G H RAISONI COLLEGE OF ENGINEERING & MANAGEMNT

(Approved by AICTE, New Delhi and Recognized by DTE, Maharashtra)
An Autonomous Institute Affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
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Department of MCA

Syllabus

Semester-III

MC3TT301: Big Data Analytics										
Teaching Scheme				Credits	Continuous Evaluation Scheme					
					Theory			Practical		Total
Th.	Tu	Pr.	Total Hours		TAE	CAE	ESE	Int	Ext	
3	0	0	3	3	20	30	50	-	-	100

Course Objectives	1. Give students in-depth understanding of Big Data Analytics platform
	2. Provide an overview of Tools used in Big Data Analytics
	3. Provide the foundation that prepares students for learning of R and its skills.
	4. Apply analytics on Structured, Unstructured Data.
	5. Exposure to Data Analytics with R.
Course Outcomes	1. Understand the basic principles of Big Data Analysis, its technologies and challenges.
	2. Demonstrate the Big Data technology foundation and how to store data in data ware houses.
	3. Understanding analytical approaches and tools to analyze data and develop Big Data Solutions using R
	4. Identify the processing of data in R and how to work with functions and packages in R and Graphical Analysis in R.
	5. Study how data visualization techniques works and about Mobile Analytics tools and challenges

Course Contents:

Unit	Contents	Hours
I	**Getting an Overview of Big Data:** What is Big Data, Evolution of Data management, Structuring Big data, Types of Data, Elements of Big data, Big data Analytics, Advantages of Big data Analytics, Careers and Future of Big data. **Introducing Technologies for Handling Big data:** Distributed and Parallel	10

	Computing in Big Data, Introducing Hadoop, HDFS and Map reduce, Cloud computing and big data, Features of Cloud Computing. **Understanding Hadoop Ecosystem:** Hadoop Ecosystem, Hadoop Distributed file system,HDFS Architecture,HDFS Commands,Mapreduce, Pig and Pig latin,Sqoop,Zookeeper,Flume,Oozie.	
II	**Understanding Big Data Technology Foundation**: Exploring The Big data Stack, Data Source Layer, Ingestion Layer, Storage Layer, Physical Infrastructure Layer, Platform Management Layer, Security Layer, Monitoring Layer, Visualization Layer, Big Data Applications, Virtualization and Big Data, Virtualization Approaches **Storing Data In Data Bases and Data Warehouses**: RDBMS and Big Data, Issues with Relational Model, Non- Relational Database, Issues with Non-Relational Model, Integrating Big Data with Traditional Data Warehouses. **Understanding Analytics and Big Data**: Comparing Reporting and Analysis, Types of Analytics; Points to Consider during Analysis; Developing an Analytic Team; Understanding Text Analytics;	10
III	**Understanding Analytics and Big Data**: Comparing and Reporting Analysis, Types of Analytics, Characteristics of Big Data Analytics **Analytical Approaches and Tools to analyses Data**: Analytical approaches, Installing R, Installing R Studio. **Exploring R**: Exploring Basic Features of R, Statistical Features, Packages, Graphical User Interfaces, R Console, Developing a Programme, Exploring R Studio, Basic Arithmetic in R, Variables and Functions in R, Handling Data in R Workspace, ls(), rm(), getwd(), save(), load(),Executing scripts, Creating Plots **Reading Data Sets and Exporting Data from R:** Using c() Command, Using scan() Command, Reading Multiple Data values from Large Files, Reading Data from R Studio, Exporting Data from R.	12
IV	**Manipulating and Processing Data In R**: Creating Data Subsets, Merging Data Sets in R, Sorting Data, Managing Data in R using Matrices, Managing Data in R using Data Frames. **Working with Functions and Packages in R**: Using Functions instead of Scripts, Using Arguments in Functions, Built in Functions in R, Introducing Packages, Working with Packages. **Performing Graphical Analysis in R:**Using Plots, Saving Graphs to External Files, Advance Features of R.	8

V	**Data Visualization**: Ways of Representing Visual Data, Techniques, Types, Applications, Visualizing Big Data**,** Tools used in Data Visualization **Social Media Analytics and Text Mining:** Introducing Social Media, Introducing Text Mining, Understanding Text Mining Processes, Sentiment Analysis **Mobile Analytics**: Introducing Mobile Analytics, Define Mobile Analytics, Introducing Mobile Analytics Tools, Performing Mobile Analytics, Challenges of Mobile Analytics.	8

Text Books	1. Big Data (Covers Hadoop 2, Map Reduce, Hive, YARN, Pig, R and Data Visualization) Black Book, DT Editorial Services, Dreamtech Press.
	2. Data Science & Big Data Analytics Discovering, Analyzing, Visualizing and Presenting Data EMC Education Services, WILEY Publication
	3. BIG DATA and ANALYTICS, Seema Acharya, Subhasinin Chellappan, Wiley publications.
Reference Books	1. Beginners Guide for Data Analysis using R Programming, Jeeva Jose, Khanna Publication
	2. Data Analytics, Maheshwari, McGraw
On-line TL Material	1. wileyindia.com/big-data-black-book-covers-hadoop-2-mapreduce-hive-yarn-pig-r-and-data-visualization-completely-revised-and-upgraded.html 2. https://www.wileyindia.com/big-data-and-analytics2ed.html

Practical List:

Sr.No.	Name of Practicals
1.	Write an R-Program to demonstrate working with Arithmetic operators.
2.	Write an R Program to Find the Factorial of a Number.
3.	Write an R Program to Make a Simple Calculator.
4.	Write an R Program to create a Matrix and access rows and columns using functions colnames() and rownames() .
5.	Write an R Program to create a Matrix using cbind() and rbind() functions.
6.	Write an R Program to create a Matrix from a Vector using dim() function.
7.	Write an R Program to create a List and modify its components.
8.	Write an R Program to create a Data Frame.
9.	Write an R Program to access a Data Frame like a List.
10.	Write an R Program to access a Data Frame like a Matrix.

