School of Computer Science, Engineering & Applications

Bharathidasan University

Tiruchirappalli – 620 023

M.Sc Artificial Intelligence - Course Structure and Syllabus

(Applicable to the candidates admitted from the academic year 2023-2024 onwards)

BHARATHIDASN UNIVERSITY
SCHOOL OF COMPUTER SCIENCE, ENGINEERING &APPLICATIONS

M.Sc. Artificial Intelligence

(CHOICE BASED CREDIT SYSTEM)
REGULATIONS
(w.e.f. 2023 - 2024)

1. **Aim of the Course** The course strives to inculcate job-oriented and value based quality education in Information Technology and Commercial Application Development. At the end of the course, the students will be well-versed, particularly in core subjects with quality in inter-personal and professional skills.

2. **Eligibility for Admission to the Programme:** A Candidates who has passed B.Sc.(Computer Science, Computer Technology, Information Technology, Information Science, Information Systems, Software Science, Software Development, Statistics, Mathematics), BCA of this University or from a recognized University.

3. **Choice Based Credit System** The University follows the Choice Based Credit System (CBCS) for all its programmes. Each credit is worth 12 hours of student study time, comprising all learning activities. Thusa four-credit course involves 48 study hours. This helps the student to understand the academic effort and to successfully complete a course.

4. **Structure of the Course and Evaluation Pattern**

Internal Marks: **25** External Marks: **75**

The duration of university examination for both theory and practical subjects shall be of 3 hours. The maximum marks for each theory and practical course is 100. Continuous Internal Assessment (CIA) will be for 25 marks. The university theory examination will be conducted for 75 marks, which will be added with continuous internal assessment to make 100 marks for the course. For the conduct of University examinations in theory, the question paper for the theory examination will be set by the external examiners and for practicalexamination, the question paper will be set by both internal and external examiners appointed by the Department.

6. Procedures for Awarding Marks for Internal Assessment

THEORY COURSES

For regularity and discipline	- 5 Marks
For two assignments (Equal weightage)	- 5 Marks
For two tests to be conducted (Equal weightage)	- 5 Marks
Model examination	- 10 Marks
Total -	25 Marks

PRACTICAL COURSES

For regularity and discipline	- 5 Marks
Completion of all Experiments prescribed for the course	- 5 Marks
Observation Note	- 5 Marks
For model Examination at the end of the Semester	- 10 Marks
Total -	25 Marks

In the case of CIA, a candidate who secures not less than 40% of total marks prescribed for any course shall be declared to have passed for that course, failing which the candidate has to redo the academic activities prescribed for the continuous internal assessment (CIA).

7. Pattern of Question Paper (Theory)

Time: 3 hours Maximum Marks:75

Section - A: (10 X 2 = 20 Marks)

All questions are to be answered. Two questions from each Unit

Section - B: (5X 5 = 25 Marks)

Five Questions are to be answered. Two questions from each unit in the either or pattern

Section - C : (3 x 10 = 30 Marks)

Three Questions are to be answered out of five questions – one question from each Unit

M.Sc Artificial Intelligence -Programme Outcomes

S.No	Programme Outcome
PO1	Computational Knowledge: Apply knowledge of computing fundamentals and domain knowledge.
PO2	Problem Analysis: Identify, formulate and solve complex computing problems reaching substantiated conclusions.
PO3	Development of Solutions: Design and evaluate solutions for complex computing problems with appropriate consideration.
PO4	Modern Tool Usage: Create, identify and apply appropriate techniques, resources, and modern computing tools to complex computing activities.
PO5	Investigations of complex Computing problems: Use research-based knowledge and research methods for analysis and implementation.
PO6	Innovation and Entrepreneurship: Identify a timely opportunity and use innovation to pursue that opportunity.
PO7	Project management and finance: Understand and apply computing, management principles to manage multidisciplinary projects.
PO8	Communication Efficacy: Communicate effectively with the computing community, and with society.

M.Sc Artificial Intelligence - Program Specific Outcome

S.No	Programme Specific Outcome
PSO1	Apply the knowledge of computer applications to find solutions for real-life applications.
PSO2	Ability to analyze, design, develop and maintain the software applications with latest technologies.
PSO3	Utilize skills and knowledge for computing practice with commitment on social, ethical, cyber and legal values.
PSO4	Inculcate employability and entrepreneur skills among students who can develop customized solutions for small to large Enterprises.
PSO5	Develop techniques to enhance ability for lifelong learning.
PSO6	Develop class environment congenial and competitive for generation of ideas, innovation and sharing.
PSO7	To make graduates understand cross cultural, societal, professional, legal and ethical issues prevailing in industry.
PSO8	Ability to research, analyze and investigate complex computing problems through design of experiments, analysis and interpretation of data and synthesis of the information to arrive at valid conclusions.

M.Sc Artificial Intelligence Programme –
Course Structure and Syllabus under CBCS

(Applicable to the candidates admitted from the academic year 2023-2024 onwards)

Course Number	Course Code	Course Name	L	P	C	Marks		Total
						Int.	Ext.	
Semester I								
MAI23011	CC- I	Introduction to Artificial Intelligence	5	0	4	25	75	100
MAI23012	CC- II	Design & Analysis of Algorithms	5	0	4	25	75	100
MAI23013	CC-III	Python Programming	4	0	4	25	75	100
MAI23014	CC-IV	Probability and Statistics	4	0	4	25	75	100
MAI23015	EC-I	Elective - I	3	0	3	25	75	100
MAI23016P	CC-V	Design & Analysis of Algorithms Lab	0	3	2	25	75	100
MAI23017P	CC-VI	Python Programming Lab	0	3	2	25	75	100
23VAC01	VAC – I	Value Added Course – I	3	0	2*	25	75	100
		Total	**30**		**23**	**-**	**-**	**800**
Semester II								
MAI23021	CC-VII	R Programming	4	0	4	25	75	100
MAI23022	CC-VIII	Machine Learning	5	0	4	25	75	100
MAI23023	CC-IX	Data Visualization	5	0	5	25	75	100
MAI23024	EC-II	Elective - II	4	0	3	25	75	100
MAI23025	EC- III	Elective - III	4	0	3	25	75	100
MAI23026P	CC-X	R Programming Lab	0	3	2	25	75	100
MAI23027P	CC-XI	Machine Learning Lab	0	3	2	25	75	100
EDC-I		Extra Disciplinary Course I	2	0	2	25	75	100
MAI23028	Online Course – I	MOOCs /SWAYAM/NPTEL	0	0	4	-	-	100
		Total	**30**		**29**	**-**	**-**	**900**
Summer Internship								

*VAC –I Credits not included in CGPA

Semester III								
MAI23031	CC-XII	Deep Learning	5	0	4	25	75	100
MAI23032	CC-XIII	Natural Language Processing	4	0	4	25	75	100
MAI23033	CC-XIV	Big Data Analytics	4	0	4	25	75	100
MAI23034	EC-IV	Elective – IV	3	0	3	25	75	100
MAI23035	EC- V	Elective – V	3	0	3	25	75	100
MAI23036P	CC-XV	Natural Language Processing Lab	0	3	2	25	75	100
MAI23037P	CC-XVI	Big Data Analytics Lab	0	3	2	25	75	100
EDC-II		Extra Disciplinary Course - II	2	0	2	25	75	100
23VAC02	VAC - II	Value Added Course – II	3	0	2*	25	75	100
		Total	**30**		**24**	**-**	**-**	**900**
Semester IV								
MAI23041	CC- XVII	Major Project Work	-	-	**14**	-	-	**100**
		Grand Total			**90**	**-**	**-**	**2700**

*VAC –II Credits not included in CGPA

List of Elective Courses

Elective I	
A	Internet of Things
B	Predictive Analytics
C	Cyber Security

Elective II		Elective III	
A	Generative AI	A	Numerical Analysis
B	Pattern Recognition & Image Analysis	B	Optimization Techniques
C	Virtual Reality	C	Simulation & Modeling Systems

Elective IV		Elective V	
A	Machine Translation	A	Design Thinking
B	Block Chain Technology	B	Soft Computing
C	Robotics	C	Reinforcement Learning

List of Value-Added Courses

Course Number	Course Code	Course Name
23VAC01	VAC-I	Soft Skills: Professional English
23VAC02	VAC-II	Soft Skills : Professional Ethics

Recommended Credits Distribution:

Total should not be less than 90 Credits.

Course Type	Course	Total Credits
Core (Theory)	10	41
Core (Practical)	6	12
Core (Major Project)	1	14
Elective	5	15
Extra Disciplinary Course	2	4
Online Course	1	4
Total	**25**	**90**

SEMESTER I

Course Number: MAI23011 **CC-I**

L-P: 5-0 **Credits: 4**

INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Objectives:

- To make students understand the basic Artificial intelligence
- To understand about the Problem-solving methods.
- To understand the basic concepts and principles of Artificial Intelligence.
- To learn various applications domains of AI.
- To study the applications of AI.

Unit-I

Introduction – Definition – Foundations of Artificial Intelligence – Intelligent Agents – Agent and Environments – The concept of Rationality – The nature of environments – The Structure of agents.

Unit-II

Problem Solving – I Solving Problems by Searching – Problem-Solving Agents - Example Problems- Uninformed Search Strategies – Avoiding Repeated States – Searching with Partial Information – Informed Search Strategies – Heuristic Functions – Local Search Algorithms and Optimization Problems – Local Search in Continuous Spaces – Online Search Agents and Unknown Environments.

Unit-III

Problem Solving – II Constraint Satisfaction Problems – Constraint Propagation – Backtracking Search for CSPs – Local Search for Constraint Satisfaction Problems – The Structure of Problems – Adversarial Search – The minimax algorithm – Alpha-Beta Pruning.

Unit-IV

Knowledge Representation - First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation – Ontological Engineering- Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories - Reasoning with Default Information.

Unit-V

Applications - Perception – Introduction – Image Formation – Early Image Processing Operations – Object Recognition – Speech Recognition - Robotics–Introduction – Robot Hardware –Robotic Perception – Planning to move – Robotic software architecture.

UNIT VI

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

Text Books:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach, Prentice Hall, Third Edition, 2009.

Reference Books:

1. M. Tim Jones, ―Artificial Intelligence: A Systems Approach (Computer Science),

2. Jones and Bartlett Publishers, Inc.; First Edition, 2008

3. Nils J. Nilsson, ―The Quest for Artificial Intelligence, Cambridge University Press, 2009.

4. William F. Clocksin and Christopher S. Mellish, Programming in Prolog: Using the ISO Standard,

5. Fifth Edition, Springer, 2003.

6. Gerhard Weiss, ―Multi Agent Systems, Second Edition, MIT Press, 2013.

7. David L. Poole and Alan K. Mackworth, ― Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.

Outcomes:

- Delineate Artificial intelligence.
- Build knowledge about Problem solving methods.
- Understand the basics of knowledge representations.
- Develop AI Applications.
- Design a Fuzzy set for a given application.

Course Number: MAI23012 **CC-II**

L-P: 5-0 **Credits: 4**

DESIGN & ANALYSIS OF ALGORITHMS

Objectives:

- To understand fundamental concepts of Algorithm.
- To impart knowledge about Basic Traversal and Search Techniques and Problematic Design.
- To implement the linear and non-linear data structures.
- To learn various applications domains of Algorithms.
- To study the applications of Algorithms.

UNIT-1

Introduction: Algorithm-Specification - Performance Analysis. Divide And Conquer - General Method - Binary Search - Find the Maximum and Minimum - Quick sort - Strassen's Matrix Multiplication.

Unit–II

Representing rooted trees –Hash Tables: Direct-address tables, Hash tables, Hash functions - Open addressing, Perfect hashing – Binary Search Trees: Querying a binary search tree, Insertion and deletion, Randomly built binary search trees – Red-Black Trees: Properties of red-black trees, Rotations, Insertion, Deletion – B- Trees: Definition of B-trees, Basic operations, Deleting a key from a B-tree.

UNIT– III

The Greedy Method: General Method - Knapsack Problem - Job Sequencing with Deadlines-Minimum Cost Spanning Tree - Single Source Shortest Path. Dynamic Programming: General Method-Multistage Graph-All Pairs Shortest Path -Optimal Binary Search Tree - 0/1 Knapsack-Travelling Salesperson Problem.

UNIT– IV

Basic Traversal And Search Techniques: Techniques for Binary Trees –Techniques for Graphs-Connected Components and Spanning Trees-Bi-connected Components and DFS. Backtracking: General Method-8-Queen Problem, Sum of Subsets Graph Coloring: Hamiltonian Cycle.

