DELHI TECHNOLOGICAL UNIVERSITY

(Formerly Delhi College of Engineering)

(Estd. By Govt. of NCT of Delhi vide Act 6 of 2009)

SCHEME OF TEACHING AND EXAMINATIONS

EXECUTIVE MBA IN DATA SCIENCE AND ANALYTICS

ACADEMIC SESSION 2023-24 ONWARDS

UNIVERSITY SCHOOL OF MANAGEMENT AND ENTREPRENEURSHIP

Scheme of Teaching and Examination

Executive Master of Business Administration in Data Science and Analytics (Exec. MBA-DSA)

(Academic Session 2023-24 onwards)

CONTENTS

Delhi Technological University

- Vision

- Mission

University School of Management and Entrepreneurship

- Vision

- Mission

Program Educational Objectives

Scheme of Teaching and Examination

List of Discipline Specific Electives

Syllabus

VISION

To be a world class university through education, innovation andresearch for the service of humanity.

MISSION

1. To establish centres of excellence in emerging areas of science, engineering, technology, management and alliedareas.

2. To foster an ecosystem for incubation, product development,transfer of technology and entrepreneurship.

3. To create environment of collaboration, experimentation, imagination and creativity.

4.   To develop human potential with analytical abilities, ethics and integrity.

5. To provide environment friendly, reasonable and sustainable solutions for local & global needs.

UNIVERSITY SCHOOL OF MANAGEMENT AND ENTREPRENEURSHIP

Vision

To develop and nurture the spirit of management leadership and entrepreneurship with a sense of social conscience for the common good of the society.

Mission

1. To impart management education through a portfolio of professionally designed programs with a focus on entrepreneurship and family business, public policy, business analytics, finance market, and many more.

2. To establish a center of excellence in entrepreneurship development, innovation & incubation, and organization development.

3. To create a new knowledge base through relevant and useful Research in the context of changing technology and societal needs.

4. To encourage and foster the spirit of inquiry and develop a scientific temper.

5. To nurture responsible ethical leaders.

6. To contribute towards the enrichment of corporate and professional life by providing consultancy and training.

Program Outcomes and Program Learning Outcomes of Executive MBA in Data Science and Analytics

Program Educational Objectives (PEOs)

PEO 1 Become leaders who drive organizational success through strategic use of data analytics.
PEO 2 Employ innovative data science techniques to solve complex business challenges.
PEO 3 Adhere to ethical practices in data handling and analytics, ensuring privacy and compliance.
PEO 4 Pursue lifelong learning and stay current with emerging trends in data science and analytics.
PEO 5 Integrate knowledge from various disciplines to create comprehensive data-driven solutions.

Program Specific Outcomes (PSOs)

PSO 1 Effectively integrate and manage large datasets from various sources.
PSO 2 Utilize advanced analytical techniques, including machine learning and AI, to derive business insights.
PSO 3 Create compelling data visualizations to communicate findings to stakeholders.
PSO 4 Develop specialized solutions tailored to specific industries such as finance, healthcare, and marketing.
PSO 5 Apply predictive analytics to anticipate market trends and business opportunities.

Program Outcomes (POs)

PO 1 Demonstrate strong critical thinking and analytical skills in data-driven decision-making.
PO 2 Be proficient in using data science tools and programming languages like Python and R.
PO 3 Work effectively in teams, leveraging diverse skills to achieve common goals.
PO 4 Integrate data science expertise with business knowledge to drive organizational strategy and growth.
PO 5 Communicate complex data insights clearly and effectively to both technical and non-technical audiences.

UNIVERSITY SCHOOL OF MANAGEMENT AND ENTREPRENEURSHIP

First Year: First Term

Course Code	Course Title	Course	Credits	Contact Hours/Week			Relative Weights				
				L	T	P	CWS	PRS	MTE	ETE	PRE
EMD101	Business Communication	SEC	3	2	1	-	25	-	25	50	-
EMD103	Data Science I - Mathematical Foundations for Data Science	AEC	3	2	1	-	25	-	25	50	-
EMD105	Organizational Behaviour	DCC	3	2	1	-	25	-	25	50	-
EMD107	Cost Accounting and Management Control	DCC	3	2	1	-	25	-	25	50	-
	Total Credits						12				

First Year: Second Term

Course Code	Course Title	Course	Credits	Contact Hours/Week			Relative Weights				
				L	T	P	CWS	PRS	MTE	ETE	PRE
EMD109	Data Sciences II - Data Mining	SEC	3	2	1	-	25	-	25	50	-
EMD111	Operations and Logistics Management	DCC	3	3	-	-	25	-	25	50	-
EMD113	Marketing Management	DCC	3	2	1	-	25	-	25	50	-
EMD115	Managerial Economics	DCC	3	2	1	-	25	-	25	50	-
	Total Credits		12								

First Year: Third Term

Course Code	Course Title	Course	Credits	Contact Hours/Week			Relative Weights				
				L	T	P	CWS	PRS	MTE	ETE	PRE
EMD102	Critical Thinking and Problem Solving	VAC	3	2	1	-	25	-	25	50	-
EMD104	Data Sciences III-Machine Learning	AEC	3	2	1	-	25	-	25	50	-
EMD106	IT & Management Systems	DCC	3	3	-	-	25	-	25	50	-
EMD108	Human Resources Management	DCC	3	2	1	-	25	-	25	50	-
EMD110	Corporate Finance	DCC	3	2	1	-	25	-	25	50	-
	Total Credits		15								

Second Year: Fourth Term

Course Code	Course Title	Course	Credits	Contact Hours/Week			Relative Weights				
				L	T	P	CWS	PRS	MTE	ETE	PRE
EMD201	Data Sciences IV-Business Intelligence & Data Visualization	SEC	3	3	-	-	25	-	25	50	-
EMD203	Business Laws	ICC	3	3	-	-	25	-	25	50	-
EMD205	Business Environment	VAC	3	2	1	-	25	-	25	50	-
EMDXXXX	Elective 1	DSE	3	3	-	-	25	-	25	50	-
EMDXXXX	Elective 2	DSE	3	3	-	-	25	-	25	50	-
	Total Credits		15								

Second Year: Fifth Term

Course Code	Course Title	Course	Credits	Contact Hours/Week			Relative Weights				
				L	T	P	CWS	PRS	MTE	ETE	PRE
EMD207	Data Sciences V- R for Machine Learning	AEC	3	2	-	2	15	25	20	40	-
EMD209	Business and Strategic Policy	DCC	3	2	1	-	25	-	25	50	-
EMDXXXX	Elective 3	DSE	3	3	-	-	25	-	25	50	-
EMDXXXX	Elective 4	DSE	3	3	-	-	25	-	25	50	-
	Total Credits		12								

Second Year: Sixth Term

Course Code	Course Title	Course	Credits	Contact Hours/Week			Relative Weights				
				L	T	P	CWS	PRS	MTE	ETE	PRE
EMD 202	Data Sciences VI -Artificial Intelligence	SEC	3	3	-	-	25	-	25	50	-
EMD 204	Big Data & Knowledge Management	ICC	3	3	-	-	25	-	25	50	-
EMDXXXX	Elective 5	DSE	3	3	-	-	25	-	25	50	-
EMDXXXX	Elective 6	DSE	3	3	-	-	25	-	25	50	-
	Total Credits		12								

Second Year: Seventh Term

4-6 weeks of Live/ Applied Capstone Projects OR MOOCs 6- Credit (In any area of specialization as per DTU norm, with prior permission of Program Coordinator, MOOCs Committee of Department, as per DTU norms.)	Total Credits =**6** **Relative Weights** **PRE=60, PRS=40**