MC3TT302: Analysis of Algorithm

Teaching Scheme				Credits	Continuous Evaluation Scheme						Exam Hours
					Theory			Practical		Total	
Th.	Tu	Pr.	Total Hours		TAE	CAE	ESE	Int	Ext		
3	-	-	3	3	20	30	50	-	-	100	3Hrs

Course Objectives	1. To analyze performance of algorithms. To choose the appropriate data structure and algorithm design method for a specified application.
	2. To solve problems using algorithm design methods such as the greedy method, divide and conquer, dynamic programming, backtracking and branch and bound.
	3. To understand how the choice of data structures and algorithm design methods impacts the performance of programs.
	4. Understand application of Dynamic Programming.
	5. To introduce P and NP classes. To understand the differences between tractable and intractable problems.
Course Outcomes	1. Ability to analyze the performance of algorithms.
	2. Ability to choose appropriate algorithm design techniques for solving problems.
	3. Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs
	4. Ability to understand the application dynamic programing for solving various problems in computer science.
	5. Demonstrate the P & NP Classes and ability to understand Branch and Bound Concept.

Course Contents:

Unit	Contents	Hours
I	**UNIT - I** Introduction-Algorithm definition, Algorithm Specification, Performance Analysis-Space Complexity, Time complexity, Divide and conquer- General method, applications - Binary search, Merge sort, Quick sort, Strassen's Matrix Multiplication.	8

II	**UNIT - II** Disjoint set operations, union and find algorithms, AND/OR graphs, Connected Components and Spanning trees, Bi-connected components Backtracking-General method, applications- The 8-queen problem, sum of subsets problem, Hamiltonian cycles.	8
III	**UNIT – III** **Greedy method**- General method, applications- Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees, Single source shortest path problem.	10
IV	**UNIT – IV** **Dynamic Programming**- General Method, applications- All pairs shortest path problem, Optimal binary search trees, 0/1 knapsack problem, Reliability design, Traveling sales person problem.	10
V	**UNIT – V** Branch and Bound- General Method, applications-0/1 Knapsack problem, LC Branch and Bound solution, FIFO Branch and Bound solution, Traveling sales person problem. NP-Hard and NP-Complete problems- Basic concepts, Non-deterministic algorithms,	12

Text Books	1. Fundamentals of Computer Algorithms, 2nd Edition, Ellis Horowitz, Sartaj Sahni and S. Rajasekharan, Universities Press.
	2. Design and Analysis of Algorithms, P. H. Dave, H.B.Dave, 2nd edition, Pearson Education.
Reference Books	1. Algorithm Design: Foundations, Analysis and Internet examples, M. T. Goodrich and R. Tomassia, John Wiley and sons.
	2. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson Education.
	3. Foundations of Algorithms, R. Neapolitan and K. Naimipour, 4th edition, Jones and Bartlett Student edition.
	4.Design and Analysis of Algorithms, S. Sridhar, Oxford Univ. Press
On-line TL Material	-

MC3TT303/MC2PT303: Python Programming/Practical Based on Python Programming										
Teaching Scheme				**Credits**	**Continuous Evaluation Scheme**					
					Theory			**Practical**		**Total**
Th.	**Tu**	**Pr.**	**Total Hours**		**TAE**	**CAE**	**ESE**	**Int**	**Ext**	
3	-	4	7	3/2	20	30	50	25	25	100/50

Course Objectives	1. To acquire programming skills in core Python.
	2. To acquire Object Oriented Skills in Python
	3. To develop the skill of designing Graphical user Interfaces in Python
	4. To develop the ability to write database applications in Python
Course Outcomes	1. Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
	2. Demonstrate proficiency in handling Exception and File Systems.
	3. Create, run and manipulate Python Programs using core data structures like Lists, use of Module and use Regular Expressions.
	4. Interpret the concepts of Thread in Python and learn Tkinter library.
	5. Implement exemplary applications related to Network Programming using CGI, Web Services, work with DataFrame and Array in Python.

