

SCSA1308	INTRODUCTION TO IoT	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand the concepts of Internet of Things
- To identify the various elements of an IoT System.
- To understand the various means of communication from Node / Gateway to Cloud Platforms.
- To transfer data from IoT devices to various cloud providers.
- To make students aware of various domain specific applications and challenges while implementing IoT solutions

UNIT 1 INTRODUCTION TO IoT**9 Hrs.**

Introduction to IoT, Current technological trends and future prospects- Evolution of IoT - IoT Devices - IoT Devices vs. Computers - Trends in the Adoption of IoT - Societal Benefits of IoT -, Business Scope, Relation with embedded system - IoT Reference Architecture – physical-logical design of IOT-From M2M to IoT, Software define Network

UNIT 2 ELEMENTS OF IoT**9 Hrs.**

Application Sensors & Actuators - Edge Networking (WSN) – Gateways - IoT Communication Model – WPAN & LPWA, Overview of IoT supported Hardware platforms such as: Raspberry pi, ARM Cortex Processors, Arduino and Intel Galileo boards, Wearable Development Boards.

UNIT 3 COMMUNICATION AND CONNECTIVE TECHNOLOGIES**9 Hrs.**

IoT Communication Model - Wireless medium access issues - MAC protocol survey -Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination. Communication technologies, Long-range Wireless Protocols : LoRa WAN, Ingenu, Satellite Communications, Short-range Wireless Protocols : ANT+, WiFi, ZigBee, WHART, EnOcean, Z-Wave, NFC communication technologies : Zigbee – Wifi - Zwave.

UNIT 4 IoT AND CLOUD**9 Hrs.**

Interoperability in IoT - Introduction to Arduino Programming - Integration of Sensors and Actuators with Arduino - Cloud computing in IoT, IoT in cloud architecture, Logging on to cloud,- cloud based IoT platforms - IBM Watson, Google cloud.

UNIT 5 DOMAIN SPECIFIC APPLICATIONS OF IoT**9 Hrs.**

Home automation, Industry applications, Surveillance applications, Other IoT applications - Introduction to different IoT tools, Developing applications through IoT tools, Developing sensor based application through embedded system platform – case studies : Soil moisture monitoring, Weather monitoring, Air quality Monitoring, Movement Detection.

Max.45Hours**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1 :** Understand general concepts of Internet of Things (IoT)
- CO2 :** Recognize various devices, sensors and applications
- CO3 :** Apply design concept to IoT solutions
- CO4 :** Analyze various M2M and IoT architectures
- CO5 :** Evaluate design issues in IoT applications
- CO6 :** Create IoT solutions using sensors, actuators and Devices

TEXT/REFERENCE BOOKS

1. Boswarthick,OmarElloumi., The Internet of Things: Applications and Protocols, Wiley publications., 2012
2. Dieter Uckelmann, Mark Harrison, Florian Michahelles., Architecting the Internet of Things, Springer publications.2011
3. Marco Schwatz Internet of Things with Arduino Cookbook, Packt Publications.2016 .
4. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatias Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
5. Vijay Madiseti, ArshdeepBahga, "Internet of Things: A Hands-On Approach" published by Vijay Madiseti 2014

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max.Marks:100****Exam Duration: 3Hrs****PART A:** 10 questions of 2 marks each –No choice**20 Marks****PART B:** 2 questions from each unit of internal choice; each carrying 16 marks**80 Marks**

SCSA1404	FOUNDATIONS OF ARTIFICIAL INTELLIGENCE	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand the various characteristics of intelligent agents
- To learn the different search strategies in AI.
- To understand the knowledge in solving AI problems.
- To learn the concepts of learning and communication in AI.
- To know about the various applications of AI.

UNIT 1 INTRODUCTION AND PROBLEM SOLVING**9 Hrs.**

Introduction – Foundations of AI – History of AI – Intelligent agent – Types of agents - Structure – Problem solving agents – Uninformed search strategies – Breadth first search – Uniform cost search – Depth first search – Depth limited search – Bidirectional search – Searching with partial Information.