Discipline Specific Electives	
Group 1	**Group 2**
EMDS211-Information and Project Management	EMDA211-Pricing Analytics
EMDS212-Advanced Time Series and Forecasting	EMDA212-Marketing, Web and Social Media Analytics
EMDS213-Data Structure and Graph Algorithms for Data Sciences	EMDA213-HR Analytics
EMDS214-Advanced Machine Learning	EMDA214-CRM and Marketing Analytics
EMDS215-Cloud Computing	EMDA215-Retail Analytics
EMDS-216-Natural Language processing	EMDA216- Operation & Supply Chain Analytics
EMDS217- Decision Making Techniques	EMDA217-Semantic Web and Web Mining
EMDS218- Swarm and Evolutionary Computing	EMDA218-Financial Analytics
EMDS219-Predictive Modelling	EMDA219- Cyber Analytics
EMDS220-Recommender Systems	EMDA220-Advanced Database Management Systems

Value Added Course (VAC)**,** Discipline Specific Core Course (DCC), Ability Enhancement Course (AEC)Inter--Disciplinary Course (ICC), Skill Enhancement Course (SEC)
 Lecture T Tutorial P Practical
CWS Class Work Sessional PRS Practical Sessional MTE Mid Term Examination
ETE End Term Examination PRE Practical Examination MOOC Massive Open Online Courses

Detailed Syllabus

Course Code: EMD101 [SEC] (L:2, T:1, P:0)
Course Title: Business communication
Course Description: Business Communication is a course that aims to equip learners with the important skills and knowledge required, for them to be great communicators in both business and casual situations. The course addresses the learners' needs related to written communication, oral communication, presentation, and inter-personal communication while also helping them overcome some of the common communication barriers or challenges using simple, practical techniques.

Course Outcomes
Upon completion of the course, the student would be able to:

CO1. Comprehend the functioning of communication and its significance in the context of data analytics.
CO2. Differentiate barriers and difficulties encountered in business communication while acquiring the skill of addressing issues through problem-solving and persuasive techniques.
CO3. Exhibit confident presentation and articulate communication of ideas within a professional   environment for resolving data analysis challenges using a mindful and proactive approach.
CO4. Formulate proficient written professional documents and effectively participate in both individual and group discussions.

Syllabus:
Unit 1: The Process of Business Communication
 Overview of Communication, models of communication, noise, sender – receiver dynamics, Meta-Communication, Essential Communication Skills, Effectiveness of Communication
(B) Professional Writing - The Basics Written Business Communication Basics, Being Managerially Appropriate, Getting it Write the First Time
Unit 2: Professional Writing - Applications
Business Correspondence Reports and Summaries, Informative and Persuasive Communication
Unit 3: Oral Communication
 Fundamentals of Oral Communication. Importance of non-verbal communication: Kinesics, Proxemics, Hepatics, Chronemics, Paralanguage, Artifacts, Gloss phobia and Lack of Confidence, Presentations , Making Professional Presentations, Plan and Prepare, Practice and Perform
Unit 4: Interpersonal Skills
 Introduction to Interpersonal Communication, Behaviour and Communication, Personality and Communication
Unit 5: Global Skills

Leadership and communication Skills, Problem Solving Skills, Active Listening Skills, Negotiation and Persuasion Skills, communicating with teams.

Reference/Text Books:

- Lesikar et al, Business Communication: Making Connections in a Digital World. Tata McGraw Hill Publishing Company Ltd. New Delhi, 2014.
- CL Boove, J. V. Thill, M. Chaturvedi ;Business Communication Today, Pearson, 2014.
- Krizan et al, Effective Business Communication, Cengage Learning, 2014. O. Scot, Contemporary Business Communication, Biztantra, New Delhi, 2012
- Chane Martin, Intercultural Business Communication, Pearson Education, 2012.

Course Code: EMD103 [AEC] (L:2, T:1, P:0)
Course Title: Data Science-I Mathematical Foundations for Data Sciences
Course Description:
Mathematical Foundations for Data Sciences is a course that aims to provide students with a solid mathematical background for data analysis. The course covers essential mathematical concepts such as linear algebra, calculus, probability theory, and statistics, and their applications in data analysis. Students will also learn how to use mathematical software tools, such as R or Python etc. for data analysis.

Course Outcomes:
Upon completion of the course, the student would be able to:

CO1.   Understand mathematical concepts and techniques relevant to data analysis
CO2.   Utilize effectively the mathematical software tools for data analysis
CO3.   Apply mathematical concepts to solve data analysis problems
CO4.   Develop critical thinking and problem-solving skills in data analysis

Syllabus:
Unit 1: Linear Algebra
Vectors and Matrices and their operations, Linear Transformations, Eigenvalues and Eigenvectors. Advanced theorems.

Unit 2. Calculus
Limits and Continuity, Multivariable Differential Calculus - Partial derivatives up to second order; Homogeneity Derivatives and Integrals, of functions and Euler's theorem; total differentials, Differentiation of implicit function with the help of total differentials. Maxima and Minima; The Directional derivative - Directional derivative and continuity - The total derivative - The total derivative expressed in terms of partial derivatives - The matrix of linear function - The Jacobian matrix - The chain rule - Matrix form of chain rule - The mean - value theorem for differentiable functions - Sufficient condition for differentiability. Cases of one variable involving second or higher order derivatives; Cases of two variables involving not more than one constraint.

Unit 3. Probability Theory

Basic Probability Concepts, Conditional Probability and Bayes' Theorem Random Variables and Probability Distributions – normal, Poisson, binomial, and other distributions. Measures of probability, estimation and errors.

Unit 4. Basic Statistics

Descriptive Statistics, Inferential Statistics, Hypothesis Testing. Parametric and non-parametric tests. Measures of association, Correlation, Regression. Decision trees, cluster and factor analysis. Projection and Time series.

Unit 5. Optimization

Convex and Concave function, Introduction to linear programming, optimization problems, applications in business.

Reference/Text Books:

- DeGroot, Morris H. and Schervish, Mark. J. (2012): Probability and Statistics, 4th edition, Addison-Wesley
- Hogg, Robert V.; Makean, J and Craig, Allen T. (2014): Introduction to Mathematical Statistics, Prentice Hall, 7th edition
- Hwang, Jessica and Blitzstein, Joseph (2014): Introduction to Probability, CRC Press

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Course Code EMD105 [DCC] (L:2, T:1, P:0)

Course Title: Organizational Behaviour

Course Description: The objective of the Organizational Behaviour course is to provide students with a comprehensive understanding of human behaviour in organizations. The course aims to develop students' knowledge and skills in analysing individual, group, and organizational dynamics to enhance organizational effectiveness. Students will learn to apply theories and concepts of organizational behaviour to real-world situations and develop insights into managing people within organizations.

Course Outcomes: By the end of this course, students should be able to:

CO1. Recall and explain the fundamental concepts and theories that underpin organizational behaviour.

CO2. Examine and break down individual behaviours within organizational contexts, discerning their effects on performance and motivation levels.

CO3. Dissect and judge the dynamics of group behaviours, determining their implications for teamwork and cooperative efforts.

CO4. Appraise various organizational structures, gauging their influence on employee conduct and the overall effectiveness of the organization.

CO5. Apprehend and dissect the role of leadership, scrutinizing its effects on employee engagement levels and overall performance.