UNIT– V

Graph Algorithms: Representation of Graphs, Breadth first search, Depth first search, Topological sort. Minimum Spanning Trees: Algorithms of Kruskal and Prim – Single Source Shortest Path: The Bellman-Ford Algorithm, Single source shortest path in directed acyclic graphs, Dijkstra's algorithm All pairs Shortest Path: Shortest path and Matrix Multiplication, The Floyd-Warshall algorithm – Johnson's algorithm for sparse graphs.

UNIT VI

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

Text Books:

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press (India) Private Ltd., 2018.

2. Aho, Hoporoft and Ullman, "The Design and Analysis of Computer Algorithm", Pearson Education, Delhi, 2001.

Reference Books:

1. Basu S.K.,"Design Methods and Analysis of Algorithms",PHI, 2006.

2. M. A. Weiss, "Data Structures and Algorithm Analysis in C++", Pearson Education, Asia, 2013.

3. Sandeep Sen and Amit Kumar, "Design and Analysis of Algorithms: A contemporary perspective", Cambridge University Press, 2019.

4. Thomas S. Cormen, Charles E. Liersorson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", Third Edition, The MIT Press, Cambridge, Massachusetts, London, England.

Outcomes:

- Understand and solve complex problems.
- Select an appropriate algorithm for the problem.
- Evolve as a competent programmer capable of designing and analyzing algorithms and data structures for different kinds of problems.
- Classify problems into complexity classes like P and NP.
- Analyze graphs and determine shortest path.

Course Number: MAI23013 **CC-III**

L-P: 4-0 **Credits: 4**

PYTHON PROGRAMMING

Objectives:

- To understand different data types in Python.
- To learn the different concept sin Python.
- To analyze Database Connectivity and Data Visualization.
- To learn various applications domains of Python.
- To study the applications of Python programming.

UNIT-1 INTRODUCTION

Introduction to Python: Features of Python – Writing the First Python Program – Executing a Python Program – Data types in Python – Literals – Operators – Input and Output – Control Statements.

UNIT II ARRAYS, STRINGS, FUNCTIONS AND TUPLES

Creating an Array – Indexing and Slicing on Arrays – Types of Arrays – Working with arrays using numpy- Slicing and Indexing in numpy Arrays – Working with Multi-dimensional Arrays – Indexing and Slicing the Multi-dimensional Arrays – Creating Strings – Indexing, Slicing and Comparing Strings – Finding and Counting Substrings – Splitting and Joining Strings – Defining and Calling a Function–Pass by Object Reference –Anonymous Functions or Lambdas–Lists – Creating and Updating the Elements of a List – Methods to Process Lists –Creating Tuples – Functions to process Tuples – Inserting, Modifying and Deleting Elements from a Tuple.

UNIT III DICTIONARIES AND INTRODUCTIONT OOPS

Operations on Dictionaries – Dictionary Methods – Creating a Class – Types of Variables – Types of Methods – Constructors in Inheritance – Types of Inheritance – Operator Overloading – Method Overloading and Overriding – Interfaces in Python – Regular Expressions in Python.

UNIT IV DATASTUCTURES & GUI

Linked Lists – Stacks – Queues – **Graphical User Interface:** The Root Window – Working with Containers – Canvas – Frame – Widgets – Button Widget – Label Widget – Message Widget – Text Widget – Scrollbar Widget – Check button Widget – Radio button Widget – Entry Widget – List box Widget – Menu Widget – Creating Tables – Sending a Simple Mail.

UNIT V DATABASE CONNECTIVITY & DATA SCIENCE

Database Connectivity: Types of Databases used with Python – Using MySQL from Python – Retrieving all rows from a Table – Inserting, Deleting and Updating rows in a Table – Creating Database Tables using Python Data Science using Python**:** Data Frame and Data Visualization.

UNIT VI

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

TEXT BOOK

Dr.R.Nageswara Rao, "Core Python Programming", Second Edition, Dreamtech Press, 2019.

REFERENCE BOOKS

1. Martin C. Brown, "The Complete Reference Python", Indian Edition, Mc Graw Hill Education, 2018.
2. Yashavant Kanetkar, Aditya Kanetkar, "Let us Python", Second Edition, BPB Publications, 2019.

Outcomes

- Create Arrays, Strings, Lists and Tuples.
- Examine Dictionaries & Object-Oriented Programming concepts in Python.
- Understand Database Connectivity and Data Visualization.
- Access Database with Python.
- Use MySQL with Python.

Course Number: MAI23014 **CC-IV**

L-P: 4-0 **Credits: 4**

PROBABILITY AND STATISTICS

Objectives:

- To understand the applications of various correlation methods.
- To study and model the sampling concepts.
- To acquire knowledge on Hypotheses test.
- To learn various Probability distribution.
- To study the applications of Statistical inference.

UNIT-1

Correlation - Definition of Correlation- Scatter Diagram- Kari Pearson‟s Coefficient of Linear Correlation- Coefficient of Correlation and Probable Error of r- Coefficient of Determination - Merits and Limitations of Coefficient of Correlation- Spearman‟s Rank Correlation.

UNIT II

Regression Analysis - Regression and Correlation (Intro) - Difference between Correlation and Regression Analysis- Linear Regression Equations -Least Square Method- Regression Lines- Properties of Regression Coefficients Standard Error of Estimate.

UNIT III

Probability Distribution and mathematical Expectation- Random Variable Defined - Probability Distribution a Random Variable- Expectation of Random Variable- Properties of Expected Value and Variance.

UNIT IV

Sampling and Sampling Distributions - Data Collection- Sampling and Non Sampling Errors – Principles of Sampling-- Merits and Limitations of Sampling Methods of Sampling- Parameter and Statistic- Sampling Distribution of a Statistic- Examples of Sampling Distributions- Standard Normal – Student’s t - Chi-Square (x2) and Snedecor’s F- Distributions.

UNIT V

Statistical Inference- Estimation and Testing of Hypothesis - Statistical Inference- Estimation- Point and interval- Confidence interval using normal - t and x2Distributions- Testing of Hypothesis- Significance of a mean - Using t Distribution.

UNIT VI

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

TEXT BOOK

1. K.L. Sehgal - “Quantitative Techniques and Statistics” - First Edition - Himalaya Publishing House - 2011.

REFERENCE BOOKS

1. N. P. Bali - P. N. Gupta - C. P. Gandhi - “A Textbook of Quantitative Techniques” - First Edition - Laxmi Publications - 2008.

2. U. K. Srivastava - G. V. Shenoy - S. C. Sharma - “Quantitative Techniques for Managerial Decisions” - Second Edition - New Age International Publishers - 2005.

3. David Makinson - “Sets - Logic and Maths for Computing” - Springer - 2011.

4. Christopher Chatfield -” Statistics for Technology- A Course in Applied Statistics - Third Edition” - CRC Press - 2015.

Outcomes

- Get insights about Statistical Computing.
- Gain knowledge Correlation.
- Understand Regression analysis.
- Analyze Sampling.
- Explore Statistical Inference.

Course Number: MAI23015 **Elective-IA**

L-P: 3-0 **Credits: 3**

INTERNET OF THINGS

Objectives:

- To gain knowledge on Internet of Things (IoT), IoT Architecture, and the Protocols.
- To understand the concept of Web of Things and the relationship between IoT & WoT.
- To understand the concept of industrial automation.
- To learn developing a smart object software.
- To study the applications of IoT.

UNIT-I

The Internet of Things: An Overview - The Flavor of the Internet of Things, The "Internet" of "Things"- The Technology of the Internet of Things - Enchanted Objects, Who is Making the Internet of Things? Design Principles for Connected Devices - Calm and Ambient Technology, Magic as Metaphor, Privacy, Keeping Secrets, Whose Data Is It Any way? Web Thinking for Connected Devices, Small Pieces, Loosely Joined, First-Class Citizens On The Internet, Graceful Degradation, and Affordances.

UNIT II

Prototyping Embedded Devices – Electronics, Sensors, Actuators, Scaling Up the Electronics, Embedded Computing Basics, Micro controllers, System-on-Chips, Choosing Your Platform, Arduino, developing on the Arduino, Some Notes on the Hardware, Openness, Raspberry Pi, Cases and Extension Boards, developing on the RaspberryPi, Some Notes on the Hardware, Openness What Are Smart Objects? - Where Do Smart Objects Come From? Challenges for Smart Objects

UNIT III

Why IP for Smart Objects? – Interoperability, An Evolving and Versatile Architecture, Stability and Universality of the Architecture Scalability, Configuration and Management, Small Foot print, What Are the Alternatives? Why Are Gateways Bad? Security for Smart Objects - The Three Properties of Security - "Security" by Obscurity, Encryption, Security Mechanisms for Smart Objects - Security Mechanisms in the IP Architecture, IPSec, TLS - Web Services for Smart Objects - Web Service Concepts - The Performance of Web Services for Smart Objects. - Connectivity Models for Smart Object Networks - Introduction, Autonomous Smart Object Networks, IOT - Extended Internet.

UNIT IV

Smart Object Hardware and Software – Hardware - Software for Smart Objects – Energy Management - THE APPLICATIONS - Smart Grid – Introduction – Terminology - Core Grid Network Monitoring and -Control -Smart Metering (NAN) – HAN

UNIT V

Industrial Automation – Opportunities, Challenges, Use Cases Smart Cities and Urban Networks– Introduction - Urban Environmental Monitoring - Social Networks - Intelligent Transport Systems - Home Automation – Introduction -Main Applications and Use Cases - Technical Challenges and Network Characteristics- Building Automation – Emerging Application in Building automation- Health Monitoring–Introduction -Main Applications and Use Case - Technical Challenges in Health Monitoring.

UNIT VI

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

TEXT BOOK

1. Adrian McEwen and Hakim Cassimally, Designing the Internet of Things, John Wiley and Sons, Ltd 2014 (Unit I & II)
2. Jean-Philippe Vasseur and Adam Dunkels, Interconnecting Smart Objects with IP-The Next Internet, Morgan Kaufmann Publishers2010 (UnitIII to V)
3. CunoPfister, Getting Started with the Internet of Things, Published by O'Reilly

REFERENCE BOOK:

1. Brian Underdah, The Internet of Things For Dummies, KORE Wireless Edition,
2. Ovidiu Vermesan and Peter Friess, Internet of Things Applications: From Research to Market Deployment, River Publishers
3. Francisda Costa, Rethinking the Internet of Things–A Scalable Approach to Connecting Everything, Apress

Outcomes

- Gain the basic knowledge about IoT.
- Use IoT related products in real life.
- Rely less on physical resources and start to do work smarter.
- Analyze opportunities and challenges in IoT.
- Understand the need of Sensors and actuators.

Course Number: MAI23015 **Elective-IB**

L-P: 3-0 **Credits: 3**

PREDICTIVE ANALYTICS

Objectives:

- To understand the applications of Predictive analysis.
- To study and model the Complexities of data.
- To acquire knowledge on Predictive data.
- To learn developing a predictive model.
- To study the predictive analytics.

UNIT-1

Introduction - Entering the Arena - Exploring Predictive Analytics - Adding Business Value - Starting a Predictive Analytics Project- Exploring Your Data Types and Associated Techniques: Recognizing Your Data Types - Identifying Data Categories - Generating Predictive Analytics-Connecting to Related Disciplines.

UNIT II

Complexities of Data: Finding Value in Your Data - Constantly Changing Data Complexities in Searching Your Data - Differentiating Business Intelligence from Big - Data Analytics - Visualization of Raw Data.

UNIT III

Identifying Similarities in Data - Explaining Data Clustering - Converting Raw Data into a Matrix-Identifying K-Groups in Your Data-Finding Associations Among Data Items - Applying Biologically Inspired Clustering Techniques - Predicting the Future Using Data Classification - Exploring the Data - Classification Process Using Data Classification to Predict the Future: Decision trees - Support vector machine - Naïve Bayes classification algorithm - Neural networks - The Markov Model - Linear regression.

UNIT IV

Developing a Roadmap - Convincing Your Management to Adopt Predictive Analytics - Preparing Data - Listing the Business Objectives - Processing Your Data - Structuring Your Data - Building a Predictive Model: Getting Started Developing and Testing the Model - Going Live with the Model.