UNIT 2 INFORMED SEARCH AND GAME PLAYING**9 Hrs.**

Informed search – Strategies – A* Heuristic function – Hill Climbing – Simulated Annealing – Constraint Specification problem – Local Search in continuous space – Genetic algorithm – Optimal decisions in games - Pruning - Imperfect decisions – Alpha-Beta pruning – Games that include an element of chance.

UNIT 3 KNOWLEDGE AND REASONING**9 Hrs.**

Knowledge based agent – The Wumpus world environment – Propositional logic – Inference rules – First-order logic – Syntax and semantics – Situation calculus – Building a knowledge base – Electronic circuit domain – Ontological Engineering – Forward and backward chaining – Resolution – Truth maintenance system-Mental Events and Mental Objects.

UNIT 4 ACTING LOGICALLY**9 Hrs.**

Planning – Representation of planning – Partial order planning – Planning and acting in real world – Acting under uncertainty – Bayes's rules – Semantics of Belief networks – Inference in Belief networks – Making simple decisions – Making complex decisions.

UNIT 5 APPLICATIONS**9 Hrs.**

AI applications – Language Models – Information Retrieval- Information Extraction –Fields of Natural Language Processing, Chatbots and its types , Artificially Intelligent Chatbots, Introduction to Chatbot Applications(Retrieval based- Conversation based)-Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving.

Max.45Hours**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1 :** An ability to identify, analyze the search algorithm for the AI problems.
- CO2 :** Represent a problem using first order logic.
- CO3 :** Provide the knowledge based agent to solve the problem
- CO4 :** Understand the Informed search strategies.
- CO5 :** Apply the baye's rule to solve the problem for societal concern.
- CO6 :** Design user centric applications that use AI concepts

TEXT/REFERENCE BOOKS

1. Stuart J.Russel, Peter Norvig, "Artificial Intelligence A Modern Approach ", 3rdEdition, Pearson Education, 2009.
2. Elaine Rich, Kevin Knight, "Artificial Intelligence", 3rd Edition, Tata McGraw Hill, 2009.
3. M. Tim Jones, "Artificial Intelligence: A Systems Approach (Computer Science)", Jones and Bartlett Publishers, Inc., First Edition, 2008
4. Artificial Intelligence: Foundations of Computational Agents, 2nd Edition,David L. Poole and Alan K. Mackworth,2010
5. Introduction to Artificial Intelligence, Ertel, Wolfgang, 1stEdition ,2017

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max.Marks:100****Exam Duration: 3Hrs****PART A:** 10 questions of 2 marks each –No choice**20 Marks****PART B:** 2 questions from each unit of internal choice; each carrying 16 marks**80 Marks**

SCSA1405	MACHINE LEARNING ESSENTIALS	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- To introduce Machine Learning concepts
- To understand Linear regression and predictive models
- To understand classification and clustering techniques
- To understand the ensembling models and its techniques.
- To evaluate the model and compare the algorithms.

UNIT 1 INTRODUCTION TO MACHINE LEARNING**9 Hrs.**

What is machine learning – Types of Machine learning Techniques-security with deep learning - Reinforcement learning- Logistic Regression-hypothesis- Logistic regression models- Decision boundary- Cost function-Dimensionality Reduction-Principal Component Analysis

UNIT 2 PREDICTIVE ANALYTICS**9 Hrs.**

Linear regression - with one variable - with multiple variable - Multiple Linear regression-Non linear regression-Regression analysis-Predictive models - prediction using logistic regression.