Syllabus:

Unit 1: Introduction to Organizational Behaviour

Definition and scope of organizational behaviour, Evolution and theoretical frameworks of organizational behaviour, Research methods in organizational behaviour

Unit 2: Individual Behaviour in Organizations

Personality and individual differences, Perception and attribution in the workplace, Motivation and job satisfaction, Learning and decision-making in organizations

Unit 3: Group Behaviour and Teamwork

Understanding group dynamics and group formation, Team development and effectiveness, Leadership in teams, Conflict resolution and collaboration

Unit 4: Organizational Structure and Design

Organizational structure and its impact on behaviour, Organizational culture and its influence on employees, Power, politics, and influence in organizations, Organizational change and its challenges

Unit 5: Leadership and Management

Theories and styles of leadership, Leadership and employee motivation, Emotional intelligence and leadership effectiveness, Ethical leadership and its impact on organizational behaviour

Unit 6: Organizational Communication and Conflict& Organizational Behaviour in Practice

Communication processes in organizations, Barriers to effective communication, Managing organizational conflict and negotiation, Diversity and cross-cultural communication in organizations, Applying organizational behaviour concepts in real-world scenarios, Employee engagement and performance management, Organizational behaviour and human resource management, Organizational behaviour and strategic management

Reference/Text Books:

- Organizational Behaviour by Stephen P. Robbins, Timothy A. Judge, and Bruce Millett
- Organizational Behaviour: Improving Performance and Commitment in the Workplace by Jason A. Colquitt, Jeffery A. LePine, and Michael J. Wesson
- Essentials of Organizational Behaviour by Stephen P. Robbins and Timothy A. Judge

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Course Code: EMD107 [DCC] (L:2, T:1, P:0)
Course Title : Cost Accounting and Management Control
Course Description: The objective of the Cost Accounting and Management Control course is to provide students with a comprehensive understanding of cost accounting principles and their application in managerial decision-making. The course aims to develop students' skills in analysing and controlling costs to support effective management decision-making and organizational performance. Students will learn various cost accounting techniques and tools to enhance profitability, budgeting, and control within organizations.

Course Outcomes: By the end of this course, students should be able to:

CO1. Comprehend the fundamental concepts, principles, and aims underpinning cost accounting.
CO2. Implement diverse methods of cost accounting to gauge, dissect, and regulate costs.
CO3. Employ cost-related information to make informed choices, strategize, and appraise performance.
CO4. Construct systems for cost allocation and product costing, addressing accurate resource allocation.
CO5. Examine and deduce cost conduct and relationships between cost, volume, and profit.
CO6. Apply techniques for cost management and dissect variances, spotlighting prospects for enhancement.

Syllabus:
Unit 1: Introduction to Cost Accounting

Introduction to cost accounting and its role in management decision-making, Cost concepts, classifications, and terminology, Cost accounting systems and their objectives, standards

Unit 2: Cost Behavior and Cost-Volume-Profit Analysis
Cost behavior patterns and cost estimation techniques, Break-even analysis and contribution margin analysis, Cost-volume-profit (CVP) relationships and sensitivity analysis

Unit 3: Costing Systems
Job costing and process costing, Activity-based costing (ABC) and its application, Cost allocation methods and techniques

Unit 4: Cost Control and Variance Analysis
Standard costing and variance analysis, Direct material and direct labor variances,Overhead variances and overhead cost control

Unit 5: Budgeting and Performance Measurement
Budgeting concepts and technique, Flexible budgeting and variance analysis, Performance measurement and key performance indicators (KPIs)

Unit 6: Management Control Systems& Strategic Cost Management
Designing management control systems, Responsibility accounting and cost centers, Transfer pricing and performance evaluation
Strategic cost analysis and value chain analysis, Target costing and life cycle costing, Cost management for decision-making and competitive advantage

Reference/Text Books:
- Cost Accounting: A Managerial Emphasis by Charles T. Horngren, Srikant M. Datar, and Madhav V. Rajan
- Management Accounting: Information for Decision-Making and Strategy Execution by Anthony A. Atkinson, Robert S. Kaplan, Ella Mae Matsumura, and S. Mark Young
- Cost Accounting: Foundations and Evolutions by Michael R. Kinney and Cecily A. Raiborn
- Cost Management: Accounting and Control by Don R. Hansen and Maryanne M. Mowen
- Strategic Cost Management: The New Tool for Competitive Advantage by Shank Govindarajan

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Second Term

Course Code: EMD109 [SEC] (L:2, T:1, P:0)
Course Title: Data Sciences II - Data Mining
Course Description: Data Sciences II & Data Mining is a course that aims to introduce students to data mining techniques and their applications in various fields. The course covers the basics of data mining, machine learning algorithms, and statistical methods to extract meaningful insights from large datasets. Students will gain practical experience in implementing data mining techniques and will learn how to use different software tools for data analysis.

Course Outcomes:
Upon completion of the course, the student would be able to:
CO1.   Comprehend the concept of data mining and its real-world applications.
CO2.   Examine various data mining techniques and their respective purposes.
CO3.   Apply data mining algorithms through hands-on practice using software tools.

CO4. Recognize the significance of data pre-processing and the process of feature selection.
CO5. Cultivate proficiencies in the analysis of extensive datasets and the discernment of patterns.
CO6. Acquire knowledge about techniques including classification, clustering, association rule mining.

Syllabus
Unit 1: Introduction to Data Mining
Definition of Data Mining, Types of Data Mining Techniques, Data Preprocessing and Feature Selection, Kinds of data, Kinds of patterns, technologies, Kinds of applications, Major issues in data mining
Unit 2: Data Exploration
Data objects and attribute types, basic statistical descriptions of data, data visualization, measuring data similarity & dissimilarity, Data preprocessing: Overview, data cleaning, data integration, data reduction, data transformation & data discretization, Exploratory Data Analysis, Data Visualization
Unit 3: Classification
Introduction to classification, classification model, Classification using Decision Tree and Neural Networks
Unit4: Clustering
K-Means Clustering, Hierarchical Clustering, applications of cluster analysis in business; segmentation and other applications
Unit 5: Association Rule Mining
Market Basket Analysis, Apriori Algorithm: Finding Frequent Itemsets by confined Candidate Generation, Generating Association Rules from Frequent Itemsets, Mining Multilevel Associations, Mining Multidimensional Associations

Reference/Text Books:
- Introduction to Data Mining by Pang-Ning Tan, Michael Steinbach, and Vipin Kumar, Pearson, 2005.
- Data Mining: Concepts and Techniques by Jiawei Han, Micheline Kamber, and Jian Pei, Morgan Kaufmann, 2011.
- Data Mining for Business Analytics: Concepts, Techniques, and Applications by Galit Shmueli, Peter C. Bruce, and Nitin R. Patel, Wiley, 2019

Course Code: EMD111 [DCC] (L:3, T:0, P:0)
Course Title: Operations and Logistics Management
Course Description: This course provides students with a comprehensive understanding of operations management and logistics, crucial elements in contemporary business. Covering topics ranging from production planning and inventory control to supply chain logistics and transportation management, students gain valuable insights into optimizing operational efficiency and orchestrating seamless logistical operations. By blending theoretical knowledge with practical applications, students are equipped to tackle the multifaceted challenges of modern operations and logistics management across various organizational contexts.
Course Outcomes:
By the end of the course, students will be able to:

CO1.   Recall and explain key concepts in operations and logistics management.
CO2.   Interpret the relationships between various operations and logistics principles.
CO3.   Apply operations and logistics strategies to practical business cases.
CO4.   Analyze supply chain dynamics and propose optimization solutions.
CO5.   Devise efficient operations and logistics systems based on industry requirements.
CO6.   Evaluate the impact of different strategies on operational and logistical effectiveness.