UNIT V

The Part of Tens-Ten Reasons to Implement Predictive Analytics: Knowing Your Data-Organizing Your Data- Making Informed Decisions-Gaining Competitive Edge-Ten Steps to Build a Predictive Analytic Model Building a Predictive Analytics Team-Setting the Business Objectives-Preparing Your Data-Sampling Your Data-Avoiding “Garbage In, Garbage Out”-Creating Quick Victories-Building Deployable Models-Evaluating Your Model-Updating Your Model.

UNIT VI

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

TEXT BOOK

- Anasse Bari, Mohammad Chaouchi, Tommy Jung, Predictive Analytics for Dummies, 2nd Edition, 2017.

Reference Books:

1. "Applied Predictive Analytics – Principles and Techniques for the Professional Data Analyst", Dean Abbott.
2. "Predictive Analytics: The Power to predict who will click, buy, lie or die", Eric Siegel.
3. "Fundamentals of Machine learning for predictive data analytics", John D. Kelleher, Brian Mac Namee, Aoife D'Arcy

Outcomes

- Get an insight about Predictive analysis.
- Gain knowledge Complexities of data.
- Understand similarities of data.
- Developing a roadmap of predictive.
- Explore & build a predictive analysis.

Course Number: MAI23015 **Elective-IC**

L-P: 3-0 **Credits: 3**

CYBER SECURITY

Objectives:

- To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity in the Cyber Security.
- To understand how to deploy security techniques to secure data in transit across data networks.
- To design security applications in the field of Information technology, Cyber Space.

UNIT – 1 VULNERABILITIES IN INFORMATION SYSTEMS

Vulnerabilities in Information Systems : Measuring Vulnerability - Avoiding Vulnerabilities through Secure Coding - Mistakes Can Be Good - Threats Classification Threat Modeling Process - Security Starts at Home - Security in Applications - International Awareness- Vulnerabilities in the Organization : Common Organizational Vulnerabilities - Access Authorization and Authentication - Human Factors - Security Services - External Technologies - Wireless Networks – Bluetooth - Wireless Fidelity - Worldwide Interoperability Microwave Access - WiMAX Features - Cloud Computing.

UNIT – 2 INFORMATION SECURITY MANAGEMENT

Risks in Information Systems Infrastructure : Risks in Hardware - Risks in Software - Risks in People - Risks in Laptops - Risks in Cyberspace - Risk Insurance in Cyberspace- Secure Information Systems : Assets Identification - Assets Communication - Assets Storage - Resource Access Control Facility - Securing the Email Communications - Information Security Management.

UNIT – 3 CYBER SECURITY

Cyber Security and the CIO: CIO: Personality - CIO: Education - CIO: Experience - CIO: Responsibilities- CIO: Information Security - CIO: The Changing Role - Building a Secure Organization: Business Continuity Planning - System Access Control - System Development and Maintenance - Physical and Environmental Security - Compliance - Personnel Security - Security Organization - Computer and Network Management - Asset Classification and Control -Security Policy.

UNIT – 4 INTRUSIONS IN CYBERSPACE

Cyberspace Intrusions: IDPS Configuration - IDPS Capabilities - IDPS Management- IDPS Classification - IDPS Comparison - Cyberspace Defense : File Protection Applications - PC Performance Applications - Protection Tools.

UNIT – 5 THE LAW AND HOMELAND SECURITY

Cyberspace and the Law: International Laws - Cyber-Related Laws – Cybercrime - Cyber Warfare and Homeland Security: Cyber Warfare - Homeland Security - Cyber Security Preparedness - Distributed Defense.

Text book:

George K. Kostopoulos, "Cyber Space and Cyber Security", CRC Press, 2013

Reference Book :

James Graham, Richard Howard, Ryan Olson, "Cyber Security Essentials", Auerbach Publications, 2011.

Outcomes:

- Implement basic security algorithms required by any computing system.
- Analyze the vulnerabilities in any computing system and hence be able to design a security solution.
- Analyze the possible security attacks in complex real time systems and their effective countermeasures.
- Identify the security issues in the network, cyber-crime and resolve it.

Course Number: MAI23016P **CC-V**

L-P: 0-3 **Credits: 2**

DESIGN & ANALYSIS ALGORITHMS LAB

Objectives:

- To understand the concept of stack.
- To understand the greedy algorithm.
- To introduce the fundamentals of topological concepts and how these concepts are useful in problem solving.
- To understand the working principle of BFS, DFS.
- To use the design techniques introduced i.e. dynamic programming, greedy algorithm etc. to design algorithms for more complex problems and analyze their performance.

Practical List

1. Implement MergeSort, HeapSort and QuickSort algorithms.
2. Implement the knapsack problem (0/1).
3. Obtain the topological ordering of vertices in a given digraph.
4. Greedy algorithm to find minimum number of coins to make change for a given value of Indian currency. Assume that we have infinite supply of denominations in Indian currency.
5. Implement Breadth First Search and Depth First search
6. Use Prim's Algorithm to find a minimum spanning tree.
7. Find shortest path using Dijkstra's algorithm.
8. Multiply two matrices recursively.
9. Find whether a string is a permutation of another given string.
10. Postfix evaluation.
11. Binary tree traversal.
12. Binary Search Tree.
13. N queen problem.
14. Hash table.
15. Divide and conquer algorithm for binary search.

Outcomes

- Understand and solve complex problems.
- Select an appropriate algorithm for the problem.
- Evolve as a competent programmer capable of designing and analyzing algorithms and data structures for different kinds of problems.
- Evaluate Postfix expressions.
- Analyze and find shortest path in a graph.

Course Number: MAI23017P **CC-VI**

L-P: 0-3 **Credits: 2**

PYTHON PROGRAMMING LAB

Objectives:

- To understand the coding of Python.
- To understand the work with widgets.
- To introduce the Insert, Delete and Update in Database.
- To understand the working principle arrays in Python.
- To use the concepts of list in Python.

Practical List

1. Program to generate the Fibonacci Series.
2. Program to check whether the given number is prime or not.
3. Program to find the factorial of a given number using function.
4. Program using Arrays -Python program to sort the elements of an array in ascending order
5. Program using Strings-Program to Sort Words in Alphabetic Order.
6. Program to perform various list operations, such as:
   - Append an element.
   - Insert an element.
   - Append a list to the given list.
   - Modify an existing element.
   - Delete an existing element from its position.
   - Delete an existing element with a given value.
   - Sort the list.
   - Display the list.
7. Program using Tuples-Write a program to swap two numbers without using a temporary variable.
8. Program using Dictionaries - Write a program to count the number of times a character appears in a given string.
9. Write a function to convert number in to corresponding number in words for eg, if the input is 876 then the output should be ‘Eight Seven Six’.
10. Program using Inheritance.

11. Program using Interfaces.
12. Program using Regular Expressions.
13. Program to perform Stack Operations.
14. Program to perform Queue Operations.
15. Working with Widgets.
16. Program to Insert, Delete and Update in Database.
17. Program to create and perform operations using Data Frames.
18. Program to implement Data Visualization.

Outcomes

- Appreciate programming concepts in Python
- Work with Widgets.
- Insert, Delete and Update in Database.
- Create and perform operations using Data Frames.
- Implement Data Visualization.

SEMESTER-II

Course Number: MAI23021 **CC-VII**

L-P: 4-0 **Credits: 4**

R PROGRAMMING

Objectives:

- To understand the basics in R Programming.
- To study the use of R Big Data analytics.
- To learn to apply R programming for Text processing.
- To learn developing a Data frames.
- To study the applications of R.

UNIT-1 INTRODUCTION TO R

Introducing to R – R Data Structures – Help functions in R – Vectors – Scalars – Declarations – recycling – Common Vector operations – Using all and any – Vectorized operations – NA and NULL values – Filtering – Vectorized if-then else – Vector Equality – Vector Element names.

UNIT II MATRICES, ARRAYS AND LISTS

Matrices, Arrays And Lists Creating matrices – Matrix operations – Applying Functions to Matrix Rows and Columns – Adding and deleting rows and columns – Vector/Matrix Distinction – Avoiding Dimension Reduction – Higher Dimensional arrays – lists – Creating lists – General list operations – Accessing list components and values – applying functions to lists – recursive lists.

UNIT III DATA FRAMES

Creating Data Frames – Matrix-like operations in frames – Merging Data Frames – Applying functions to Data frames – Factors and Tables – factors and levels – Common functions used with factors – Working with tables - Other factors and table related functions.

UNIT IV CONTROL STATEMENTS, FUNCTIONS, R GRAPHS

Control statements – Arithmetic and Boolean operators and values – Default values for arguments - Returning Boolean values – functions are objects – Environment and Scope issues –Writing Upstairs - Recursion – Replacement functions – Tools for composing function code – Math and Simulations in R Creating Graphs – Customizing Graphs – Saving graphs to files – Creating three-dimensional plots.

UNIT V INTERFACING

Interfacing R to other languages – Parallel R – Basic Statistics – Linear Model – Generalized Linear models – Non-linear models – Time Series and Auto-correlation – Clustering

UNIT VI

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

TEXT BOOK

1. Norman Mat off, "The Art of R Programming: A Tour of Statistical Software Design", No Starch Press, 2011.

REFERENCE BOOKS:

1. 1 Jared P. Lander, "R for Everyone: Advanced Analytics and Graphics", Addison-Wesley Data & Analytics Series, 2013.
2. Mark Gardener, "Beginning R – The Statistical Programming Language", Wiley, 2013
3. Robert Knell, "Introductory R: A Beginner's Guide to Data Visualisation, Statistical Analysis and Programming in R", Amazon Digital South Asia Services Inc, 2013.'

Outcomes

- Learn to create artful graphs to visualize complex data sets and functions.
- Extract to write more efficient code using parallel R and vectorization.
- Interface R with C/C++ and Python for increased speed or functionality.
- Visualize to find new packages for text, image manipulation, and perform statistical analysis.
- Develop interfacing R to other Languages.

Course Number: MAI23022 **CC-VII**

L-P: 5-0 **Credits: 4**

MACHINE LEARNING

Objectives:

- To understand the concept of Machine Intelligence.
- To implement and apply machine learning algorithms to real-world applications.
- To identify and apply the appropriate machine learning technique.
- To classify pattern recognition, optimization and decision problems.
- To study the applications of Machine Learning.

UNIT-1 INTRODUCTION

Learning – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Linear Discriminants – Perceptron – Linear Separability– Linear Regression.

UNIT–II LINEAR MODELS

Multi-layer Perceptron – Going Forwards – Going Backwards: Back Propagation Error – Multi- layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back- Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Course of Dimensionality – Interpolations and Basis Functions – Support Vector Machines.

UNIT– III TREE AND PROBABILISTIC MODELS

Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Probability and Learning – Data into Probabilities – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms – Vector Quantization – Self Organizing Feature Map.

UNIT– IV DIMENSIONALITY REDUCTION AND EVOLUTIONARY MODELS

Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms – Reinforcement Learning – Overview – Getting Lost Example – Markov Decision Process.

UNIT– V GRAPHICAL MODELS

Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods.

UNIT VI

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

TEXT BOOKS:

1. Stephen Marshland ―Machine Learning – An Algorithmic Perspective‖, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

REFERENCE BOOKS:

1. Tom M Mitchell, ―Machine Learning, First Edition, McGraw Hill Education, 2013.

Outcomes:

- Have a good understanding of the fundamental issues and challenges of Machine learning.
- Appreciate the underlying mathematical relationships within and across Machine Learning algorithms.
- Understand the paradigms of supervised and un-supervised learning.
- Design and implement various machine learning applications.
- Analyze different machine learning models.

Course Number: MAI23023 **CC-IX**

L-P: 5-0 **Credits: 5**

DATA VISUALIZATION

Objectives:

- Understand the basics of data visualization.
- Understand the importance of data visualization and the design and use of many visual components.
- Explain the process of data visualization.
- Explain the basics of interactive data visualization techniques visualization-based issues.
- Understand the concept of various types of visualization.

UNIT I Introduction

Introduction- Context of Data Visualization- Definition Methodology, Visualization Design Objectives. Key Factors – Purpose, Visualization Function and Tone – Visualization – Design Options – Data Representation - Data Presentation - Seven Stages of Data Visualization – Widgets - Data Visualization Tools.

UNIT II Visualizing Data Methods

Visualizing Data Methods- Mapping, Time Series- Connections And Correlations-Scatter Plot Maps- Trees - Hierarchies And Recursion- Networks and Graphs - Info Graphics.