Course Contents:

Unit	Contents	Hours
I	**Python Basics:** Objects- Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions, **Related Modules Sequences** - Strings, Lists, and Tuples.	08
II	**FILES:** File Objects, File Built-in Function [open()], File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, Persistent Storage Modules. **Exceptions**: Related Modules Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Creating Exceptions, Why Exceptions (Now)?, Why Exceptions at All? Exceptions and the sys Module.	12

III	**Related Modules**: Modules and Files, Namespaces, Importing Modules, Importing Module Attributes, Module Built-in Functions, Packages, Other Features of Modules **Regular Expressions:** Introduction, Special Symbols and Characters for REs.	08
IV	**Python Multithreaded Programming**: Introduction, Threads and Processes, Threads, Thread Module, Threading Module, Related Modules. **GUI Programming:** Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs.	12
V	**WEB Programming**: CGI Introduction, Wed Surfing with Python, Creating Simple Web Clients, Web (HTTP) Servers. **Pandas:** Series**,** Data Frame, Read CSV File, Analysing Data. **NumPy:** Creating Array, Data Types, Array Slicing, Array Indexing.	08

Practical

Sr. No.	Name of Experiments
1	Create a list and perform the following methods
2	Write a python program to add two numbers.
3	Write a program to create a menu with the following options i) TO PERFORM ADDITITON ii) TO PERFORM SUBTRACTION iii)TO PERFORM MULTIPICATION iv) TO PERFORM DIVISION Accepts users input and perform the operation accordingly. Use functions witharguments.
4	Write a program to double a given number and add two numbers using lambda()?
5	Demonstrate a python code to implement abnormal termination?
6	Write a python program to get python version
7	Write a python program to print date, time for today and now.
8	Write a python Program to display welcome to MRCET by using classes andobjects.
9	Using a numpy module create an array and check the following: 1. Type of array 2. Axes of array 3. Shape of array 4. Type of elements in array
10	Write a python program to concatenate the data frames with two differentobjects.
11	Write a python code to set background color and pic and draw a circle using turtle module
12	Write a Python program to find first n prime numbers.
13	Write a Python program to multiply matrices.
14	Write a Python program to find the exponentiation of a number.
15	Using a for loop, write a program that prints out the decimal equivalents of ½+1/3+1/4+. . . , 1/10

24MCALXXX (ELECTIVE 2)

MC3TT304: Statistics and Probability

Teaching Scheme				Credits	Continuous Evaluation Scheme					
					Theory			Practical		Total
Th.	Tu	Pr.	Total Hours		TAE	CAE	ESE	Int	Ext	
3	0	0	3	3	20	30	50	50	50	100

Course Objectives	1. To understand the importance of data-driven business decisions.
	2. To summarize business data numerically and graphically.
	3. To understand the process associated with statistical decisions, defining and formulating problems, analyzing the data.
	4. To understand the basic role of probability in business decision making.
	5. To understand in Random Variables, Distribution Functions and Mathematical Expectation.
Course Outcomes	1. Understand scope of Statistics, create and interpret frequency tables.
	2. Recognize, describe, and calculate the measures of location of data, center of data, Spread of data.
	3. Apply different statistical measures on data.
	4. Study the concept of probability.
	5. Understand in Random Variables and Distribution Functions.

Course Contents:

Unit	Contents	Hours
I	**Introduction to Statistics:** Webster, Secrists, Gronton and Cowden definitions of statistics, Importance of statistics Scope of statistics: Industry, Economy, Planning, medical science, Computer Science etc. Limitations of statistics. General principles of classification of data. Construction of Frequency distribution, cumulative frequency distribution, relative frequency distribution. Graphical representation of frequency distribution. Diagrammatic representation: Simple bar, subdivided bar, pie diagram. Numerical Problems.	9
II	Measures of Central Tendency and Dispersion: Introduction, Objectives of statistical average, Requisites of a Good Average, Statistical Averages - Arithmetic mean - Properties of arithmetic mean - Merits and demerits of arithmetic mean ,Median - Merits and demerits of median , Mode - Merits and demerits of mode , Geometric Mean , Harmonic Mean , Appropriate Situations for the Use of Various	12

	Averages , Positional Averages , Dispersion – Range - Quartile deviations, Mean deviation ,Standard Deviation -Properties of standard deviation Coefficient of Variance Meaning and Significance of Dispersion, Methods of Measuring Dispersion- Range, Quartile, Mean Deviation, Standard Deviation, Skewness & Kurtosis: Coefficient of Skewness, Kurtosis, Coefficient of Dispersion, Coefficient of Variation.	
III	Correlation and Regression: Definition of Correlation, Scatter Diagram, Karl Person Coefficient of Correlation, limits for Correlation Coefficient, Properties of Karl Pearson's correlation coefficient - Factors influencing the size of correlation coefficient, Spearman's Rank Correlation Coefficient Definition of Regression, Lines of Regression, and Regression curves, Regression Coefficient, properties of Regression Coefficients, Multiple Regression Analysis , Application of Multiple Regressions, Correlation Analysis vs. Regression Analysis.	11
IV	Probability – Introduction , Definitions of various terms, Mathematical or Classical Probability, Statistical or Empirical Probability, Mathematical Tools, Sets and Elements of sets, Operations on sets, Axiomatic Approach to Probability, Probability function, Mathematical Law of Addition of Probabilities and Conditional Probabilities , Independent Events , Bayes Theorem , Geometric Probability.	11
V	Random Variables and Distribution Functions: Definition of Random variable, Distribution function, Properties of Distribution Function, Discrete Random Variable, Probability Mass Function, Discrete Distribution Function, Continuous Random Variable, Probability Density Function, Continuous Density Function, Continuous Distribution Function. Mathematical Expectation and Generation Function – Definition of Mathematical Expectation, addition & Multiplication Theorem of Expectation.	11