Syllabus:
Unit 1:
Managing operations; planning and design of production and operations systems. Service characteristics. Facilities planning location, layout and movement of materials. Line balancing. Analytical tools and techniques for facilities planning and design. Production forecasting. Aggregate planning and operations scheduling, Production Planning and Control. Purchasing, Materials Management and Inventory control and JIT Material Requirements Planning. MRPII, ERP, Optimization techniques applications.
Unit 2:
 Perspective of Supply Chain Logistics Management. Logistics concept, role and scope; Logistics Environment- Integrating Logistics of Supply, Logistics of Production and Logistics of Distribution. Internal and external factors for logistics strategy, Operational Resources of logistics (personnel, warehouse means of transport, warehouse transport aids, organizational aids, material stocks, and area/spare) Effective supply chain management, customer networking and manufacturing, Risk Pooling, Postponement, cross docking in supply chain, CPFR, IT-enabled supply chains value of Information, Coordination in SCM.
Unit 3 :
Logistics Activity Mix. JIT and Logistics, Synchronized manufacturing. Purchasing and Materials Management. Automated Warehousing, Materials Handling and Packaging. Simulation aided planning of conveyor and warehousing systems. Logistical Connectivity: Transportation modes, Routing of freight flows. Management and Organization of the Logistics Systems; Organization, Information, and cost control; Logistical information Systems, Computer aided logistics management.

References/Text Books:
- Russell R.S., Taylor B.W., Saddikuti V. and Gudavalleti P.K. (2023), Operations and Supply
- Chain Management, 10ed, Wiley India Private Limited.
- Chase R.B., Ravi Shankar R. and Jacobs F.R. (2018), Operations and Supply Chain
- Management (SIE) | 15th Edition McGraw Hill Education.
- Vijayaraghavan T. A. S. (2021), Supply Chain Analytics, Wiley.
- Designing & Managing the Supply Chain Paperback – 22 May 2022
- by David Simchi-Levi D., Philip Kaminsky P., Edith Simchi-Levi E. and Shankar R. (2022), McGraw Hill Education

Course Code: EMD113 [DCC] (L:2, T:1, P:0)
Course Title: Marketing Management
Course Description: The course aims to equip students with a comprehensive understanding of marketing principles and strategies essential for success in today's dynamic business environment. Through a structured curriculum, students will delve into key areas such as the functions of marketing in business, customer perception, market environment analysis, product strategy, and marketing mix strategies. By the end of the course, students will be able to critically analyze marketing challenges and opportunities, develop effective marketing strategies, and apply theoretical knowledge to practical scenarios. Furthermore, they will gain proficiency in evaluating consumer behavior, managing brand equity, and formulating strategies for product development and market positioning

Course Outcomes:
CO1. Remember the definition of marketing and its significance for businesses and non-profit organizations, and track the progression of marketing philosophy and concepts employed in both traditional and modern marketing practices.
CO2. Understand the defined components of the marketing process, including market segmentation, target audience selection, and crafting positioning strategies, to formulate a comprehensive marketing mix.
CO3. Analyze the marketing landscape, discern the value expectations of customers and other stakeholders, and devise strategies that facilitate ethical and sustainable value exchange with customers.
CO4. Develop basic skills required in managing and designing the marketing process, including the, segmentation, targeting and positioning, marketing mix and researching the market.
CO5. Formulate Effective Marketing Mix Strategies

Syllabus:
Unit 1: The functions of Marketing in business, The marketing mix elements, Marketing Mix Strategy – Mix elements for Marketing of Services. Segmentation, Targeting and positioning, the sales and marketing difference. Marketing Myopia, customer centricity and evolution of marketing philosophy.
Unit 2. Customer Perceived Value, Customer Expectations, Consumer Behaviour in consumer and business markets, Satisfaction and Loyalty, drivers of customer lifetime value. Diffusion of innovations and the socio-economic process; frameworks for measuring customer value and value management strategies.
Unit 3: Market Environment, scanning and assessment, PESTEL, Opportunity assessment and forecasting & targeting. The planning matrix for opportunities – Ansoff grid, BCG, GE matrix etc. Market Segmentation and targeting, Positioning the offer, Dealing with competition, building value proposition over time.
Unit 4: Product strategy and lifecycle concept, new product development process, product portfolio and product driven growth strategies Managing Brand Equity, brand growth and diversification, extension and other strategies. Managing brands and products in a custoemr
Unit 5: Mix Strategies:
Pricing strategies, approaches to pricing, Competing through price, Setting and managing prices.

Managing Distribution and Channels, Channel design and conflict, Managing the sales force, territories and quotas, setting targets.

Promotional Mix: Advertising, Sales Promotion, Managing PR, Online promotions and measuring promotional effects, Communications hierarchy, Marketing Organization and Control

Reference/Text Books:

- Textbook: Kotler, P., Keller K.L., Marketing Management (15th Edition), Pearson Education.
- Reference Book: Etzel, M., Walker, B., Stanton, W. and Pandit, A (2009), Marketing Management, Tata McGrawHill.
- Additional Reference: Saxena, R. (2009), Marketing Management, 4th Edition, Tata McGraw Hill.

Course Code: EMD115 [DCC] (L:2, T:1, P:0)
Course Title: Course: Managerial Economics
Course Description: The objective of the Managerial Economics course is to provide students with a solid understanding of economic principles and their application in managerial decision-making. The course aims to develop students' analytical skills to effectively analyze and solve business problems in a dynamic economic environment. Students will learn to apply economic concepts and tools to make informed decisions and maximize organizational efficiency and profitability.

Course Outcomes: By the end of this course, students should be able to:
CO1.   Understand the fundamental concepts and principles of managerial economics.
CO2.   Apply economic theories and models to analyze and solve business problems.
CO3.   Evaluate the demand and supply dynamics to make pricing and production decisions.
CO4.   Analyze cost structures and apply cost-volume-profit analysis in decision-making.
CO5.   Assess market structures and conduct competitive analysis.

Syllabus:
Unit 1: Introduction to Managerial Economics
Introduction to managerial economics and its scope, Basic economic concepts and principles, Role of managerial economics in decision-making
Unit 2: Demand Analysis and Forecasting
Demand concepts and factors influencing demand, Demand estimation techniques and forecasting methods, Elasticity of demand and its managerial implications
Unit 3: Supply and Production Analysis
Production concepts and production function analysis, Cost analysis and cost curves, Production and cost optimization
Unit 4: Pricing and Output Decisions
Market structures and pricing strategies, Price determination under different market conditions, Output and profit maximization
Unit 5: Competitive Analysis and Strategy
Competitive forces analysis, Industry analysis and competitive advantage, Game theory and strategic decision-making, Government and Business & Economic Forecasting and Decision-making, Government regulations and their impact on business decisions, Antitrust policies and their implications, Environmental regulations and corporate responsibility

Economic forecasting techniques, Time value of money and investment analysis, Risk analysis and decision-making under uncertainty

Reference/Text Books:
- Managerial Economics and Business Strategy by Michael R. Baye and Jeff Prince
- Managerial Economics by William F. Samuelson and Stephen G. Marks
- Managerial Economics: Foundations of Business Analysis and Strategy by Christopher R. Thomas and S. Charles Maurice
- Managerial Economics: Economic Tools for Today's Decision Makers by Paul G. Keat and Philip K. Y. Young
- Managerial Economics: Applications, Strategy, and Tactics by James R. McGuigan, R. Charles Moyer, and Frederick H. Harris

Third Term

Course Code: EMD102 [VAC] (L:2, T:1, P:0)
Course Title: Critical Thinking and Problem Solving
Course Description: The objective of the course Critical Thinking and Problem Solving is to develop students' abilities to think critically, analyze information, and apply systematic problem-solving techniques. The course aims to enhance students' intellectual and analytical skills, enabling them to identify and solve complex problems effectively. It fosters a mindset of inquiry, logical reasoning, and creativity, empowering students to make well-informed decisions and address challenges in various personal and professional contexts.
Course Outcomes: Upon successful completion of this course, students will be able to:
CO1.   Apply critical thinking techniques to analyze and evaluate information, arguments, and ideas.
CO2.   Recognize and identify biases, fallacies, and assumptions in reasoning.
CO3.   Utilize various problem-solving frameworks and strategies to address real-world challenges.
CO4.   Generate creative solutions to complex problems and evaluate their effectiveness.
CO5.   Demonstrate effective communication and presentation skills to articulate reasoned arguments.