UNIT III Visualizing Data Process

Visualizing Data Process- Acquiring Data, Where To Find Data, Tools Of Acquiring Data From The Internet, Locating File For Use With Processing, Loading Text Data, Dealing With Files And Folders, Listing Files In A Folder, Asynchronous Image Downloads, Advanced Web Techniques, Using A Database, Dealing With Large Number Of Files, Parsing Data, Level Of Effort, Tools For Gathering Clues, Text Is Best, Text Mark Up Languages, Regular Expressions(Regexps), Grammars And Bnf Notation, Compressed Data Vectors And Geometry, Binary Data Formats, Advances Detect Work.

UNIT IV Interactive Data Visualization

Interactive Data Visualization - Drawing With Data - Scales – Axes – Updates, Transaction And Mode - Interactivity- Layouts – Geomapping - Exporting Frame Work - T3 Stabio.

UNIT V Security Data Visualization

Security Data Visualization - Port Scan Visualization - Vulnerability Assessment And Exploitation – Firewall Log Visualization - Instruction Detection Log Visualization - Attacking And Defending VisualizationSystems - Creating Security Visualization System.

Unit VI

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related To The Course During The Semester Concerned.

Text Book(s)

Scott Murray,"Interactive Data Visualization for the Web", O'Reilly Media, Inc., 2013.

Reference Books

1. Ben fry, "Visualizing Data", O'Reilly Media, Inc. 2007.
2. Greg Conti,"Security Data Visualization: Graphical Techniques for Network Analysis", No Starch Press Inc, 2007.

Course Number: MAI23024 **Elective-IIA**

L-P: 4-0 **Credits: 3**

GENERATIVE AI

Objectives:

- To understand the principles used in Generative AI
- To explore Knowledge about OpenAI.
- To acquire knowledge in prompt design.
- To improve writing skills using ChatGPT.
- To study the translation among different languages.

UNIT – I FUNDAMENTALS OF GENERATIVE AI AND GPT MODELS

Introduction To Generative AI - Domains Of Generative AI - Text Generation - Image Generation - Music Generation - Video Generation - The History And Current Status Of Research - OpenAI And ChatGPT-Beyond The Market Hype: - Technical Requirements - What Is OpenAI? - An Overview Of ChatGPT: The Math Of The Model Behind It - The Structure Of RNNs - The Main Limitations Of RNNs -Overcoming Limitations-Introducing Transformers GPT-3 - ChatGPT: The State Of The Art.

UNIT – II CHATGPT IN ACTION - GETTING FAMILIAR WITH CHATGPT

Setting up a ChatGPT Account – Familiarizing Yourself With The UI – Organizing Chats - Understanding Prompt Design: What is a Prompt and Why is it Important? – Zero-, One-, And Few-Shot Learning - Typical of Transformers Models – Principles of Well-Defined Prompts to obtain Relevant and Consistent Results – Avoiding The Risk of Hidden Bias And Taking Into Account Ethical Considerations in ChatGPT.

UNIT - III BOOSTING DAY-TO-DAY PRODUCTIVITY WITH CHATGPT:

Technical Requirements – ChatGPT as a Daily Assistant – Generating Text – Improving Writing Skills And Translation – Quick Information Retrieval and Competitive Intelligence - Developing The Future With ChatGPT - Why ChatGPT For Developers? – Generating, Optimizing, And Debugging Code – Generating Documentation And Code Explainability – Understanding Ml Model Interpretability – Translation Among Different Programming Languages.

UNIT – IV MASTERING MARKETING AND RESEARCH WITH CHATGPT

Technical Requirements – Marketers' Need For ChatGPT – New Product Development And The Go-To-Market Strategy – A/B Testing For Marketing Comparison – Boosting Search Engine Optimization (seo) – Sentiment Analysis To Improve Quality And Increase Customer Satisfaction - Research Reinvented With ChatGPT: Researcher's Need For ChatGPT – Brainstorming Literature For Your Study – Providing Support For The Design And Framework of Your Experiment – Generating And Formatting A Bibliography – Generating A Presentation Of The Study.

UNIT – V OPENAI FOR ENTERPRISES

OpenAI And ChatGPT For Enterprises-Introducing Azure OpenAI: Technical Requirements – OpenAI And Microsoft For Enterprise-Level AI – Introducing Azure OpenAI: Microsoft AI Background – Azure OpenAI Service – Exploring Playground Why Introduce A Public Cloud? – Understanding Responsible AI – Microsoft's Journey Towards Responsible AI – Azure OpenAI And Responsible AI - Trending Use Cases For Enterprises: Technical Requirements – How Azure OpenAI Is Being Used In Enterprises – Contract Analyzer And Generator– Understanding Call Center Analytics – Exploring Semantic Search.

UNIT VI

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

TEXT BOOK

- Valentina Alto, "Modern Generative AI with ChatGPT and OpenAI Models" , Packt Publishing, 2023.

REFERENCE BOOKS

1. Raghav Bali, Generative AI with Python and TensorFlow2, 2021.
2. Mohak Agarwal, "Generative AI for Entrepreneurs in a Hurry", 2023.

Outcomes

- Understand ChatGPT applications.
- Appreciate the working of ChatGPT.
- Explore the features of Generative AI.
- Update writing skills in research.
- Design a chat bot.

Course Number: MAI23024 **Elective-IIB**

L-P: 4-0 **Credits: 3**

PATTERN RECOGNITION & IMAGE ANALYSIS

Objectives:

- To be familiar with processing of images, recognition of the pattern and their applications.
- To explore Knowledge about image processing.
- To acquire knowledge on segmentation techniques.
- To learn pattern recognition .
- To study the applications of image analysis.

UNIT-1

Introduction To Image Processing: Image Formation, Image Geometry Perspective And Other Transformation, Stereo Imaging Elements of Visual Perception. Digital Image- Sampling And Quantization Serial & Parallel Image Processing.

UNIT II

Image Restoration: Constrained And Unconstrained Restoration Wiener Filter, Motion Blur Remover, Geometric And Radiometric Correction Image Data Compression-Huffman And Other Codes Transform Compression, Predictive Compression Two Tone Image Compression, Block Coding, Run Length Coding, And Contour Coding.

UNIT III

Segmentation Techniques-Thresh Holding Approaches, Region Growing, Relaxation, Line And Edge Detection Approaches, Edge Linking, Supervised And Unsupervised Classification Techniques, Remotely Sensed Image Analysis And Applications, Shape Analysis – Gestalt Principles, Shape Number, Moment Fourier And Other Shape Descriptors, Skelton Detection, Hough Trans-Form, Topological And Texture Analysis, Shape Matching.

UNIT IV

Basics of Pattern Recognition, Design Principles of Pattern Recognition System, Learning And Adaptation, Pattern Recognition Approaches, Mathematical Foundations – Linear Algebra, Probability Theory, Expectation, Mean And Covariance, Normal Distribution, Multivariate Normal Densities, Chi Squared Test.

UNIT V

Statistical Pattern Recognition - Bayesian Decision Theory, Classifiers, Normal density and discriminant functions, Parameter estimation methods: Maximum - Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods – Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

UNIT VI

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

TEXT BOOK

1. Digital Image Processing–Gonzalez and Wood, Addison Wesley, 1993.
2. Fundamental of Image Processing–Anil K.Jain, Prentice Hall of India.
3. Pattern Classification–R.O.Duda, P.E.Hartand D.G.Stork, Second Edition John Wiley, 2006

REFERENCE BOOKS

1. Digital Picture Processing–Rosenfeld and Kak, vol. I &vol. II, Academic,1982
2. Computer Vision–Ballard and Brown, PrenticeHall,1982
3. An Introduction to Digital Image Processing–WayneNiblack, PrenticeHall, 1986
4. Pattern Recognition and Machine Learning–C.M. Bishop, Springer, 2009.
5. Pattern Recognition–S. Theodoridis and K. Koutroumbas, 4thEdition, Academic Press, 2009

Outcomes

- Get acquainted with image processing.
- Apply basic image restoration.
- Understand the concept of segmentation techniques.
- Grasp basics pattern recognition.
- Study the statistical pattern recognition.

Course Number: MAI23024 **Elective-IIC**

L-P: 4-0 **Credits: 3**

VIRTUAL REALITY

Objectives:

- To understand the basics of typography, grids in layout design, color modes.
- To conceive the design concepts of Virtual Reality.
- To acquire knowledge on color modes.
- To learn developing a virtual reality.
- To study the applications of virtual reality.

UNIT-1

Introduction to Image Processing - Image Formation, Image Geometry Perspective And Other Transformation, Stereo Imaging Elements of Visual Perception. Digital Image- Sampling And Quantization Serial & Parallel Image Processing. Basic Elements of Visual Design - Principles of Visual Design - Creating - Headlines And Body Content - Pre-Press Technology And Post-Press Technology Grids In Layout Design: Anatomy of A Grid - Types of Layout Design - Mixed Design - Design Process – Brand Management – Branding – Brand Identity Design- Design Thinking Process

UNIT II

Introduction – A Generic VR System - Virtual Environment – Technology – Modes Of Interaction – VR Hardware - Sensor Hardware, Head Coupled Displays – Acoustic Hardware – Integrated VR – VR Software - Modeling Virtual Worlds – Physical Simulations – VR Applications

UNIT III

Designing For VR - Visual Aid - Ui Depth And Eye Strain - Constant Velocity – Maintaining Head Tracking – Guiding With Light – Leveraging Scale – Spatial Audio- Gaze Cues Image Size And Resolution - Pixel Density - Eye Buffers - Optimal Resolution - Creating Panoramic Images.

UNIT IV

Color Modes - Changing Color Mode - Type Tool Options - Work Path From Type – Layers Panel - Types of Layers - Features of Layers - Shape Tools and Painting Tools - Brush Tools - Gradient Tools - Effects Panel - Graphics Panel - Photo Effects.

UNIT V

Filter Gallery - Applying Filters - Smart Filters - Channels Panel - Actions Panel - Change Settings - Exclude Commands - Inserting a Non-Recordable Menu Command - Batch Command – Rollovers - Creating Buttons -make Layer Duplicates - Create Rollover States 360-Degree Illustrations For VR-Panorama - Planning And Drawing 360-Degree Illustration - Exporting For VR 23.

UNIT VI

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

TEXT BOOKS

1. John Vince, "Virtual Reality Systems" Addison Wesley1995.
2. Karl Aspelund, "The Design Process",3rdEdition, 2014.
3. Brian Wood, "Adobe Illustrator CC Classroom", 1st Edition, 2019.
4. Joseph A.Gatto, "Exploring Visual Design: The Elements and Principles", 2010.

REFERENCE BOOKS

1. Erin Pangilinan, Steve Lukas, etal. 'Creating Augmented and Virtual Realities: Theory and Practice for Next-Generation Spatial Computing', Apr 14, 2019.
2. Steve Aukstakalnis, 'Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR (Usability).

Outcomes

- Work with typography and grids in layout design.
- Efficiently use various color modes.
- Able to record an action and create rollover states.
- Explore the issues in Virtual Reality.
- Analyze the role and importance of Virtual Reality in the modern world.

Course Number: MAI23025 **Elective-IIIA**

L-P: 4-0 **Credits: 3**

NUMERICAL ANALYSIS

Objectives:

- To understand the fundamental concepts of Numerical Methods and analysis.
- To explore tools and practices for working with Numerical concepts.
- To know about the research with the integration of large amounts of data.
- To learn various Stimulus concepts.
- To study the applications of Numerical methods.

UNIT-1

Algebraic and Transcendental Equations: Errors in numerical computation Iteration method-Bisection method – Regula - Falsi method – Newton - Raphson method Horner ‘s method.

UNIT II

Simultaneous Equations: Introduction-Simultaneous equations-Back substitution Gauss Elimination method-Gauss –Jordan Elimination method- Calculation of Inverse of a matrix- Crout‘s method-Iterative methods-Gauss- Jacobi Iteration method-Gauss seidal Iteration method-Newton Raphson‘s method for simultaneous equations.

UNIT III

Interpolation & Introduction: Newton‘s interpolation Formulae-Central difference Interpolation formulae-Gauss forward, Gauss backward, Lagrange‘s interpolation formulae- Divided differences-Newton‘s divided difference formula-Inverse Interpolation.

UNIT IV

Numerical Differentiation and Integration: Introduction-Derivates using Newton‘s forward difference formula-Derivates using Newton‘s backward difference formula Numerical Integration-Newton-cotes quadrature formula- Trapezoidal Rule-Simpson‘s one third rule-Simpson‘s 3/8 th rule.