Text Books	1. Mathematical Statistics (MCG) by J.N. Kapoor
	2. Probability and Statistics with Computer Science Applications (TMH) by Trivedi
	3. Fundamental of Mathematical Statistics [Sultan Chand & Sons] by Gupta & Kapoor
	4. Fundamental of Statistics by K. Agrawal & Sahib Singh
Reference Books	1. Statistical Methods (An Introductory Text) by J. Medhi
	2. Fundamentals of Statistics : Goon, Gupta, Dasgupta
On-line TL Material	https://nptel.ac.in/courses/110/107/110107114/ https://nptel.ac.in/courses/111/105/111105041/

MC3TT305: Operation Research

Teaching Scheme				Credits	Continuous Evaluation Scheme					
					Theory			Practical		Total
Th.	Tu	Pr.	Total Hours		TAE	CAE	ESE	Int	Ext	
3	0	0	3	3	20	30	50	50	50	100

Course Objectives	1. To impart knowledge in concepts and tools of Operations Research.
	2. To understand mathematical models used in Operations Research
	3. To apply these techniques constructively to make effective business decisions
	4. To analyzing different situations in the industrial/ business scenario involving limited resources and finding the optimal solution within constraints.
	5. Study the selection of the best alternatives from the available choices.
Course Outcomes	1. Analyze any real life system with limited constraints and depict it in a model form. Convert the problem into a mathematical model. Solve Linear Programming Problems.
	2. Convert the problem into a mathematical model. Solve Linear Programming Problems.
	3. Understand variety of problems such as assignment, transportation and game theory.
	4. Use CPM and PERT techniques, to plan, schedule, and control project activities and decision making techniques.
	5. Introduction to sequencing problems and selective control techniques in Inventory.

Course Contents:

Unit	Contents	Hours
I	**Introduction:** Introduction to Operation Research (OR) Origin and development of OR, Nature of OR, Characteristics of OR, Classification of Problems in OR, Models in OR, Phases of OR, Uses and Limitations of OR, Methodologies of OR, Applications in OR. Linear Programming – Concepts of Linear Programming Model, Mathematical Formulation of the Problem, Graphical solution methods. Feasible Solution, Unbounded Solution.	9
	Linear Programming: Introduction, concept of linear programming model, development of LP model, simplex method, Big M method, Two phase method.	12

II	Duality in Linear Programming – Duality theory, Formulation of Dual Problem, Application of Duality, dual simplex method, Two phase method.	
III	Transportation Problem Mathematical model for Transportation Problem, Types of Transportation Problem. Assignment Problem – Zero-One Programming Model for Assignment Problem, Types of Assignment Problem, Hungarian Method. Game Theory – Terminologies of Game Theory, Two Person Zero-Sum Games, The Maximin-Minimax Principle, Games without Saddle points-Mixed Strategies, Graphical Solution of 2x n and m x 2 games, Dominance Property.	12
IV	Decision Theory Introduction, Decision under Certainty, Decision under Risk, Decision under Uncertainty, Decision Tree. Network Scheduling by CPM/PERT – Introduction, Basic Concept, Constraints in Network, Critical Path Method (CPM), PERT Network, PERT calculations, Time-Cost trade-off aspects in Network Technique, Advantage of Network (PERT/CPM).	11
V	Introduction to sequencing problem, Processing N jobs on Two machines, three machine sequencing problem. Inventory Control Introduction: Inventory Control, Selective Control Techniques, Types of Inventory, Economic Lot Size Problem, and Problem of EOQ with shortage. Inventory Control with Price Breaks.	10

Text Books	1. Operation Research by D S Hira & P K Gupta
	2. Operation Research Problems and Solutions by Sharma J. K. [MacMillan].
	3. Operation Research by R. Panneerselvam [PHI]
Reference Books	3. Introduction to Operation Research B.E Gillelt, TMH Edition
	4. "Operation Research" Taha H. A., Macmillan.
On-line TL Material	https://nptel.ac.in/courses/111/107/111107128/

MC3TT306: Artificial Intelligence and Expert System

Teaching Scheme				Credits	Continuous Evaluation Scheme					
					Theory			Practical		Total
Th.	Tu	Pr.	Total Hours		TAE	CAE	ESE	Int	Ext	
3	-	-	3	3	20	30	50	-	-	100

Course Objectives	1. To learn the difference between optimal reasoning vs human like reasoning
	2. To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities
	3. To learn different knowledge representation techniques
	4. To understand the applications of AI: namely Game Playing, Theorem Proving, Expert Systems, Machine Learning and Natural Language Processing
Course Outcomes	1. Possess the ability to formulate an efficient problem space for a problem expressed in English.
	2. Possess the ability to select a search algorithm for a problem and characterize its time and space complexities.
	3. Possess the skill for representing knowledge using the appropriate technique
	4. Possess the ability to apply AI techniques to solve problems of Game Playing, Expert Systems, Machine Learning and Natural Language Processing
	5. Possess the ability to formulate Expert Systems.