UNIT 3 CLASSIFICATION AND CLUSTERING TECHNIQUES**9 Hrs.**

Support vector Machine- Decision Tree-Naïve Bayes-Random Forest- Density-Based Clustering Methods-Hierarchical Based clustering methods-Partitioning methods- Grid based methods-K means clustering - pattern based with deep learning

UNIT 4 ENSEMBLING MODELS**9 Hrs.**

Need of Ensembling - Applications of Ensembling - Types of Ensembling- Techniques of Ensembling- Bagging-Boosting – Stacking-Blending-AdaBoost-informatics with deep learning

UNIT 5 MODEL EVALUATION, MODEL SELECTION, AND ALGORITHM SELECTION**9 Hrs.**

Statistical tests - validation Techniques-Cross validation -Nested Cross validation- Essential Model Evaluation Terms and Techniques - Bootstrapping and Uncertainties -Cross-validation and Hyperparameter Optimization - Algorithm Comparison - Testing the Difference of Proportions - Comparing Two Models with the McNemar Test - The F-test for Comparing Multiple Classifiers - Comparing Algorithms - optimizing deep learning hyper parameters by evolutionary algorithm.

Max.45Hours**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1 :** Reduce the dimension of the dataset with machine learning techniques
- CO2 :** Implement the predictive analytics for any real scenario
- CO3 :** Implement applications with clustering and classification techniques
- CO4 :** Implement the ensembling 2model .
- CO5 :** Implement model evaluations and model comparisons.
- CO6 :** Design a case study on the business data and compare the performance of the classifiers and algorithms

TEXT/REFERENCE BOOKS

1. Introduction to Machine Learning with Python: A Guide for Data Scientists Paperback – 1 January 2016 by Andreas Muller
2. Zhi-Hua Zhou, "Ensemble Methods: Foundations and Algorithms", CRC Press, 2012
3. <https://machinelearningmastery.com/stacking-ensemble-machine-learning-with-python/>
4. <https://sebastianraschka.com/blog/2018/model-evaluation-selection-part4.html>

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max.Marks:100****Exam Duration: 3Hrs****PART A:** 10 questions of 2 marks each –No choice**20 Marks****PART B:** 2 questions from each unit of internal choice; each carrying 16 marks**80 Marks**

SCSA1406	INTRODUCTION TO ROBOTICS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- The objective of this course is to impart knowledge about industrial robots for their control and design.

UNIT 1 INTRODUCTION TO ROBOTICS**7 Hrs.**

Types and components of a robot, Classification of robots, closed-loop and open-loop control systems. Kinematics systems; Definition of mechanisms and manipulators, Social issues and safety.

UNIT 2 ROBOT KINEMATICS AND DYNAMICS**9 Hrs.**

Denavit Hartenberg parameters, Forward Kinematics, Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, DH parameters, Jacobian, Singularity, and Statics Dynamic Modelling: Equations of motion: Euler-Lagrange formulation

UNIT 3 SENSORS AND VISION SYSTEM**9 Hrs.**

Controller software and sensor inputs, basic sensor based controls, demining operations. Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean/Similarity/Affine/Projective transformations Vision applications in robotics.

UNIT 4 ROBOT CONTROL**9 Hrs.**

Basics of control: Transfer functions, Control laws: P, PD, PID Non-linear and advanced controls

UNIT 5 ROBOT ACTUATION SYSTEMS**11 Hrs.**

Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators - Control Hardware and Interfacing: Embedded systems: Architecture and integration with sensors, actuators, components, Programming for Robot Applications

Max.45Hours**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1 :** Perform kinematic and dynamic analyses with simulation.
CO2 : Design control laws for a robot.
CO3 : Integrate mechanical and electrical hardware for a real prototype of robotic device.
CO4 : Select a robotic system for given application.
CO5 : Identifying Robot actuation system operations
CO6 : Apply steps of designing simple robots for applications

TEXT/REFERENCE BOOKS

1. Saha, S.K., "Introduction to Robotics, 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014.
2. Ghosal, A., "Robotics", Oxford, New Delhi, 2006.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max.Marks:100****Exam Duration: 3Hrs****PART A:** 10 questions of 2 marks each –No choice**20 Marks****PART B:** 2 questions from each unit of internal choice; each carrying 16 marks**80 Marks**