UNIT V

Numerical Solution of Ordinary Differential Equations: Introduction-Taylor series method-Picard‘s method-Euler‘s method – Runge-kutta method of second, third, fourth order - Predictor & corrector methods - Mile‘s method.

UNIT VI

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

TEXT BOOK

1. Numerical Methods, Second Edition, S. Arumugam, A.Thangapandi Issac, A.Somasundaram, SCITECH publications, 2015.

REFERENCE BOOKS

1. Mathews J.H. Numerical Method for Maths, Science and Engineering; PHI, New Delhi, 2001.
2. Iqbal H. Khan & Q. Hassan Numerical Methods for Engineers and Scientist – Galgotia Publications (P) Ltd., New Delhi, 1997.
3. 3. M.K. Jain, S.R.K. Iyengar & R.K.Jain - Numerical Methods for Scientific and Engineering Computation - New Age International(P) Ltd., New Delhi, 1996.

Outcomes

- Acquire the knowledge on the basics of Numerical methods.
- Work with simultaneous equations.
- Design Interpolation with numerical analysis.
- Explore the Numerical differentiation.
- Analyze the numerical solutions.

Course Number: MAI23025 **Elective-IIIB**

L-P: 4-0 **Credits: 3**

OPTIMIZATION TECHNIQUES

Objectives:

- To apply various optimization techniques for decision making.
- To introduce the use of variables for formulating complex mathematical models in management, science and industrial applications.
- To acquire knowledge on optimization techniques.
- To learn developing a linear programming.
- To study the applications of queuing model.

UNIT-1 INTRODUCTION-LINEAR PROGRAMMING PROBLEM

The Nature and Meaning of OR – Management – Applications of OR – Modeling in OR – General methods for solving OR models – Scope of OR. Linear Programming Problem: Formulation of LP problems – Graphical solution of LP problems – General formulation of LPP – Slack and Surplus variables – Standard form of LPP – Some important forms of LPP – Simplex Method and its special cases.

UNIT II ARIFICIAL VARIABLE TECHNIQUES AND IPP

Artificial Variable Techniques: Two Phase method and special cases. Integer Programming Problem: Importance–Definitions– Gomory's Pure Integer Programming Problem – Mixed Integer Programming Problem.

UNIT III ASSIGNMENT AND TRANSPORTATION PROBLEMS

Assignment Problem: Mathematical formulation– Hungarian method– Unbalanced assignment problem – Various types. Transportation Model: Mathematical formulation – Matrix form–Methods for finding Initial Basic Feasible solution and Optimal solution – Degeneracy in Transportation Problems – Unbalanced Transportation Problem.

UNIT IV SEQUENCING PROBLEMS AND QUEUING MODELS

Sequencing Problems: Assumptions – Solutions to Sequencing Problems: Processing n jobs through 2 machines – Processing n jobs through 3 machines – Processing n jobs on m machines. Queuing Models: Queuing System – Transient and Steady States– Kendal's Notation for representing Queuing Models – Various Models in Queuing System – Birth and Death Model.

UNIT V PERT AND CPM TECHNIQUES

PERT and CPM Techniques: Basic Steps – Network Diagram representation– Rules for drawing Network Diagram – Labeling Fulkerson's I–J Rule – Time Estimates and Critical Path in Network Analysis – Examples on optimum duration and minimum duration cost – PERT.

UNIT VI

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

TEXT BOOK

1. S.D. Sharma, "Operations Research", Tenth Edition, Pearson, 2017.

REFERENCE BOOKS

1. Hamdy A Taha, "Operations Research", Ninth Edition, 2016.
2. V. Sundaresan, K.S. Ganapathy Subramanian, K.Ganesan, "Resource Management Techniques", Ninth Edition, A. R. Publications, 2015.

Outcomes

- Formulate and solve Linear Programming Problems.
- Examine the Two phase method.
- Analyze the usage of Integer Programming Problem.
- Evaluate the Sequencing Problems and Queueing Models.
- Apply PERT and CPM techniques to find the optimal solution.

Course Number: MAI23025 **Elective-IIIC**

L-P: 4-0 **Credits: 3**

SIMULATION & MODELING SYSTEMS

Objectives:

- To know the key concepts in the computer modeling and simulation.
- To understand the applications of modeling and simulation.
- To know the basic concepts of the distributions.
- To understand the verification and validation of simulation models.

UNIT – 1 INTRODUCTION TO SIMULATION

Principle of Computer Modeling and Simulation – Monete Carlo Simulation – Nature of Computer Modeling and Simulation – Limitation of Simulation – Areas of Application Systems and System Environment, Components of a system, general systems theory, Concept of simulation, Simulation as a decision making tool, types of simulation.

UNIT – 2 RANDOM NUMBER GENERATION AND RANDOM VARIABLE GENERATION

Pseudo Random Numbers - Techniques for Generating Random Numbers - Tests forRandom Numbers - Inverse transform technique - exponential distribution – uniform distribution - Weibull distribution. Empirical continuous distribution – generating approximate normal variates - Erlang distribution.

UNIT – 3 DISTRIBUTIONS

Empirical Discrete Distribution – Discrete Uniform Distribution – Poisson Distribution – Geometric Distribution – Acceptance – Rejection Technique for Poison Distribution – Gamma Distribution.

UNIT – 4 VERIFICATION AND VALIDATION

Design and evaluation of simulation experiments – Variance reduction technique –Antithetic Variables – Verification and Validation of Simulation models. Discrete EventSimulation – Concepts in Discrete – Event Simulation, ManualSimulation using eventScheduling, Single Channel Queue, two server queue, Simulation of Inventory Problem.

UNIT – 5 SIMULATIONS LANGUAGES

Simulation Languages - GPSS – SIMSCRIPT – SIMULA - Case Studies - Development of simulation models using simulation language studied for systems like queuing systems, Production systems, Inventory systems, maintenance and replacement systems and Investment analysis.

Text books:

1. "Discrete Event System Simulation" - by Jerry Banks and John S.Carson, Barry L. Nelson, David M.Nicol - 3rd Edition, Prentice Hall, India, 2002.
2. "System Simulation with Digital Computer" – by Narsingh Deo, PHI, 2001.

Outcomes:

- Familiar with key concepts of computer modeling and simulations.
- Clear understanding of the Random Number Generation and Random Variable Generation.
- Familiar with concepts of various distribution methods.
- Understanding the simulation languages and case studies using simulation tools.

Course Number: MAI23026P **CC-X**

L-P: 0-3 **Credits: 2**

R PROGRAMMING LAB

Objectives:

- To expose the students to the fundamental concepts of R Programming.
- To acquire knowledge about vectors and matrix manipulation.
- To implement Data frames.
- To draw graphs.
- To apply in analytics.

Practical List:

- R Expressions and Data Structures
- Manipulation of vectors and matrix
- Operators on Factors in R
- Data Frames in R
- Lists and Operators
- Working with looping statements.
- Graphs in R
- 3D plots in R

Outcomes

- Understand the basics in R programming in terms of constructs, control statements, string functions.
- Understand the use of R for Big Data analytics.
- Apply R programming for Text processing.
- Appreciate and apply the R programming from a statistical perspective.

Course Number: MAI23027P **CC-XI**

L-P: 0-3 **Credits: 2**

MACHINE LEARNING LAB

Objectives:

- To apply the concepts of Machine Learning to solve real-world problems.
- To implement basic algorithms in clustering & classification applied to text & numeric data.
- To implement algorithms emphasizing the importance of bagging & boosting in classification & regression.
- To implement algorithms related to dimensionality reduction.
- To apply machine learning algorithms for Natural Language Processing applications.

Practical List

1. Solving Regression & Classification using Decision Trees.
2. Root Node Attribute Selection for Decision Trees using Information Gain.
3. Bayesian Inference in Gene Expression Analysis.
4. Pattern Recognition Application using Bayesian Inference.
5. Bagging in Classification.
6. Bagging, Boosting applications using Regression Trees.
7. Data& Text Classification using Neural Networks.
8. Using Weka tool for SVM classification for chosen domain application.
9. Data & Text Clustering using K-means algorithm.
10. Data & Text Clustering using Gaussian Mixture Models.
11. Dimensionality Reduction Algorithms in Image Processing applications.
12. Application of CRFs in Natural Language Processing.

Outcomes

- Implement machine learning algorithms related to numeric data.
- Apply machine learning algorithms for text data.
- Use dimensionality reduction algorithms for image processing applications.
- Distinguish Clustering and Classification.
- Apply CRFs in Natural Language Processing.

SEMESTER-III

Course Number: MAI23031 **CC-XII**

L-P: 5-0 **Credits: 4**

DEEP LEARNING

Objectives:

- To introduce the fundamental techniques and principles of Neural Networks.
- To familiarize fundamental concepts in Deep Learning.
- To identify and apply the appropriate training in deep neural networks.
- To classify recurrent neural networks.
- To study the applications of Deep Learning.

UNIT-1

Introduction to Neural Networks – Introduction – Basic Architecture of Neural Networks – Training and Neural Network with Back propagation – Practical Issues in Neural Network Training – The Secrets to the Power of Function Composition – Common Neural Architectures – Advanced Topics.

UNIT–II

TensorFlow: variables, operations, placeholder Tensors, sessions – Navigating variable scopes and shared variables – Managing models over CPU and GPU – Logistic Regression in TensorFlow–Training Logistic Regression model – Visualizing using TensorBoard – Building multilayer model in TensorFlow.

UNIT– III

Training Deep Neural Networks: Introduction – Back propagation – Setup and Initialization issues – The vanishing and exploding gradient problems – Gradient Descent Strategies' – Batch Normalization–Teaching Deep Learners to Generalize: Introduction –The Bias-Variance trade-off – Generalization issues in model tuning and evaluation – Penalty based regularization – Ensemble methods – Early Stopping – Unsupervised pre-training – Continuation and Curriculum learning – Parameter sharing – Regularization in Unsupervised Applications.

UNIT– IV

Recurrent Neural Networks: Introduction – Architecture of Recurrent Neural Networks –The challenges of training recurrent Networks–Echo-State Networks– Long Short-Term memory – Gated Recurrent Units – Applications of Recurrent Neural Networks. Convolutional Neural Networks: Introduction – The Basic Structure of a Convolutional Network – Training a convolutional network – Case studies of Convolutional Architectures – Visualization and

Unsupervised Learning – Applications of Convolutional networks.

UNIT– V

Deep Reinforcement Learning: Introduction – Stateless Algorithms – The basic framework of Reinforcement Learning – Bootstrapping for value function learning– Policy Gradient Methods – Monte Carlo Tree Search – Case Studies – Practical Challenges associated with safety. Advanced Topics associated with Deep Learning: Generative Adversarial Networks (GAN) – Competitive Learning – Limitations of Neural Networks.

UNIT VI

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

TEXT BOOKS:

1. Charu C. Aggarwal, Neural Networks and Deep Learning, Springer 2018.

REFERENCE BOOKS:

1. Ian Good fellow, Yoshua Bengio and Aaron Courville, Deep Learning, The MIT Press, 2016.
2. Francois Chollet, Deep Learning with Python, Manning Publications Co., 2018.
3. Josh Patterson, Adam Gibson, Deep Learning: A Practitioner's Approach 1st Edition, O'Reilly', 2017.

Outcomes:

- Become familiar with the fundamental concepts in Deep Learning.
- Explore the use of Deep Learning technology in computer vision, speech analysis, healthcare, agriculture, and understanding climate change.
- Apply Deep Learning technology in computer vision, speech analysis, Health care, agriculture, and understanding climate change.
- Analyze Deep Reinforcement Learning.
- Evaluate the Practical Challenges in Deep Learning.

Course Number: MAI23032 **CC-XIII**

L-P: 4-0 **Credits: 4**

NATURAL LANGUAGE PROCESSING

Objectives:

- To understand the algorithms available for the processing of linguistic information and computational properties of natural languages.
- To conceive basic knowledge on various morphological, syntactic and semantic NLP tasks.
- To identify and apply the appropriate training in NLP.
- To classify Language modeling.
- To study the applications of NLP.

UNIT-1

Introduction to NLP: NLP – introduction and applications, NLP phases, Difficulty of NLP including ambiguity; Spelling error and Noisy Channel Model; Concepts of Parts-of-speech and Formal Grammar of English.