Course Contents:

Unit	Contents	Hours
I	**Introduction** AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search)	10
II	**Advanced Search** Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem	10
III	**Advanced Knowledge Representation and Reasoning** Knowledge Representation Issues, Nonmonotonic Reasoning, Other Knowledge Representation Schemes Reasoning Under Uncertainty: Basic probability, Acting Under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks	10
IV	**Learning** What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees.	8

V	**Expert Systems** Representing and Using Domain Knowledge, Shell, Explanation, Knowledge Acquisition.	8

Text Books	1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, PrenticeHall, 2010.
	2. Artificial Intelligence by Elaine Rich, Mcgrawhill Inc.
	3. 2. Artificial Intelligence and Expert Systems – Jankiraman, Sarukes (M)
Reference Books	1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition, 2009.
	2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.
	3. Int. ti Expert System – Jackson – Pearson.
	4. Artificial intelligence – Russell-Pearson- Ist Text book.
	5. Principles of AI- Nils Nilson
On-line TL Material	-

MC3TT307 : Data Mining

Teaching Scheme				**Credits**	**Continuous Evaluation Scheme**					
					Theory			**Practical**		
Th.	**Tu**	**Pr.**	**Total Hours**		**TAE**	**CAE**	**ESE**	**Int**	**Ext**	**Total**
3	0	0	3	3	20	30	50	-	-	100

Course Objectives	**1.** Learn data mining concepts understand association rules mining.
	2. Discuss classification algorithms learn how data is grouped using clustering techniques.
	3. To develop the abilities of critical analysis to data mining systems and applications.
	4. To implement practical and theoretical understanding of the technologies for data mining

Course Outcomes	1. Ability to perform the preprocessing of data and apply mining techniques on it.
	2. Ability to identify the association rules, classification and clusters in large data sets.
	3. Ability to identify the classification in large data sets.
	4. Ability to solve real world problems in business and scientific information using data mining.
	5. Ability to classify web pages, extracting knowledge from the web.

Course Contents:

Unit	Contents	Hours
I	UNIT - I Introduction to Data Mining: Introduction, What is Data Mining, Definition, KDD, Challenges, Data Mining Tasks, Data Preprocessing, Data Cleaning, Missing data, Dimensionality Reduction, Feature Subset Selection, Discretization and Binaryzation, Data Transformation; Measures of Similarity and Dissimilarity-Basics.	12
II	UNIT – II Association Rules: Problem Definition, Frequent Item Set Generation, The APRIORI Principle, Support and Confidence Measures, Association Rule Generation; APRIOIRI Algorithm, The Partition Algorithms, FP-Growth Algorithms, Compact Representation of Frequent Item Set- Maximal Frequent Item Set, Closed Frequent Item Set.	10
III	UNIT – III Classification: Problem Definition, General Approaches to solving a classification problem, Evaluation of Classifiers , Classification techniques, Decision Trees-Decision tree Construction , Methods for Expressing attribute test conditions, Measures for Selecting the Best Split, Algorithm for Decision tree Induction ; Naive-Bayes Classifier, Bayesian Belief Networks; K- Nearest neighbor classification-Algorithm and Characteristics.	12
IV	UNIT - IV Clustering: Problem Definition, Clustering Overview, Evaluation of Clustering Algorithms, Partitioning Clustering-K-Means Algorithm, K-Means Additional issues, PAM Algorithm; Hierarchical Clustering-Agglomerative Methods and divisive methods, Basic Agglomerative Hierarchical Clustering Algorithm, Specific techniques, Key Issues in Hierarchical Clustering, Strengths and Weakness; Outlier Detection	10

V	UNIT - V Web and Text Mining: Introduction, web mining, web content mining, web structure mining, we usage mining, Text mining –unstructured text, episode rule discovery for texts, hierarchy of categories, text clustering.	10

Text Books	1. Data Mining- Concepts and Techniques- Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, 2 Edition, 2006.
	2. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.
	3. Data mining Techniques and Applications, Hongbo Du Cengage India Publishing.
Reference Books	1. Data Mining Techniques, Arun K Pujari, 3rd Edition, Universities Press.
	2. Data Mining Principles & Applications – T.V Sveresh Kumar, B.Esware Reddy, Jagadish S Kalimani, Elsevier.
	3. Data Mining, Vikaram Pudi, P Radha Krishna, Oxford University Press.
On-line TL Material	-

MC3TT308: Cryptography and Network Security

Teaching Scheme				**Credits**	**Continuous Evaluation Scheme**					
					Theory			**Practical**		
Th.	**Tu.**	**Pr.**	**Total Hours**		**TAE**	**CAE**	**ESE**	**Int**	**Ext**	**Total**
3	-	-	3	3	20	30	50	-	-	100

Course Objectives	1. To make the students to understand the principles of encryption algorithms, conventional and public key cryptography.
Course Outcomes	1. Understand various Cryptographic Techniques.
	2. Apply various public key cryptography techniques.
	3. Implement Hashing and Digital Signature techniques.
	4. Understand the various Security Applications.
	5. Understand Email, Web IP Security, and Web Security with security protocols.

