | **Apply** AI and ML techniques to solve real world problems. | Skill Development |
| 6 | **Build** AI enabled intelligent systems for solving real world problems. | Skill Development |

## Artificial Intelligence & Machine Learning Lab: 220603

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Implement** algorithms related to artificial intelligence in Python | Skill Development |
| 2 | **Analyze** the performance of different regression, classification and clustering models. | Skill Development |
| 3 | **Acquire** teamwork skills for working effectively in groups | Employability |
| 4 | **Prepare** technical report on experiments performed in the lab | Skill Development |

## Smart Energy Analytics: 220701

**Course Objective:**

- The course covers fundamental concepts, methodologies, and practical applications of data science and machine learning techniques in optimizing and enhancing hybrid energy system performance.
- The students will be able to learn how to leverage data-driven approaches to maximize efficiency, reliability, and performance in the design, operation, and maintenance of hybrid energy systems.

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Develop** proficiency in data visualization, data statistics using python programming | Skill Development |
| 2 | **Utilize** Pandas and Numpy for data prep, statistics, and modeling | Skill Development |
| 3 | **Understand** renewable energy resources, hybrid systems, and their characteristics | Skill Development |
| 4 | **Apply** data analysis and visualization techniques to optimize hybrid energy system performance | Skill Development |
| 5 | **Implement** data-driven techniques for energy management and forecasting, including real-time optimization strategies to enhance energy utilization | Employability |

## Advance IoT Applications: 220702

**Course Objective:**

- To understand the advance application and vision of IoT from a global context.
- Make the students to apply IoT data for advance applications in various domain in secured manner

**Course outcomes focused on employability/entrepreneurship and skill development**

| S No. | Course Outcome (CO) | Mapping |
|---|---|---|
| 1 | **Explain** the application and usages of the internet of things in different contexts | Skill Development |
| 2 | **Understand** the key components and applications of IoT in Smart Grid | Skill Development |
| 3 | **Explain** and implementation of IoT application for value creations | Skill Development |
| 4 | **Design** and develop of IoT architecture used to monitor the air quality | Employability |
| 5 | **Implementation** of IoT architecture for healthcare system | Employability |