UNIT–II

Language Modeling: N-gram and Neural Language Models Language Modeling with N-gram, Simple N-gram models, Smoothing (basic techniques), Evaluating language models; Neural Network basics, Training; Neural Language Model, Case study: application of neural language model in NLP system development.

UNIT– III

Parts-of-speech Tagging Parts-of-speech Tagging: basic concepts; Tag set; Early approaches: Rule based and TBL; POS tagging using HMM, Introduction to POS Tagging using Neural Model.

UNIT– IV

Parsing Basic concepts Parts-of-speech Tagging Parts-of-speech Tagging: basic concepts; Tag set; Early approaches: Rule based and TBL; POS tagging using HMM, Introduction to POS Tagging using Neural Model. top down and bottom up parsing, treebank; Syntactic parsing: CKY parsing; Statistical Parsing basics: Probabilistic Context Free Grammar (PCFG); Probabilistic CKY Parsing of PCFGs.

UNIT– V

Semantics Vector Semantics; Words and Vector; Measuring Similarity; Semantics with dense vectors; SVD and Latent Semantic Analysis; Embedding from prediction: Skip-gram and CBOW; Concept of Word Sense; Introduction to WordNet.

UNIT VI

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

TEXT BOOKS:

1. Jurafsky Danand Martin James S. “Speech and Language Processing”,3rd Edition, 2018.

REFERENCE BOOKS:

1. Daniel Jurafsky and James H. Martin J.S., “Speech and language processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, 2nd Edition, Upper Saddle River, NJ: Prentice-Hall, 2008.
2. Goldberg Yoav “A Primer on Neural Network Models for Natural Language Processing”.

Outcomes:

- Describe the concepts of morphology, syntax, semantics, discourse & pragmatics of natural language.
- Discover various linguistics relevant to NLP tasks.
- Identify statistical features relevant to NLP tasks.
- Analyze parsing in NLP.
- Develop systems for various NLP problems with moderate complexity.

Course Number: MAI23033 **CC-XIV**

L-P: 4-0 **Credits: 4**

BIG DATA ANALYTICS

Objectives:

- To understand the fundamental concepts of big data and analytics.
- To explore tools and practices for working with big data.
- To know about the research with the integration of large amounts of data.
- To classify data analytic methods.
- To study the applications of big data analytics.

UNIT-1 INTRODUCTION

Introduction to Big Data Analytics: Big Data Overview–Data Structures–Analyst Perspective on Data Repositories - State of the Practice in Analytics – BI Versus Data Science - Current Analytical Architecture – Drivers of Big Data – Big Data Ecosystem - Data Analytics Lifecycle – Data Discovery – Data Preparation – Model Planning – Model Building – Communicate Results – Operationalize.

UNIT–II DATA ANALYTIC METHODS

Basic Data Analytic Methods Using R : Introduction to R programming – R Graphical User Interfaces – Data Import and Export Attribute and Data Types – Descriptive Statistics Exploratory Data Analysis : Visualization Before Analysis – Dirty Data – Visualizing a Single Variable – Examining Multiple Variables Data Exploration Versus Presentation -– Statistical Methods of Evaluation: Hypothesis Testing – Difference of Means – Wilcoxon Rank-Sum Test – Type I and Type II Errors – Power and Sample Size – ANOVA.

UNIT– III ADVANCED METHODS

Advanced Analytical Theory and Methods: Clustering – K Means – Use Cases – Overview – Determining number of clusters – Diagnostics Reasons to choose and cautions – Additional Algorithms - Association Rules: A Priori Algorithm – Evaluation of Candidate Rules Applications of Association Rules – Validation and Testing – Diagnostics. Regression: Linear Regression and Logistic Regression: – Use cases – Model Description – Diagnostics -

Additional Regression Models.

UNIT– IV CLASSIFICATION

Classification : Decision Trees – Overview – Genetic Algorithm – Decision Tree Algorithms – Evaluating Decision Tree – Decision Trees in R - Naive Bayes – Bayes Theorem – Naïve Bayes Classifier – Smoothing – Diagnostics – Naïve Bayes in R – Diagnostics of Classifiers – Additional Classification Methods - Time Series Analysis: Overview –Box–Jenkins Methodology–ARIMA Model –Autocorrelation Function – Autoregressive Models – Moving Average Models – ARMA and ARIMA Models–Building and Evaluating and ARIMA Model- Text Analysis: Text Analysis Steps – Example – Collecting – Representing Term Frequency – Categorizing – Determining Sentiments – Gaining Insights.

UNIT– V TECHNOLOGY

Advanced Analytics-Technology and Tools: MapReduce and Hadoop: Analytics for Unstructured Data . - Use Cases - MapReduce - Apache Hadoop – The Hadoop Ecosystem – pig – Hive – Hbase – Mahout – NoSQL - Tools in Database Analytics : SQL Essentials – Joins – Set operations – Grouping Extensions – In Database Text Analysis - Advanced SQL – Windows Functions – User Defined Functions and Aggregates – ordered aggregates- MAD Lib – Analytics Reports Consolidation – Communicating and operationalizing and Analytics Project – Creating the Final Deliverables : Developing Core Material for Multiple Audiences – Project Goals – Main Findings – Approach Model Description – Key points support with Data - Model details – Recommendations – Data Visualization.

UNIT VI

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

TEXT BOOKS:

1. Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", EMC Education Services Published by John Wiley & Sons,
2. Noreen Burlingame, "The little book on Big Data", New Street publishers, 2012.
3. Anil Maheshwari, "Data Analytics", McGraw Hill Education, 2017.

REFERENCE BOOKS:

1. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", 2013.
2. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2015.
3. Dietmar Jannachand Markus Zanker, "Recommender Systems: An Introduction", Cambridge University Press, 2010.
4. KimS. Priesand Robert Dunnigan, "Big Data Analytics: A Practical Guide for Managers " CRC Press, 2015.

Outcomes:

- Acquire the knowledge on the basics of Big Data.
- Work with big data tools.
- Design efficient algorithms for mining the data from large volumes.
- Explore the cutting-edge tools and technologies to analyze Big Data.
- Appreciate Big Data Processing concepts and Data visualization techniques.

Course Number: MAI23034 **Elective-IVA**

L-P: 3-0 **Credits: 3**

MACHINE TRANSLATION

Objectives:

- To Learn the basics of Machine Translation.
- To know the paradigms of Machine Translation.
- To acquire knowledge about Phrase-based machine translation.
- To illustrate essential steps in Example based machine translation.
- To know about Translation memory.

UNIT – I Introduction

A feel for a modern approach to Machine Translation: Data-Driven MT - MT Approaches: Vauquois Triangle - Language Divergence with illustration between Hindi and English - Three Major Paradigms of Machine Translation - MT Evaluation.

UNIT – II Learning Bilingual word Mappings

A Combinatorial Argument - Deeper Look at One-to-One Alignment - Heuristics-Based Computation of the $V_E \times V_F$ Table - Iterative (EM-Based) Computation of the $V_E \times V_F$ Table - Mathematics of Alignment - Complexity Considerations - EM: Study of progress in Parameter Values.

UNIT – III Phrase-Based Machine Translation

Need for Phrase Alignment - An Example to illustrate Phrase Alignment Technique - Phrase Table - Mathematics of Phrase-Based SMT – Decoding - Moses

UNIT – IV Rule-Based Machine Translation (RBMT)

Two Kinds of RBMT: Interlingua and Transfer - Universal Networking Language (UNL) - UNL Expressions as Binary Predicates - Interlingua and Word Knowledge - Translation Using Interlingua - Details of English-to-UNL Conversion: With Illustration - UNL-to-Hindi Conversion: With Illustration - Transfer-Based MT - Case Study of Marathi-Hindi Transfer-Based MT.

UNIT – V Example-Based Machine Translation

Illustration of Essential Steps of EBMT - Deeper Look at EBMT's Working - EBMT and Case-Based Reasoning - Text Similarity Computation - Recombination: Adaptation on Retrieved Examples - EBMT and Translation Memory - EBMT and SMT

UNIT - VI

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

TEXT BOOK

- Pushpak Bhattacharyya, "Machine Translation", CRC Press, 2015.

REFERENCE BOOKS:

- An Introduction to Machine Translation, W.J.Hutchins, H.L.Somers, Academic Press, 1992
- Translation Engines: Techniques for Machine Translation, A.Trujillo, Springer Verlag, 1999
- Machine Translation: An Introductory Guide, D.Arnold, L.Balkan, S.Meijer, R.L.Humphreys, L.Sadler, Blackwell Pub., 2001.
- Hybrid Approaches to Machine Translation, M.R.Costa-jussa, et al. (eds.), Springer, 2016
- Handbook of Natural Language Processing and Machine Translation, J.Olive, C.Christianson, J.McCary (eds.),

Outcomes:

- Acquire modern approach in machine translation.
- Learn Bilingual word mapping.
- Knowledge about phrase based machine translation.
- Translate using Interlingua.
- Computer Text Similarity.

Course Number: MAI23034 **Elective-IVB**

L-P: 3-0 **Credits: 3**

BLOCK CHAIN TECHNOLOGY

Objectives:

- To Introduce the Concepts of Block chain Technologies.
- To be familiar with the types of Block chain.
- To understand the concept of Private and Public Block chain.
- To learn developing a Block chain system.
- To study the security in Block chain.

UNIT-I FUNDAMENTALS OF BLOCK CHAIN

Introduction - Origin of Block chain–Block chain Solution - Components of Block chain – Block in Block chain - The Technology and the Future.

UNIT II BLOCKCHAIN TYPES AND CONSENSUS MECHANISM

Introduction - Decentralization and Distribution - Types of Block chain - Consensus Protocol - CRYPTOCURRENCY - BITCOIN, ALTCOIN and TOKEN: Introduction - Bitcoin and Crypto currency Basics - Types of Crypto currency – Crypto currency Usage

UNIT III PUBLIC BLOCKCHAIN SYSTEM

Introduction - Public Block chain - Popular Public Block chains - The Bitcoin Clock chain– Etherum Block chain.

UNIT IV PRIVATE BLOCKCHAIN SYSTEM

Introduction - Key Characteristics of Private Block chain - Why We Need Private Block chain - Private Block chain Examples - Private Block chain and Open Source - E-Commerce Site Examples - Various Commands in E-Commerce Block chain - Smart Contract in Private Environment - State Machine - Different Algorithms of Permissioned Block chain - Byzantine Fault - Multi chain.

UNIT V SECURITY IN BLOCKCHAIN

Introduction - Security Aspects in Bit coin - Security and Privacy Challenges of Block chain in General - Performance and Scalability - Identity Management and Authentication - Regularity Compliance and Assurance - Safeguarding Block chain Smart Contract - Security Aspects in Hyper ledger Fabric - Applications of Blockchain: Block chain in Banking and Finance – Block chain in Healthcare.

UNIT VI

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

TEXT BOOK

1. Block Chain Technology, Chandramouli Subramaniam, Asha A George, Abhilash K A,Meera Karthikeyan, University Press, 2020.

REFERENCE BOOK:

1. Blockchain Basics: A Non-Technical Introduction, Daniel Drescher, Apress, 2017.
2. Block Chain from Concept to Execution, Debajani Mohanty, BPB, 2018.

Online Resources:

1. https://www.pdfdrive.com/Blockchain-books.html
2. https://www.Blockchain.com/

Outcomes

- Understand the Basic Idea of Block chain Technology.
- Identify the Differences between Public and Private Block chain Technologies.
- Know about Crypto currency - Bit coin, Altcoin and Token.
- Understanding the Security Challenges.
- Know about Applications in Block chain Technology.

Course Number: MAI23034 **Elective-IVC**

L-P: 3-0 **Credits: 3**

ROBOTICS

Objectives:

- To understand the functions of the basic components of a Robot.
- To study the use of various types of End Effectors and Sensors.
- To impart knowledge in Robot Kinematics and Programming.
- To learn developing a robot .
- To study the applications of robotics.

UNIT-I

Fundamentals of Robot: Robot - Definition - Robot Anatomy - Coordinate Systems, Work Envelope Types and Classification- Specifications-Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load Robot Parts and their Functions-Need for Robots-Different Applications.

UNIT II

Robot Drive Systems And End Effectors: Pneumatic Drives-Hydraulic Drives-Mechanical Drives – Electrical Drives- D. C. Servo Motors, Stepper Motors, A/C Servo Motors -Salient Features, Applications and Comparison of all these Drives, End Effectors-Grippers- Mechanical Grippers, Pneumatic and Hydraulic- Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations.