Course Content

Unit	Content	Hours
I	**INTRODUCTION & NUMBER THEORY :** Services, Mechanisms and attacks-the OSI security architecture-Network security model-Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, steganography).FINITE FIELDS AND NUMBER THEORY: Groups, Rings, Fields-Modular arithmetic-Euclid‟s algorithm-Finite fields- Polynomial Arithmetic –Prime numbers-Fermat‟s and Euler‟s theorem-Testing for primality -The Chinese remainder theorem- Discrete logarit	10
II	**BLOCK CIPHERS & PUBLIC KEY CRYPTOGRAPHY:** Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES)-Triple DES-Blowfish-RC5 algorithm. **Public key cryptography:** Principles of public key cryptosystems-The RSA algorithm-Key management – Diffie Hellman Key exchange-Elliptic curve arithmetic-Elliptic curve cryptography.	10
III	**HASH FUNCTIONS AND DIGITAL SIGNATURES :** Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC –MD5 – SHA – HMAC – CMAC – Digital signature and authentication protocols – DSS – EI Gamal – Schnorr	10
IV	**SECURITY PRACTICE & SYSTEM SECURITY :** Authentication applications – Kerberos – X.509 Authentication services – Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls – Firewall designs – SET for E-Commerce Transactions. Intruder – Intrusion detection system – Virus and related threats	10
V	**E-MAIL, IP & WEB SECURITY :** **E-mail Security:** Security Services for E-mail-attacks possible through E-mail – establishing keys privacy-authentication of the source-Message Integrity-Non-repudiation-Pretty Good Privacy-S/MIME. **IPSecurity:** Overview of IPSec – IP and IPv6-Authentication Header-Encapsulation Security Payload (ESP)-Internet Key Exchange (Phases of IKE, ISAKMP/IKE Encoding). **Web Security:** Basic Concepts, Secure Socket Layer(SSL), Transport Layer Security(TLS), Time Stamping Protocol(TSP),Secure Electronic Transaction (SET).	10

Text Books	William Stallings, “Cryptography and Network Security: Principals and Practice”, Prentice Hall
Reference Books	Cryptography and Network Security by Atul Kahate
On-line TL Material	-

AEMC1TI310: Business Communication										
Teaching Scheme				Credits	Continuous Evaluation Scheme					
					Theory			Practical		Total
Th.	Tu	Pr.	Total Hours		TAE	CAE	ESE	Int	Ext	
1	-	-	1	1	15	10	-	-	-	25

Course Objectives	1. Understand and demonstrate the use of basic and advanced proper writing techniques that today's technology demands, including anticipating audience reaction.
	2. Develop interpersonal skills that contribute to effective and satisfying personal, social and professional relationships
Course Outcomes	1. The student will be able understand the basic principles of communication
	2. The student will be able understand the Importance of Listening.
	3. The student will be able to apply basic functions of PowerPoint and will also be able to create effective PowerPoint Presentations using templates.

Course Contents:

Unit	Contents	Hours
I	**Basic Principles of Communication**: Introduction to Business Communication, Types of Business Communication, Communication Network in Organizations.	3
II	**The Importance of Listening in the Workplace**: Introduction, what is listening? Barriers to Listening, Strategies for Effective Listening, Listening in a Business Context	3
III	**Business Presentations & Business Etiquette:** Principles of effective presentation, planning an effective business presentation, organizing the content, making presentations. Business Etiquette – Handshake & Namaste, Introductions & Greetings, Exchange of Visiting Cards and Body Language.	3

Text Books	1. Business Communication for Managers, PayalMehra, Pearson Education India; Second edition, ISBN-13: 978-9332576643
	2. Business Communication, Asha Kaul, Prentice Hall India Learning Private Limited; 2 edition, ISBN-13: 978-8120338487
Reference Books	1. Foundation programme English & Business Communication. The Institute of company secretaries of India.
	2. Computer Applications in Business, S. Page 17 of 99 Sudalaimuthu and S. Anthony Raj, Himalaya Publication House, Chapter 10 (10.4)
On-line TL Material	

AEMC1TI311: Social Skills, Body Language, Stage Work/ Entrepreneurship Development

Teaching Scheme				Credits	Continuous Evaluation Scheme					
					Theory			Practical		Total
Th.	Tu	Pr.	Total Hours		TAE	CAE	ESE	Int	Ext	
1	-	-	1	1	15	10	-	-	-	25

Course Objectives	The students develop and can systematically apply an entrepreneurial way of thinking that will allow them to identify and create business opportunities that may be commercialized successfully.
Course Outcomes	**1.** To understand Entrepreneurship and its significance in economy
	2. To understand Women Entrepreneurship and its significance.
	3. To understand the concept of small, medium and large scale industries

Course Contents:

Unit	Contents	Hours
I	Entrepreneurship: Entrepreneur & Entrepreneurship: Evolution of the concept of Entrepreneurs, Characteristics of an Entrepreneur, Distinction between an entrepreneur and a manager; functions of an entrepreneur, types of entrepreneurs.	3
II	**Women Entrepreneurship:** concept, problems and possible solutions and Social Entrepreneurship. Theory of Achievement Motivation	3
III	**Entrepreneurial growth:** Factors - Economic factors, non-economic factors, Small, Medium & Large Scale Industries in India, Agencies supporting MSME's.	3

Text Books	1.Entrepreneurship (6thEdition) – Robert D Hisrich, Tata McGrawHill
	2. Entrepreneurship: A Contemporary Approach – Kuratko, Thomson Learning Books
Reference Books	1.Entrepreneurial Development – S.S. Khanka, S. Chand &Co.
	2. Small-Scale Industries and Entrepreneurship. Desai, Vasant (2003). Himalaya Publishing House, Delhi. 4.
On-line TL Material	-

Professional courses 24MCAL3XX

VSMC1PI312: React.js										
Teaching Scheme				**Credits**	**Continuous Evaluation Scheme**					
					Theory			**Practical**		**Total**
Th.	**Tu.**	**Pr.**	**Total Hours**		**TAE**	**CAE**	**ESE**	**Int**	**Ext**	
-	-	1	2	1	-	-	-	25	-	25

Course Objectives	1. To understand the concepts and functions of React which is JavaScript library.
	2. To understand CSS Styling module in react with components.
	3. To design react table and understand the concept of ES6.
Course Outcomes	1. Developed the application using react and handle the Events.
	2. Apply the CSS, Sass styling in React.
	3. Design table with bootstrap and understand the property of ES6.