Syllabus:
Unit 1: Introduction to Critical Thinking
Definition and Importance of Critical Thinking, Elements of Critical Thinking: Analysis, Evaluation, and Inference, Cognitive Biases and Fallacies, Enhancing Critical Thinking Skills
Unit 2: Critical Reading and Information Evaluation
Active Reading and Note-taking Techniques, Evaluating Sources: Credibility and Reliability, Distinguishing Facts from Opinions
Unit 3: Problem Identification and Analysis
Identifying Problems and Decision Points, Root Cause Analysis, SWOT Analysis and Problem Prioritization
Unit 4: Problem-Solving Approaches

Problem-Solving Frameworks: PDSA, DMAIC, and Design Thinking, Creativity and Idea Generation Techniques, Brainstorming and Mind Mapping

Unit 5: Decision Making and Solution Evaluation

Rational Decision Making: Cost-Benefit Analysis, Pros and Cons, Ethical Considerations in Decision Making, Evaluating and Selecting Solutions

Unit 6: Communication and Presentation

Effective Communication in Critical Thinking, Logical Argumentation and Reasoning, Presenting Findings and Solutions

Reference/Text Books:

- Paul, R., & Elder, L. (2019). Critical Thinking: The Nature of Critical and Creative Thought. Rowman & Littlefield Publishers.
- Browne, M. N., & Keeley, S. M. (2018). Asking the Right Questions: A Guide to Critical Thinking. Pearson.
- Ruggiero, V. R. (2018). The Art of Thinking: A Guide to Critical and Creative Thought. Pearson.
- Facione, P. A., & Gittens, C. A. (2016). Think Critically. Pearson.
- West, R. L. (2020). Effective Critical Thinking: The Key to Better Problem Solving and Decision Making. Pearson.

Course Code: EMD104 [AEC] (L:2, T:1, P:0)

Course Title: Data Sciences III -Machine Learning

Course Description: Data Sciences III - Machine Learning is a course that provides students with a comprehensive introduction to the fundamental concepts and techniques of machine learning. The course covers supervised and unsupervised learning, regression and classification, and model selection and evaluation. Students will also learn how to implement machine learning algorithms using Python and popular libraries such as scikit-learn.

Course Outcomes:

CO1. Understand the basic principles and concepts of machine learning.

CO2. Learn various machine learning algorithms and techniques for supervised and unsupervised learning.

CO3. Implementing machine learning models using programming languages such as Python.

CO4. Develop the ability to evaluate and interpret machine learning models' performance.

CO5. Apply machine learning techniques to analyze and extract insights from real-world datasets

Syllabus:

Unit 1: Introduction to Machine Learning

Introduction to Machine Learning and its types, Key terminology: Features/attributes, labels/targets, training and test data, models, Applications of Machine Learning

Unit 2: Supervised Learning

Linear Regression, K-Nearest Neighbors, Bayesian learners, Bayes theorem and concept learning, maximum likelihood and least-squared error hypothesis, maximum likelihood hypothesis for predicting probabilities**,** Data Preprocessing, Model Training and Evaluation, NumPy and Pandas, Scikit-Learn

Unit 3: Decision Trees for classification

ree Structure and Components, Splitting Criteria in Decision Trees, Handling Categorical Data with Decision Trees, Pruning to Prevent Overfitting, Decision Tree Algorithms (e.g., CART, ID3, C4.5) Decision Trees for Classification, Feature Importance in Decision Trees, Interpretability and Visualization of Decision Trees

Unit 4: Rule based classification and Artificial Neural Networks

Introduction to rule-based classification, coverage and accuracy of rules, direct and indirect methods of rule extraction, sequential covering algorithm, Artificial Neural Networks: Introduction, Network representation, perceptron, back-propagation.

Unit 5: Unsupervised Learning: Clustering & Association, Dimensionality Reduction Algorithms.

Reference/Text Books:
- Understanding Machine Learning: From Theory to Algorithms by Shai Shalev-Shwartz and Shai Ben-David, Cambridge University Press, 2014.
- Machine Learning: A Probabilistic Perspective by Kevin P. Murphy (Publisher: MIT Press, Year: 2012
- Machine Learning by Tom M. Mitchell, McGraw-Hill, 1997

Course Code: EMD106 [DCC] (L:3, T:0, P:0)
Course Title: IT and Management Systems
Course Description
The course on IT and Management Systems aims to equip students with a comprehensive understanding of the fundamental concepts and principles underlying the integration of information technology information systems. By the end of the course, students will be able to analyse the role of MIS in supporting organizational processes and decision-making, evaluate different components of MIS, such as hardware, software, data, and people, and their interdependencies, apply information systems concepts and tools for data management, decision support, and business intelligence, comprehend the ethical and security considerations in MIS.

Course Outcomes
Upon completion of the course, the student would be able to:
CO1. Demonstrate an understanding of the fundamental concepts and principles of information technology and its integration with management systems.
CO2. Analyse and evaluate different types of IT infrastructure, including hardware, software, and network components.
CO3. Apply IT tools and techniques for data management, including data modelling, normalization.
CO4. Comprehend the system development process, including the system development life cycle (SDLC), prototyping, and methodologies.
CO5. Comprehend the principles and functionality of decision support systems.

Syllabus:
Unit 1: Introduction to IT and Management Systems
Overview of IT and its role in organizations, Management information systems (MIS) and its components, Basic components of MIS, Role of IT and MIS in business organisations, Emerging

trends in IT and management. Information in Decision Making: Meaning and importance, Sources and Types of Information, information requirements with particular reference to Management Levels, Relevance of Information in Decision Making.

Unit 2: IT Infrastructure for MIS:
Components of IT infrastructure, Hardware, software, and network components, IT architecture and systems integration, Cloud computing and virtualization.

Unit 3: System Development:
System Development Process, System Development Life Cycle (SDLC), Prototyping, End User Development, Waterfall and Spiral method, System Analysis, Design
and Implementation.

Unit 4: Data Management and Decision Support Systems:
Data types, structures, and databases, Data modelling and normalization, Data quality and governance, Decision Support Systems, Data visualization and reporting tools.

Unit 5: Emerging Concepts and Issues in Information Systems:
Enterprise Resource Planning (ERP) - An overview, Characteristics, and Role of ERP in Business Organization, ERP Unit s, Customer Relationship Management, Business Intelligence, Data Mining and its Applications, MIS- Security threats and controls.

Reference/Text Books:

- Laudon, Management Information Systems, Pearson Education, 2014.
- Pradeep K. Sinha, Priti Sinha, Information Technology: Theory and Practice, PHI Learning, 2016.
- Reference Books:
- W. S. Javadekar, Management Information Systems, Tata McGraw Hill Publication, 2014.
- O'Brien, A. James, Management Information System, Tata McGraw Hill, 2014.
- Davis, B. Gordon, Management Information System, Tata McGraw Hill Publication, 2012.

Course Code: EMD108 [DCC] (L:2, T:1, P:0)
Course Title: Human Resources Management
Course Description: The objective of the course Human Resources Management is to provide students with a comprehensive understanding of the principles and practices of managing human resources in organizations. The course aims to equip students with the knowledge and skills required to effectively recruit, develop, motivate, and retain employees. It also emphasizes the significance of ethical and legal considerations in managing human resources and highlights the role of HRM in organizational success and employee well-being.
Course Outcomes: Upon successful completion of this course, students will be able to:
CO1.   Understand the role and importance of human resources management in organizations.
CO2.   Explain the key functions and processes of human resources management.
CO3.   Demonstrate knowledge of recruitment, selection, and onboarding processes.
CO4.   Apply various training and development techniques to enhance employee skills and performance.
CO5.   Understand the principles of performance management and employee appraisal.