UNIT III

Sensors & Machine Vision: Requirements, Principles & Applications of the following types of sensors- Position - Piezo Electric, LVDT, Resolvers, Optical Encoders, pneumatic Position, Range- Triangulations Principles, Structured, Lighting Approach, Time of Flight, Range Finders, Laser Range Meters, Sensors- Touch–binary–Analog-Wrist-Compliance-Slip-Camera, Frame Grabber, Sensing and Digitizing Image Data- Signal Conversion, Image Storage, Lighting Techniques, Image Processing & Analysis-Data Reduction, Segmentation, Feature Extraction, Object Recognition, Other Algorithms, Applications- Inspection, Identification, Visual Serving and Navigation.

UNIT IV

Robot Kinematics And Robot Programming: Forward Kinematics, Inverse Kinematics and Difference; Forward Kinematics and Reverse Kinematics of manipulators with Two, Three Degrees of Freedom (in 2Dimension), Four Degrees of freedom (in 3 Dimension) Jacobians, Velocity and Forces- Manipulator Dynamics, Trajectory Generator, Manipulator Mechanism Design-Derivations and problems. Lead through Programming, Robot programming Languages-VAL Programming-Motion Commands, Sensor Commands, End Effector commands and simple Programs.

UNIT V

Implementation and Robot Economics: RGV, AGV; Implementation of Robots in Industries-Various Steps; Safety Considerations for Robot Operations - Economic Analysis of Robots.

UNIT VI

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

TEXT BOOK

1. Klafter R.D., Chmielewski T.A and Negin M., "Robotic Engineering – An Integrated Approach", Prentice Hall, 2019.
2. Groover M.P., "Industrial Robotics-Technology Programming and Applications", McGraw Hill, 2018.

REFERENCE BOOKS:

1. CraigJ.J., "Introduction to Robotics Mechanics and Control", Pearson Education, 2017.
2. KorenY.,"Robotics forEngineers", McGrawHillBookCo., 2019.
3. Fu. K. S., Gonzalez R. C.and Lee C. S. G.,"Robotics Control, Sensing, Vision and Intelligence", McGraw Hill Book Co., 2017.
4. Janakiraman P.A., "Robotics and Image Processing", Tata McGraw Hill, 2015.

Outcomes

- Understand the functions of the basic components of a Robot.
- Analyze the use of various types of End Effectors and Sensors.
- Gain knowledge in Robot Kinematics and Programming.
- Ascertain Safety Considerations for Robot Operations.
- Determine the feasibility of implementing a Robot.

Course Number: MAI23035 **Elective-VA**

L-P: 3-0 **Credits: 3**

DESIGN THINKING

Objectives:

- To understand the applications of Design Thinking.
- To study and model the Designing.
- To acquire knowledge on Ideation.
- To learn Prototyping concepts.
- To study the applications of prototypes.

UNIT-1

INTRODUCTION TO DESIGN THINKING – Definition - Origin of Design Thinking - Importance of Design Thinking - Design Vs. Design thinking - Understanding Design Thinking and its process model - Design thinking tools - Types of the thinking process.

UNIT II

EMPATHIZE - Design thinking phases - How to empathize - Role of empathy in Design Thinking,-Understanding empathy tools: Customer Journey Map - Personas.

UNIT III

IDEATION - Challenges in idea generation - Need for systematic method to connect to user – Visualize – Empathize and Ideate method -Importance of visualizing and empathizing before ideating.

UNIT IV

PROTOTYPING - What is a prototype? - Prototyping as a mindset - prototype examples - prototyping for products - Process of prototyping - Minimum Viable prototype

UNIT V

TESTING PROTOTYPES - Prototyping for digital products – What's unique for digital – Preparation -Prototyping for physical products –What's unique for physical products - Preparation.

UNIT VI

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

TEXT BOOK

1. S. Salivahanan, S. Suresh Kumar, D. Praveen Sam, ―Introduction to Design Thinking, Tata Mc Graw Hill, First Edition, 2019.

2. Kathryn McElroy, ―Prototyping for Designers: Developing the best Digital and Physical Products, O_Reilly, 2017.

REFERENCE BOOKS

1. Michael G. Luchs, Scott Swan, Abbie Griffin, Design Thinking – New Product Essentials from PDMA, Wiley, 2015.
2. Vijay Kumar, ―101 Design Methods: A Structured Approach for Driving Innovation in Your Organization, 2012.

ONLINE RESOURCES

- https://www.interaction-design.org/literature/article/. 5-stages-in-thedesignthinking-process
- https://www.ibm.com/design/thinking/page/toolkit
- https://www.culturepartnership.eu/en/article/ten-tools-for-design-thinking
- https://nptel.ac.in/courses/109/104/109104109/
- https://nptel.ac.in/courses/110106124/

Outcomes

- Get an insight about Design Thinking.
- Gain knowledge Ideology.
- Understand Prototyping.
- Analyze Testing Prototypes.
- Explore Design thinking.

Course Number: MAI23035 **Elective-VB**

L-P: 3-0 **Credits: 3**

SOFT COMPUTING

Objectives:

- To understand the concept of Fuzzy Logic.
- To analyze the architecture and working of Artificial Neural Network.
- To identify and apply the appropriate Fuzzy logic technique.
- To learn the architecture of neural networks.
- To study the applications of Fuzzy systems.

UNIT-1 FUNDAMENTALS OF FUZZY LOGIC

Basic Concepts: Fuzzy Set Theory - Basic Concept of Crisp Sets And Fuzzy Sets – Complements - Union Intersection - Combination of Operation - General Aggregation Operations - Fuzzy Relations - Compatibility Relations – Orderings – Morphisms - Fuzzy Relational Equations - Fuzzy Set And Systems.

UNIT–II ARCHITECTURE OF NEURAL NETWORKS

Architectures: Motivation For The Development of Natural Networks - Artificial Neural Networks - Biological Neural Networks - Area of Applications - Typical Architecture - Setting Weights - Common Activations Function Basic Learning Rules – Mcculloch-Pitts Neuron - Architecture, Algorithm, Applications-Single Layer Net For Pattern Classification - Biases and Thresholds, Linear Separability - Hebb's Rule- Algorithm - Perceptron - Convergence Theorem - Delta Rule

UNIT– III BASIC NEURAL NETWORK TECHNIQUES

Back Propagation Neural Net: Standard Back Propagation - Architecture Algorithm - Derivation Of Learning Rules Number of Hidden Layers - Associative and Other Neural Networks - Hetro Associative Memory Neural Net, Auto Associative Net - Bidirectional Associative Memory – Applications - Hopfield Nets-Boltzmann Machine.

UNIT– IV COMPETITIVE NEURAL NETWORKS

Neural Network Based on Competition: Fixed Weight Competitive Nets - Kohonen Self-Organizing Maps And Applications - Learning Vector Quantization - Counter Propagation Nets and Applications Adaptive Resonance Theory: Basic Architecture And Operation - Architecture, Algorithm, Application and Analysis of Art1 & Art2.

UNIT– V SPECIAL NEURAL NETWORKS

Cognitron and Neo cognitron - Architecture, training algorithm and application - fuzzy associate memories, fuzzy system architecture - comparison of fuzzy and neural systems.

UNIT VI

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

TEXT BOOKS:

1. T. Kliryvan-Fuzzy System & Fuzzy logic Prentice Hall of India, First Edition.
2. Lawrence Fusset- Fundamental of Neural Network Prentice Hall, First Edition.

REFERENCE BOOKS:

1. Bart Kosko,—Neural network and Fuzzy System‖-PrenticeHall-1994.
2. J. Klinand T.A. Folger, — Fuzzysets ‖University and information-Prentice Hall -1996.
3. J.M. Zurada,—Introduction to artificial neural systems-Jaico Publication house, Delhi 1994.
4. Intelligent Systems and Control-http://nptel.ac.in/courses/108104049/16.

Outcomes:

- Gain sound knowledge of Fuzzy Logic and Neural Networks.
- Apply fuzzy logic and reasoning to handle uncertainty.
- Apply Neural Network based algorithms to real world problems.
- Analyze Neuro-fuzzy system.
- Understand Fuzzy System Architecture.

Course Number: MAI23035 **Elective -VC**

L-P: 3-0 **Credits: 3**

REINFORCEMENT LEARNING

Objectives:

- To understand the concept of Reinforcement Learning.
- To implement and apply Reinforcement Learning algorithms to real-world applications.
- To identify and apply the appropriate Reinforcement Learning technique.
- To study the applications of Reinforcement Learning.

UNIT - I

Basics of probability and linear algebra, Definition of a stochastic multi-armed bandit, Definition of regret, Achieving sublinear regret, UCB algorithm, KL-UCB, Thompson Sampling.

UNIT - II

Markov Decision Problem, policy, and value function, Reward models (infinite discounted, total, finite horizon, and average), Episodic & continuing tasks, Bellman's optimality operator, and Value iteration & policy iteration

UNIT - III

The Reinforcement Learning problem, prediction and control problems, Model-based algorithm, Monte Carlo methods for prediction, and Online implementation of Monte Carlo policy evaluation

UNIT - IV

Bootstrapping; TD(0) algorithm; Convergence of Monte Carlo and batch TD(0) algorithms; Model-free control: Q-learning, Sarsa, Expected Sarsa.

UNIT - V

n-step returns; TD(λ) algorithm; Need for generalization in practice; Linear function approximation and geometric view; Linear TD(λ). Tile coding; Control with function approximation; Policy search; Policy gradient methods; Experience replay; Fitted Q Iteration; Case studies.

UNIT VI

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

TEXT BOOKS:

1. “Reinforcement learning: An introduction,” First Edition, Sutton, Richard S., and Andrew G. Barto, MIT press 2020.

2. “Statistical reinforcement learning: modern machine learning approaches,” First Edition, Sugiyama, Masashi. CRC Press 2015.

REFERENCE BOOKS:

1. “Bandit algorithms,” First Edition, Lattimore, T. and C. Szepesvári. Cambridge University Press. 2020.

2. “Reinforcement Learning Algorithms: Analysis and Applications,” Boris Belousov, Hany Abdulsamad, Pascal Klink, Simone Parisi, and Jan Peters First Edition, Springer 2021.

3. Alexander Zai and Brandon Brown “Deep Reinforcement Learning in Action,” First Edition, Manning Publications 2020.

Course Outcomes

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(λ) algorithm.

Course Number: MAI23036P **CC-XV**

L-P: 0-3 **Credits: 2**

NATURAL LANGUAGE PROCESSING LAB

Objectives:

- To familiarize the students with practical aspects of processing Natural Language.
- To Understand the Logic of NLP Techniques.
- To Know the Implementation of NLP Techniques.
- To Apply Present Compatible Programming Language for NLP.

Practical List

1. Tokenizing Text and WordNet basics: Tokenizing text into sentences, Tokenizing sentences into words, Tokenizing sentences using regular expressions, Filtering stop words in a tokenized sentence, Looking up synsets for a word in WordNet, Looking up lemmas and synonyms in WordNet, Calculating WordNet synset similarity Discovering word collocations.
2. Replacing and correcting words: Stemming words, Lemmatizing words with WordNet, Translating text with Babelfish, Replacing words matching regular expressions, Removing repeating characters, Spelling correction with Enchant, Replacing synonyms, Replacing negations with antonyms.
3. Creating Custom Corpora : Setting up acustom corpus, Creating a word list corpus, Creating a part of speech tagged word corpus, Creating a chunked phrase corpus, Creating a categorized text corpus, Creating a categorized chunk corpus reader, Lazy corpus loading, Creating a custom corpus view, Creating a MongoDB backed corpus reader, Corpus editing with file locking.
4. Parts-of -Speech Tagging: Training a unigram part-of-speech tagger, Combining taggers with backoff tagging, Training and combining Ngram taggers, Creating a model of likely word tags, Tagging with regular expressions, Affix tagging, Training a Brill tagger, Training the TnT tagger Using WordNet for tagging, Tagging proper names, Classifier based tagging.
5. Extracting Chunks : Chunking and chinking with regular expressions, Merging and splitting chunks with regular expressions, Expanding and removing chunks with regular expressions, Partial parsing with regular expressions, Training a tagger-based chunker, Classification-based chunking, extracting named entities, Extracting proper noun chunks, Extracting location chunks, Training a named entity chunker.