Unit	Content	Hours
I	Setting up React environment, Create React App., Hello World, Components, JSX, Functional vs class components, Props, State, Lifecycle methods, Event handling, React Forms – controlled components, submission, validation, Conditional rendering – if, ternary, &&.	10
II	React Components, React Class Components, Lists and keys, Importance of keys, React Events, React Conditional Rendering, Styling – CSS, CSS Modules, CSS-in-JS, React Sass styling.	10
III	React Table, React Bootstrap, React Hook, React Flux Concept, Hook, React ES6. ES6 classes, ES6 variable, ES6 Array Method, ES6 Spread Operator, ES6 Module.	10

Text Books	The Road to Learn React: Your Journey To Master Plain Yet Pragmatic React.Js by Robin Wieruch (Author)
	React.js For Beginners by Mr. Mayur Patil.
Reference Books	www.geeksforgeeks.com
	www.w3schools.com/react
	https://www.simplilearn.com/tutorials/reactjs-tutorial/what-is-reactjs

Sr. No.	Practical List
1.	Program to print “Hello World” using react.
2.	Program to implement the unicode concatemation with variable using the parseInt and fromCodePoint methods.
3.	Program to Concatenate Two Variables in JavaScript.
4.	Program to pass data from one component to other component in ReactJS?
5.	Program to pass data from Parent to Child component in Angular?
6.	Program to create Menu Item Component in ReactJS?
7.	Program to embed two components in one component?

VSMC1PI313: Fundamental of Machine Learning										
Teaching Scheme				**Credits**	**Continuous Evaluation Scheme**					
					Theory			**Practical**		**Total**
Th.	**Tu**	**Pr.**	**Total Hours**		**TAE**	**CAE**	**ESE**	**Int**	**Ext**	
-	-	-	2	1	-	-	-	25	-	25

Course Objectives	1.To understand the basic concepts of machine learning and probability theory
	2. To appreciate supervised learning and their applications.
	3. To understand unsupervised learning like clustering and PCA.
Course Outcomes	1. The student be able to learn about ML concept deeply.
	2. The student be able to choose and implement regression algorithms for application using an open source tool.
	3. The student will be able to use a tool to implement typical clustering algorithms for different types of applications.

Unit	**Contents**	**Hours**
I	Machine Learning – Types of Machine Learning – Supervised Learning – Unsupervised Learning – Basic Concepts in Machine Learning – Machine Learning Process – Testing Machine Learning Algorithms – A Brief Review of Probability Theory – Turning Data into Probabilities – The Bias-Variance Tradeoff.	10
II	Simple Linear Regression – Multiple Linear Regression – Naive Bayesian Classifier - K-Nearest Neighbors –Random Forest model – Support Vector Machines.	10
III	K-Means Clustering – Hierarchical Clustering – Dimensionality Reduction – Principal Component Analysis.	10

Text Books	Sridhar S, Vijayalakshmi M, "Machine Learning", First Edition, Oxford University Press, 2022
	Stephen Marsland, "Machine Learning – An Algorithmic Perspective", Second Edition, CRC Press, 2014.
	Ethem Alpaydin, "Introduction to Machine Learning", Third Edition, Prentice Hall of India, 2015.
Online Reference	www.w3school.com
	www.geeksforgeeks.org
	www.javpoint.com

Practical List

1	Develop python programs to import and export data using NumPy, Pandas library functions.
2	Demonstrate various data pre-processing techniques for a given dataset.
3	Develop Python programs to demonstrate various Data Visualization techniques
4	Implement Linear Regression
5	Implement K-Nearest Neighbor Classifier
6	Implement Random Forest
7	Develop a system to implement a classifier using SVM
8	Implement Data & Text Clustering Using K-Means Algorithm

VSMC1PI314: Internet Of Things										
Teaching Scheme				Credits	Continuous Evaluation Scheme					
					Theory			Practical		Total
Th.	Tu	Pr.	Total Hours		TAE	CAE	ESE	Int	Ext	
-	-	1	2	1	-	-	-	25	-	25

Course Objectives	1. To understand the fundamentals of Internet of Things.
	2. To build a small low-cost embedded system using Arduino / Raspberry Pi or equivalent boards.
	3. To learn communication protocols that is frequently used in IoT ecosystems.
Course Outcomes	1. The students will be able to understand the enabling technologies and reference models of IoT.
	2. The students will be able to design portable IoT devices using Arduino IDE/ Raspberry Pi with Python.
	3. The student will be able to apply appropriate protocols in various parts of IoT based systems.