Syllabus:
Unit 1: Introduction to Human Resources Management
Definition and Scope of Human Resources Management (HRM), Importance of HRM in Organizational Success, HRM Functions and Roles
Unit 2: Human Resource Planning and Recruitment
Human Resource Planning: Forecasting and Demand-Supply Analysis, Job Analysis and Job Description, Recruitment Methods and Strategies, Selection Techniques: Interviewing, Testing, and Assessment Centers
Unit 3: Employee Training and Development
Training Needs Analysis, Training Methods: On-the-Job and Off-the-Job Training, Employee Development and Career Planning, Talent Management and Succession Planning
Unit 4: Performance Management and Appraisal
Performance Management Process, Setting SMART Goals and Performance Standards, Performance Appraisal Methods: Graphic Rating Scales, 360-Degree Feedback, etc., Addressing Performance Issues and Providing Feedback
Unit 5: Compensation and Benefits
Compensation Philosophy and Structure, Pay-for-Performance and Incentive Systems, Employee Benefits: Health, Retirement, and Work-Life Balance
Unit 6: Employee Relations and Engagement & Legal and Ethical Considerations in HRM
Employee Communication and Feedback, Employee Engagement Strategies, Managing Employee Grievances and Disputes, Diversity and Inclusion in the Workplace, Ethical Challenges in HRM

Reference/Text Books:
- Dessler, G. (2019). Human Resource Management. Pearson.
- Armstrong, M., & Taylor, S. (2019). Armstrong's Handbook of Human Resource Management Practice. Kogan Page.
- Milkovich, G. T., Newman, J. M., & Gerhart, B. (2020). Compensation. McGraw-Hill Education.
- Cascio, W. F., & Boudreau, J. W. (2019). Managing Human Resources. McGraw-Hill Education.
- Gomez-Mejia, L. R., Balkin, D. B., & Cardy, R. L. (2019). Managing Human Resources. Pearson.

Course Code: EMD110 [DCC] (L:2, T:1, P:0)
Course Title: Corporate Finance
Course Description: The objective of the course Corporate Finance is to provide students with a comprehensive understanding of the financial management principles and practices within organizations. The course aims to equip students with the knowledge and analytical skills required to make informed financial decisions that enhance the value of the firm. It emphasizes the importance of capital budgeting, financing decisions, and working capital management in achieving the financial goals of a company. Additionally, the course highlights the ethical considerations in financial decision-making and the role of corporate governance in ensuring financial transparency and accountability.
Course Outcomes: Upon successful completion of this course, students will be able to:

CO1.   Understand the fundamental principles and concepts of corporate finance.
CO2.   Analyze financial statements to assess the financial health and performance of a firm.
CO3.   Evaluate investment opportunities through capital budgeting techniques.
CO4.   Demonstrate knowledge of financing decisions and capital structure.
CO5.   Apply time value of money concepts in financial decision-making.

Syllabus:
Unit 1: Introduction to Corporate Finance
Definition and Scope of Corporate Finance, Role and Objectives of Financial Management, Financial Markets and Institutions
Unit 2: Financial Statement Analysis
Understanding Financial Statements: Balance Sheet, Income Statement, and Cash Flow Statement, Ratio Analysis for Financial Performance Evaluation, Assessing Financial Health and Solvency
Unit 3: Time Value of Money and Capital Budgeting
Time Value of Money Concepts: Present Value and Future Value, Discounted Cash Flow (DCF) Techniques: NPV, IRR, and Payback Period, Capital Budgeting Decision Criteria
Unit 4: Financing Decisions and Capital Structure
Sources of Financing: Equity and Debt, Cost of Capital and Weighted Average Cost of Capital (WACC), Optimal Capital Structure and Leverage
Unit 5: Working Capital Management
Components of Working Capital: Inventory, Accounts Receivable, and Accounts Payable, Working Capital Financing and Management Strategies, Managing Cash and Cash Conversion Cycle, Financial Ethics and Corporate Governance, Ethical Dimensions in Financial Decision-Making, Corporate Governance Principles and Best Practices, Role of Boards and Auditors in Financial Transparency

Reference/Text Books:
- Ross, S. A., Westerfield, R. W., Jaffe, J., & Jordan, B. D. (2020). Corporate Finance. McGraw-Hill Education.
- Brealey, R. A., Myers, S. C., & Allen, F. (2017). Principles of Corporate Finance. McGraw-Hill Education.
- Berk, J., & DeMarzo, P. (2017). Corporate Finance. Pearson.
- Brigham, E. F., & Ehrhardt, M. C. (2018). Financial Management: Theory & Practice. Cengage Learning.
- Damodaran, A. (2019). Corporate Finance: Theory and Practice. Wiley.

Fourth Term

Course Code: EMD201 [SEC] (L:2, T:0, P:1)
Course Title: Data Sciences IV-Business Intelligence & Data Visualization
Course Description: BI & Visualization Techniques is a course that provides students with a comprehensive understanding of Business Intelligence and data visualization concepts and techniques. The course covers data preparation, data exploration, data visualization, dashboard

design, and data storytelling. Students will also learn how to use popular BI and visualization tools such as Tableau and Power BI.

Course Outcomes:

CO1. Understand the fundamental concepts and techniques of Business Intelligence

CO2. Develop skills in data preparation and exploration

CO3. Learn how to create effective visualizations and dashboards

CO4. Develop critical thinking and problem-solving skills in data visualization and BI

Syllabus:

Unit I: Introduction to Business Intelligence

Introduction to Business Intelligence, Core concepts of BI and its applications, understanding data warehousing, dimensional modelling-facts & dimensions, ETL process, OLAP and OLTP

Unit II: Data Preparation and Exploration

Data Cleaning and Transformation, Data Integration, Data Exploration, Practices in industry

Unit III: Data Visualization

Visualization Principles, Types of Visualization, Python for Data Visualization: Matplotlib, Seaborn & Plotly

Unit IV: Dashboard Design & Story telling

Creating Dashboards in Tableau, Creating Dashboards in Power BI, Communicating Insights with Data, Telling a Compelling Data Story, Data Storytelling with Visualization

Reference/Text Books:

- The Visual Display of Quantitative Information by Edward R. Tufte, Graphics Press
- Storytelling with Data: A Data Visualization Guide for Business Professionals by Cole Nussbaumer Knaflic, Wiley
- Data Visualization: A Practical Introduction by Kieran Healy, Princeton University Press
- Information Dashboard Design: Displaying Data for At-a-Glance Monitoring by Stephen Few
- The Big Book of Dashboards: Visualizing Your Data Using Real-World Business Scenarios by Steve Wexler, Jeffrey Shaffer, and Andy Cotgreave, Wiley

Course Code: EMD203 [ICC] (L:3, T:0, P:0)

Course Title: Business Laws

Course Description: This course provides a comprehensive study of business law, focusing on legal principles and regulations that govern commercial transactions and business operations. Students will explore contracts, torts, intellectual property, employment law, and other legal aspects crucial to effective business management.

Course Outcomes: At the end of the course, the student should be able to:

CO1. Understand the foundational principles of business law and their applications in various business contexts.

CO2. Develop critical thinking and legal reasoning skills for analyzing and addressing legal issues in business settings.

CO3. Gain insights into contractual obligations, liability, ethical considerations, and risk management in business operations.

CO4. Enhance communication skills for effectively navigating legal frameworks and collaborating with legal professionals.