6. Transforming Chunks and Trees: Filtering insignificant words, Correcting verb forms, Swapping verb phrases, Swapping noun cardinals, Swapping infinitive phrases, Singularizing plural nouns, Chaining chunk transformations, Converting a chunk tree to text, Flattening a deep tree, Creating a shallow tree, Converting tree nodes.
7. Parsing Specific Data: Parsing dates and times with Date util, Time zone lookup and conversion, Tagging temporal expressions with Timex, Extracting URLs from HTML with lxml, Cleaning and stripping HTML, Converting HTML entities with Beautiful Soup.

Outcomes

- Implement common NLP tasks using Python and Natural Language Toolkit, NLTK
- Describe the concepts of morphology, syntax, semantics, discourse& pragmatics of Natural Language.
- Discover various linguistics relevant to NLP tasks.
- Analyze parsing in NLP.
- Develop systems for various NLP problems with moderate complexity.

Course Number: MAI23037P **CC-XVI**

L-P: 0-3 **Credits: 2**

BIG DATA ANALYTICS LAB

Objectives:

- Know the concept of MapReduce architecture.
- Know the concept of Programming Methods.
- Understand the HDFS Commands.
- Know the concept of data types in Hadoop.
- Know the concept of MapReduce program.

Practical List

1. To study big data analytics and Hadoop Architecture
2. To Understand the Overall Programming architecture of Map Reduce API. Implement MapReduce Programming
3. To Study HDFS Commands
4. To Study serializes and deserializes data of integer type in Hadoop.
5. To run a basic Word Count MapReduce program to understand MapReduce
6. Paradigm.
7. Basic CRUD operations in MongoDB.
8. Store the basic information about students such as roll no and name using 9. various collection types Map
10. To run a Grep program on Hadoop to understand MapReduce Paradigm:
11. To count words in a given file, to view the output file, and calculate execution time.
12. To Study the Hive commands using HQL (DDL and DML).

Outcomes:

- Understand Hadoop Architecture.
- Implement the concept of MapReduce.
- Understand the HDFS commands.
- Implement basic operations in MongoDB.

SEMESTER IV

Course Number: MAI23041 **CC-XVI**

L-P: 4-0 **Credits: 14**

SEMESTER IV

MAJOR PROJECT

Objectives:

1. Each student has to undergo an individual project either in the Institution or in a reputed industry.
2. Internal Project Supervisor shall be allocated for each student**.**

Outcome:

- Develop a model to achieve the project's goal.
- Demonstrate sound technical knowledge of the selected project topic.
- Undertake problem identification, formulation and solution.
- Design solutions to complex problems utilizing a systematic approach.
- Appreciate the steps involved in Software development process.

VALUE ADDED COURSES

Course Number: 23VAC01 **VAC - I**

SOFT SKILLS : PROFESSIONAL ENGLISH

Objectives:

- To improve the communication skills of the students.
- To understand and demonstrate writing and speaking processes.
- To develop vocabulary and improve the accuracy in grammar.
- To improve speaking processes through conducting meetings and report-writing.
- To understand and demonstrate writing and speaking processes through written communication, conducting meetings and report-writing.

UNIT I INTRODUCTION

Meaning- Objectives- Importance- Principles of Communication-Forms of Communication- Process of Communication- Communication barriers- techniques for effective communication

UNIT II BASIC ENGLISH COMMUNICATION

Parts of Speech- Meaning and its usage- Noun- Pronoun-Verbs-Types of Verbs- Adverb- Adjectives- Conjunction- Interjections-Parts of Sentence- Subject and Predicate

UNIT III WRITTEN COMMUNICATION

Paragraph writing - Letter Writing – Essay writing - Principles- Inquiries- Circulars- Acknowledgement - Complaints- Job Application Letters- Bio-Data- Covering Letters, Interview letters, Letter of Reference. E-Mail

UNIT IV MEETINGS

Conducting Meetings: Procedure - preparing Agenda, minutes, and resolutions – Conducting Seminars and Conferences

UNIT V REPORT WRITING

Types of Business Reports- Format- Structure- Components of Report - Analysis of Sample Reports from Industry

TEXT BOOKS:

1. Communication Skills, by N. Gupta, K. Jain, P. Mahajan, Sahitya Bhawan Publications, 2022, revised edition
2. Communication skills 2nd Edition, Oxford University Press, 2015
3. Business Communication, N. Gupta, K. Jain, P. Mahajan, Sahitya Bhawan Publications, 2021.
4. Urmila Rai and S. M Rai , Effective Communication (Himalaya Publishing House)
5. Shirley Taylor, Communication for Business, Pearson Education, New Delhi
6. Business communication, principles and methods and Techniques, Nirmal Singh,Deep, and Deep publications Pvt Ltd., 2018.
7. Business communication, Sri Jin Kushal, Suniti Ahuja, VK Global Publications Pvt Ltd, 2020.
8. Business communication, Meenakshi Raman, Prakash Singh, Oxford universitypress, 2016.
9. Foundations of Business communication, India Edition, Dona. J. Young, Tata McGrawHill, 2018.

REFERENCES:

- Professional communication, Aruna Koneru, Tata mcgraw Hill, 2016.

E-Resources:

- https://www.edx.org/learn/business-communications
- https://learndigital.withgoogle.com/digitalunlocked/course/business- communication
- https://www.eduonix.com/courses/Office-Productivity/a-complete-guide-for- effective-business-communication
- https://www.futurelearn.com/courses/effective-communication

Outcomes:

- To provide an overview of Prerequisites to English Communication.
- Develop vocabulary and improve the accuracy in grammar
- Display competence in oral, written, and visual communication.
- Show an understanding of opportunities in the field of communication.
- Develop the confidence to speak in public
- Demonstrate positive group communication exchanges.

Course Number: 23VAC02 **VAC-II**

SOFT SKILLS : PROFESSIONAL ETHICS

Objective:

- To create awareness on professional ethics and Human Values
- To create awareness on Engineering Ethics providing basic knowledge about engineering Ethics, Variety of moral issues and Moral dilemmas, Professional Ideals and Virtues
- To provide basic familiarity about Engineers as responsible Experimenters, Research Ethics, Codes of Ethics, Industrial Standards

UNIT I: HUMAN VALUES

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self-confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II: ENGINEERING ETHICS

Senses of ―Engineering Ethics‟ – Variety of moral issues – Types of inquiry – Moral dilemmas– Moral Autonomy – Kohlberg's theory – Gilligan‟s theory – Consensus and Controversy – Models of professional roles – Theories about right action – Self-interest – Customs and Religion - Uses of Ethical Theories.

UNIT III: ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV: SAFETY, RESPONSIBILITIES AND RIGHTS

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT V: GLOBAL ISSUES

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers - Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct.

UNIT VI

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

Text Books:

1. Mike W. Martin andRoland Schinzinger, ―Ethics in Engineering‖, Tata McGraw Hill, New Delhi,2013.

2. R. Subramanian, ―ProfessionalEthics‖,Oxford UniversityPress,NewDelhi, 2013.

3. Govindarajan M, Natarajan S, Senthil Kumar V. S, ―Engineering Ethics‖, Prentice Hall of India, New Delhi,2004.

Reference Books:

1. Daniel Albuquerque, ―Business Ethics ,Oxford University Press, NewDelhi, 2013.

2. Edmund G.Seebauer and Robert L. Barry, ―Fundamentals of Ethics, OxfordUniversity Press, New Delhi, 2012.

3. Laura P. Hartman and Joe Desjardins, ―Business Ethics: Decision Making for Personal Integrity and Social Responsibility‖ McGraw Hill education, India Pvt. Ltd.,New Delhi2013.

4. World Community Service Centre, "Value Education", Vethathiri publications, Erode,2011.

E-References:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

Outcomes:

 Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society

 Can analysis and have an idea about the Collective Bargaining, Confidentiality, Professional, Employee, Intellectual Property Rights

 Inculcate knowledge and exposure on Safety and Risk, Risk Benefit

 Understand the core values that shape the ethical behavior of an engineer and Exposed awareness on professional ethics and human values.

Extra Disciplinary Courses

Course Number: EDC-I

L-P: 2-0 **Credits: 2**

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Objectives:

- To understand the revolution in computers and communications.
- To know about various application software.
- To understand the information systems and software development.

UNIT I: INFORMATION TECHNOLOGY

Introduction – Information systems – Definition of computer and system – Software and Data - IT in business and Industry – IT in the Home and at Play – IT in Education and Training – IT in Entertainment and the Arts – IT in Science, Engineering, and Mathematics – GlobalPositioning System.

UNIT II: INTRODUCTION TO COMPUTERS

History of computers, Types of computers, Characteristics of computers, Basic Anatomy of a computer, Applications of computer – Memory – Memory types.

UNIT III: SOFTWARE

Kinds of Software - The five types of Applications software - Word processing – Spreadsheets - Database software, Presentation graphics software - Communications software System Software – Operating system – functions.

UNIT IV: COMPUTER NETWORKS

Introduction – Definition Computer Networks - Types of Networks – Local Area Network – Metropolitan Area Network - Wide Area Network – Personal Area Network - internet – Intranet – firewalls - Network Topology – Bus – Ring – Hybrid – Star.

UNIT V: BASIC INTERNET CONCEPTS

Analog and Digital Signals - modems and communication Software, ISDN lines, and Cable Modems - Definition of Internet - The World Wide Web - Connecting to the Internet – Browsing the web – Web browser – Uniform Resource Locator (URL) – E-mailcommunication.

UNIT VI

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

Text Books:

1. Dennis P.Curtin, Kim dolwy, KunL AWN, Xrhleen morin, Information Technology, the breakingwave, TMH 2000.
2. Stacey C Sawyer, Brain K Williams, Sarah E Hutchinson Using Information Technology –BriefVersion.
3. A Practical Introduction to Computer and Communications Third Edition, 40 McGraw HillCompanies 2011.
4. James O'Brien – Introduction to Information systems. 16th edition, 2005.
5. The Internet Book: Everything You Need to Know About Computer Networking and How theInternet Works, Douglas E. Comer, Pearson, 2000.

Outcomes:

At the end of the course, the students will be able to:

- To know the latest trends in information technology.
- To understand the fundamentals of computers.
- To gain knowledge about networks.
- To acquire knowledge about different software.
- To understand Internet basics.

Course Number: EDC-II

L-P: 2-0 **Credits: 2**

BASICS OF OFFICE AUTOMATION

Objectives:

- To make students understand the MS Office applications.
- To create the professional-quality documents.
- To create dynamic slide presentations with animation digitally and effectively.
- To expose the students with organize and analyze information in worksheet.

UNIT I: Introduction to Microsoft Office

Navigate the Microsoft Office command structure using the Ribbon- Quick Access Toolbar-Minimum Toolbar and Shortcut Menus - Use Microsoft Office help.

UNIT II: Ms. Word

Format text- paragraphs and document elements-Identify and use correct sequencing and spacing of all required business letter components- Format a research paper with footnotes and bibliographical list of sources-Insert a Word table, enter data and format the table- Streamline document creation using templates - Insert and format a graphic or word art in Word documents.

UNIT III: Ms. Excel

Enter text-numbers and formulas into a worksheet applying to business situations- Create and edit Excel charts to graphically present numerical data- Format a worksheet using number formats, borders, color, fonts and conditional formats- Use the Excel SUM, AVERAGE, MAX, MIN, IF, and NOW functions to display desired calculations- Create and copy formulas using relative and absolute cell references- Edit worksheets and add new worksheets to a workbook, rename and rearrange sheets.

UNIT IV: Ms. Access

Create a database file consisting of at least two tables using proper designing principles- Create a report that presents the data in the database in an organized and flexible manner- Sort the records of a database and use criteria to search for specific information- Create queries to retrieve specific information from one or more related tables- Use the design and update features of Access to maintain a database- Specify data validation rules and enforce referential integrity.

UNIT V: Ms. PowerPoint

Create single and multi-level bulleted list slides- Use the PowerPoint ribbon to change Layouts and Themes in presentations- Insert and size clip art, photographs, and shapes into a presentation- Create and run a presentation with slide transitions- Print PowerPoint slides and handouts in a variety of formats.

UNIT VI
Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

Text Books:

1. Microsoft Office 2016: In Practice 1st Edition by Randy Nordell.
2. Exploring Microsoft Office: The Illustrated, Practical Guide to Using Office and Microsoft by Kevin Wilson

Outcomes:

- Students can understand the basics concepts of MS- office.
- Students can able to acquire the working principle of MS-excel.
- Students can able to know about the presentations effectively.
- Students can familiarize with the Report generations.