Unit	Contents	Hours
I	Sensors and Actuators – Centralized Sensing vs Distributed Sensing – Making Physical Objects as Smart Objects – Enabling Technologies – Wireless Sensor Networks, Cloud Computing and Data Analytics – IoT vs M2M – Possible IoT Reference Models – Domain Specific IoTs – Levels of IoT Based Systems.	10
II	Microprocessors vs. Microcontrollers – Open Source Movement in Hardware – Engineering vs Prototyping – Software Development Lifecycle for Embedded Systems – Arduino IDE – Programming and Developing Sketches – Arduino Rest APIs – Raspberry Pi – Interfaces – Python Packages of Interests for IoT	10

III	MAC Layer Protocols – IEEE 802.15.4 – G and E Variants of IEEE 802.15.4 – IEEE 802.11ah – IEEE 1901.2a – LoRaWAN – 6LoWPAN – From 6LoWPAN to 6Lo – NBIoT – REST Based Protocols – SCADA, CoAP and MQTT	10

Text Books	Arsheen Bahga, Vijay Madisetti, "Internet of Things – A Hands-On Approach", Universities Press, 2015.
	Manoel Carlos Ramon, "Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers", Apress, 2014
	David Hanes, Gonzalo Salguerio, Patrick Grossetete, Rob Barton, Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for Internet of Things", Cisco Press, 2017
Online Reference	www.w3school.com
	www.geeksforgeeks.org
	www.javpoint.com

VSMC1PI315: Computer Graphics										
Teaching Scheme				**Credits**	**Continuous Evaluation Scheme**					
					Theory			**Practical**		**Total**
Th.	**Tu**	**Pr.**	**Total Hours**		**TAE**	**CAE**	**ESE**	**Int**	**Ext**	
-	-	1	2	1	-	-	-	25	-	25

Course Objectives	1. To understand the basic concepts of Computer Graphics
	2. To understand about CRT monitor and Logical classification of input devices.
	3. To understand Mid-point circle algorithm
Course Outcomes	1. The student be able to learn about Computer Graphics.
	2. The student be able to learn about CRT monitor and Logical classification of input devices.
	3. The student will be able to use Mid-point circle algorithm in Computer Graphics.

Course Content

Unit	Contents	Hours
I	Introduction of computer Graphics and its applications, Overview of Graphics systems, Video display devices, Raster scan display, Raster scan systems, video controller, Raster scan display processor, Random scan display, random scan systems	10
II	Color CRT monitor, Flat panel display, Interactive input devices, Logical classification of input devices, Keyboard, mouse, Trackball and Spaceball, Joysticks, Image scanner, Light pens, Graphics software, Coordinates representations, Graphics functions.	10
III	Line drawing algorithms, DDA, Bresenham's, Circle generating, Mid-point circle algorithm, Ellipse generating, Polygon, Scan-line polygon fill, Boundary fill.	10

VSMC1PI316: Introduction to Metaverse										
Teaching Scheme				**Credits**	**Continuous Evaluation Scheme**					
					Theory			**Practical**		**Total**
Th.	**Tu**	**Pr.**	**Total Hours**		**TAE**	**CAE**	**ESE**	**Int**	**Ext**	
-	-	1	2	1	-	-	-	25	-	25

Text Books	Computer Graphics, M. Pauline Baker, Donald Hearn, PHI.
	Mathematical Element for Computer Graphics, David F. Roger, J. Alan Adams, Tata McGHill
	Computer Graphics, Apurva Desai, PHI
Online Reference	www.w3school.com
	www.geeksforgeeks.org
	www.javpoint.com

Course Objectives	1. To describe common terminologies related to Metaverse and how it is related with virtual world.
	2. It equip students with knowledge and skills on how to navigate the digitized universe
	3. Students will engage, create, and immerse themselves in augmented and virtual reality. It seamlessly blends real-world elements into a communal online space.
Course Outcomes	1. It will help students in redefining educational boundaries, making learning more dynamic and impactful.
	2. The Metaverse provides an immersive learning environment that boosts motivation by enabling students to participate in virtual classes and communicate with instructors and peers via avatars
	3. The Metaverse help users to interact with each other, engage in activities, and experience digital simulations in real time.

Unit	Contents	Hours
I	**Introduction to Metaverse** Brief explanation of what is Metaverse ,Overview of immersive experience, Historical development, Introduction to Metaverse value chain with 7 layers	10
II	**Technologies involved in Metaverse** Metaverse as a product of extended reality(XR), Explanation of augmented reality(AR) and virtual reality(VR), Benefit and differentiated of AR & VR, Introduction to mixed reality(MR), Incorporation of AI in Metaverse, general benefit , Financial and economical aspect	10
III	**Blockchain adoption in Metaverse** Overview , Historical context, the need for decentralization , Smart contract and their capability, Integration of Blockchain, Understanding token and NEFT , NEFT tokens standard, Crypto currency in Metaverse **Metaverse Application and future trend** Application in gaming, Education and social interaction, Ethical and privacy concern, Legal and regulatory issue, Future trend and social impact	10

Text Books	Metaverse fundamentals: Easy Hands- Pallavi Agrawal (Notion Press)
	The Metaverse: And How It Will Revolutionize Everything-Matthew Ball WW Norton, 2022
Online Reference	https://learn.unity.com/project/road-to-the-metaverse-live
	https://www.coursera.org/learn/what-is-the-metaverse