CO5. Apply legal knowledge to make informed decisions, mitigate legal risks, and ensure business compliance.

Syllabus

Unit-I: Business Legislation: Meaning and Nature of Law, Sources of Indian Law, Legal Environment of Business, Mercantile Law, Some Basic Legal Concepts, Essentials of Law, Indian legal System, An introduction of the various legislations under the Indian Legal Framework.

Unit-II: Indian Contract Act, 1872 and Negotiable Instruments Act, 1881– Concept of Agreement, Contract, Formation of a Contract, Essential of a Valid Contract, Offer and Acceptance, Consideration, Discharge of Contract, Remedies for Breach of Contract, Special Contracts, Cases on Indian Contract Act, 1872. Negotiable Instruments Act, 1881: Meaning and Essential Features, Types, Discharge and Liabilities, Dishonor of Negotiable Instruments. Law of torts.

Unit –III Companies Act 2013 – Meaning and Essential Features of Company, Types of Companies, Formation of Company, Memorandum and Articles of Association, Prospectus; Company Meetings; Company Management: Directors and Independent Directors, Responsibilities, Appointment and Liabilities of Directors; One Person Company.

E-commerce regulations

Unit- IV Sales of Goods Act and Competition Law: Sales of Goods Act, 1930-Meaning and Essential Elements of Contract of Sale, Meaning of Goods, Conditions and Warranties, Implied Conditions and Warranties, Rights of unpaid seller. Competition Act 2002: Objective, Anti Competitive Agreements, Abuse of Dominant Position, Regulation of Combinations, Competition Commission of India.

Unit -V Consumer Protection Act, 1986 and Information Technology Act, 2000: The Consumer Protection Act, 1986, Definitions of Consumer, Complainant, Goods, Service - Meaning of Consumer Dispute, Complaint - Unfair Trade Practices - Restrictive Trade Practices, Rights of Consumers, Consumer Disputes Redressal Agencies, The Information Technology Act, 2000, Digital Signature, Digital Signature Certificate, Electronic Governance, Electronic Records, Certifying Authorities, Penalty & Adjudication, Intellectual Property Law Copyright, trademark, and patent law; Protection of intellectual property rights; Licensing and infringement issues.

Reference/Text Books:

- Khuchhal and Khuchhal, Business and Corporate Law (2014), Vikas Publishing.
- Kapoor ND, Business Laws (2015), Sultan Chand and Sons.
- Business Law: Text and Cases by Kenneth W. Clarkson, Roger LeRoy Miller, and Frank B. Cross
- Business Law and the Regulation of Business by Richard A. Mann and Barry S. Roberts
- The Legal Environment of Business: Text and Cases by Frank B. Cross and Roger LeRoy Miller

Course Code: EMD205 [VAC] (L:2, T:1, P:0)
Course Title: Business Environment
Course Description:

The objective of the Business Environment course is to provide students with a comprehensive understanding of the internal and external factors that shape the business environment. Students will gain knowledge about the economic, social, political, and technological aspects that influence business operations and decision-making. The course aims to develop students' analytical skills and their ability to assess the impact of the business environment on organizations.

Course Outcomes:
By the end of this course, students should be able to:
CO1. Understand the concept and significance of the business environment.
CO2. Identify and analyze the internal and external factors that affect business operations.
CO3. Evaluate the impact of economic factors on business decision-making.
CO4. Assess the social and cultural factors influencing business practices.
CO5. Analyze the political and legal aspects of the business environment.

Syllabus:
Unit 1: Introduction to Business Environment
Concept and importance of the business environment; Macro and Micro environment.
Environments and markets, regulations and institutions. Components of the business environment: PESTEL
Unit 2:Economic Environment
Macroeconomic factors affecting business operations, Economic systems and their impact on business, Business cycles and their implications Markets and Institutions. Demand and production functions' Trade and tariffs, Trading blocs and agreements, Role of Fiscal Policy; Monetary Policy: Indian business environment and evolution; National Income Aggregates and their measurement; Inflation: Nature and Causes; Fiscal policy: Taxes and Transfer payments, Role of Monetary Policy in India, Instruments of monetary control; Liberalization, Privatization and Globalization; FDI, Balance of Payments.
Unit 3: Social and Cultural Environment
Socio-cultural factors shaping business practices, Values and norms, shaping business and consumption – consumer and business markets. Acceptance of technology and openness, Hoffstede framework, Demographic trends and their impact on markets, Cross cultural environments in business and related management practises, Social issues and community engagement
Unit 4: Political, Legal and Technological Environment
Political systems and their influence on business, Government regulations and policies affecting business operations, Legal frameworks and their implications for business activities
Role of technology in shaping the business environment, Impact of technological advancements on industries and markets, Digital transformation and its implications for businesses
Unit 5: Competitive Environment and Industry Analysis
Competitive forces and industry structure analysis, Porter's Five Forces framework, Analyzing industry trends and competitive advantage, Ethics and Sustainability in the Business Environment

Reference/Text Books:

- Business Environment: Text and Cases by Francis Cherunilam
- Business Environment: Concepts and Applications by S. S. Khanka
- Business Environment: Economic, Political, and Legal Dimensions by Aswathappa and Sundara Rajan
- Business Environment and Concepts by Arvind Kumar

Fifth Term

Course Code: EMD207 [AEC] (L:2, T:0, P:1)
Course Title: Data Sciences V- R for Machine Learning
Course Description: This course provides a comprehensive introduction to implementing machine learning algorithms within the R programming environment. This unit covers a variety of regression techniques essential for predictive modeling, including linear regression, polynomial regression, and logistic regression. Participants will learn to apply these algorithms to real-world datasets, utilizing R's extensive libraries and packages designed for machine learning.
Course Outcomes:
CO1.   Implement linear, polynomial, and logistic regression algorithms in R.
CO2.   Preprocess and clean data effectively for machine learning tasks.
CO3.   Evaluate the performance of machine learning models using appropriate metrics.
CO4.   Utilize R's machine learning libraries and packages for model development.
CO5.   Apply machine learning techniques to solve real-world problems across various domains.

Syllabus:
Unit 1: R Basics and Language
Getting and Installing R, The R user Interface, A short R tutorial, R packages. Overview: Expressions, Objects, Symbols, Functions. Syntax: Constants, Operators, Expressions, Control Structures, Accessing Data Structures. R Objects: Primitive object types, vectors, lists, other object types. Symbols and Environment: Symbols, Global environment, environment and functions, exceptions.

Unit 2: Functions and Object-Oriented Programming
Functions: Arguments, Return values, Function as arguments, side effects. Object Oriented Programming: Overview, Defining Classes, new objects, accessing slots, working with objects, creating coercion methods, methods, basic classes. High performance R with built in math functions, lookup tables etc.

Unit 3: Working with Data
Entering Data Within R, Entering Data Using R Commands, Using the Edit GUI, Saving and Loading R Objects, Importing Data from External Files, Exporting and Importing Data from Databases. Preparing Data: Combining Data Sets, Transformations, Binning Data, Subsets, Summarizing Functions, Data Cleaning, An overview of R graphics.

Unit 4: Regression Analysis and Statistics with R
Analyzing Data: Summary Statistics, Correlation and Covariance, Bootstrap Resampling. Probability Distributions: Normal Distribution, Common Distribution-Type Arguments, Distribution Function Families. Statistical Tests for Continuous and Discrete Data, Power Tests: Experimental Design Example, t-Test Design, ANOVA Test Design.

Unit 5: Machine Learning using R
Machine Learning Algorithms for Regression and classification, performance evaluation of Models

Reference/Text Books:

- Adler, J. (2012), R in a Nutshell: A Desktop Quick Reference, O'reilly
- publications, Second Edition.
- Lantz, B. (2013), Machine Learning with R, Packt publishing Ltd.
- Transform, Visualize, and Model Data, O. Reilly Media.
- Gillespie, C., Lovelace, R. (2016), R for Data Science: Import, Tidy, Transform, Visualize, and Model Data, O'Reilly Media.

Course Code: EMD209 [DSC] (L:2, T:1, P:0)
Course Title: Business and Strategic Policy
Course Description: The objective of the course Business and Strategic Policy is to provide students with a comprehensive understanding of the principles and concepts of business strategy formulation and implementation. The course aims to equip students with the knowledge and analytical skills required to make informed strategic decisions in a dynamic business environment. Additionally, it seeks to foster critical thinking, problem-solving abilities, and an appreciation for ethical considerations in the realm of strategic management.

Course Outcomes: Upon successful completion of this course, students will be able to:

CO1. Demonstrate a clear understanding of fundamental concepts and theories in strategic management.

CO2. Analyze the external and internal business environments to identify strategic opportunities and challenges.

CO3. Formulate viable business strategies considering the organization's strengths, weaknesses, opportunities, and threats.

CO4. Evaluate strategic alternatives and recommend appropriate courses of action for business growth and competitiveness.

CO5. Understand the ethical implications of strategic decisions and apply ethical considerations in business policy development.

Syllabus:
Unit 1: Introduction to Strategic Management, Definition and Importance of Strategic Management, Levels of Strategy, Process of Strategic Management, Environmental Analysis: PESTEL, Five Forces, and SWOT Analysis
Unit 2: Formulation of Business Strategy, Vision, Mission, and Objectives, Business-Level Strategy: Cost Leadership, Differentiation, and Focus Corporate-Level Strategy: Growth, Stability, and Retrenchment, Diversification Strategies: Related and Unrelated Diversification, Competitive Advantage and Sustainable Competitive Advantage
Unit 3: Strategy Implementation and Evaluation, Strategy Execution and Resource Allocation, Organizational Structure and Design for Strategy Implementation, Strategic Control and Performance Measurement, Balanced Scorecard and Key Performance Indicators (KPIs)
Unit 4: International and Global Strategic Management, Globalization and International Business Environment, Entry Modes in International Markets, Managing Multinational and Global Companies, Global Corporate Social Responsibility and Sustainability
Unit 5: Business Ethics and Corporate Governance, Ethical Theories and Ethical Decision Making Ethical Issues in Business Strategy, Corporate Governance and Its Role in Strategy Formulation,
Reference/Text Books:

- Wheelen, T. L., Hunger, J. D., Hoffman, A. N., & Bamford, C. E. (2017). Strategic Management and Business Policy: Globalization, Innovation, and Sustainability. Pearson.
- Thompson, A. A., Peteraf, M. A., Gamble, J. E., & Strickland, A. J. (2021). Crafting & Executing Strategy: The Quest for Competitive Advantage: Concepts and Cases. McGraw-Hill Education.

Sixth Term

Course Code: EMD202 [SEC] (L:2, T:1, P:0)
Course Title: Data Sciences VI-Artificial Intelligence
Course Description: This course provides an in-depth study of artificial intelligence (AI) techniques, algorithms, and applications. Students will learn the fundamentals of AI, including problem-solving, knowledge representation, machine learning, natural language processing, and robotics.
Course Outcomes:
CO1. Understand the principles and techniques of artificial intelligence.
CO2. Learn various AI algorithms and methodologies for problem-solving.
CO3. Gain hands-on experience with AI programming languages and tools.
CO4. Explore applications of AI across different domains.

Syllabus:
Unit 1: AI Problems, Task Domains of AI, AI Techniques: search knowledge, abstraction. Introduction to Intelligent program and Intelligent agents.
Unit 2: Problem Solving: Basic Problem-solving Method: state space search, problem characteristics, Production systems characteristics, Heuristic search Techniques: Hill climbing techniques, Best First search, A* Search, Problem Reduction: AO* Search, Constraint Satisfaction, Means7 End Analysis. Game Playing: Game Tree, Searching procedure Minimax, alpha-beta pruning
Unit 3: Knowledge Representation and Reasoning
Knowledge Representation issues. Knowledge Representation using Predicate Logic: Unification, resolution.   Rule based Systems: Forward versus backward reasoning, conflict resolution. Structured Knowledge Representation: Semantic Nets, Frames, conceptual dependency, scripts.
Unit 4: Handling uncertainty Non-Monotonic Reasoning, Probabilistic reasoning, use of certainty factors, fuzzy logic. Learning Concept of learning, learning automation, genetic algorithm, learning by inductions, neural nets, Expert Systems: Architecture, Domain Knowledge, Knowledge Acquisition, MYCIN

Reference/Text Books:
- Artificial Intelligence: A Modern Approach by Stuart Russell and Peter Norvig
- Deep Learning by Ian Goodfellow, Yoshua Bengio, and Aaron Courville
- Natural Language Processing with Python by Steven Bird, Ewan Klein, and Edward Loper

Course Code: EMD 204 [ICC] (L:2, T:1, P:0)

Course Title: Big Data & Knowledge Management

Course Description: The objective of the course Big Data & Knowledge Management is to provide students with a comprehensive understanding of the concepts, tools, and techniques related to handling and extracting value from large-scale data, commonly known as big data. The course aims to familiarize students with knowledge management practices that enable effective utilization of data assets for decision-making and organizational growth. It emphasizes the importance of data analytics, data mining, and knowledge extraction to enhance business intelligence, innovation, and strategic planning.

Course Outcomes: Upon successful completion of this course, students will be able to:

CO1. Understand the fundamental concepts and characteristics of big data and knowledge management.

CO2. Utilize big data technologies and tools to manage and analyze large and complex datasets.

CO3. Apply data mining and machine learning techniques to extract insights from big data.

CO4. Design and implement knowledge management strategies for efficient data utilization.

CO5. Employ data visualization methods to communicate meaningful information from big data analysis.

Syllabus:

Unit 1: Introduction to Big Data & Knowledge Management: Definition and Characteristics of Big Data, Key Challenges and Opportunities in Big Data Management, Basics of Knowledge Management and its Importance,

Unit 2: Big Data Technologies and Tools

Hadoop, MapReduce, and Distributed File Systems, NoSQL Databases and NewSQL, Apache Spark and In-Memory Computing

Unit 3: Data Mining and Machine Learning for Big Data

Data Preprocessing and Cleaning for Big Data, Classification and Clustering Techniques, Predictive Analytics and Recommender Systems

Unit 4: Knowledge Discovery and Extraction

Text Mining and Natural Language Processing (NLP), Web Mining and Social Media Analytics, Pattern Recognition and Data Visualization, Knowledge Capture, Organization, and Sharing, Tacit and Explicit Knowledge Management, Knowledge Repositories and Knowledge Transfer

Reference/Text Books:

- Marz, N., & Warren, J. (2015). Big Data: Principles and Best Practices of Scalable Real-Time Data Systems. Manning Publications.
- Loshin, D. (2014). Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph. Morgan Kaufmann.
- Tan, P.-N., Steinbach, M., & Kumar, V. (2019). Introduction to Data Mining. Pearson.
- Wiig, K. M. (1997). Knowledge Management Foundations: Thinking about Thinking - How People and Organizations Represent, Create, and Use Knowledge. Schema Press.
- Alavi, M., & Leidner, D. E. (2001). Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues. MIS Quarterly.

Course Code: EMDS211 [DSE] (L:3, T:0, P:0)
Course Title: Information and Project Management

Course Description: This course covers the principles and practices of information and project management, including project planning, scheduling, risk management, resource allocation, and stakeholder management. Students will learn how to manage projects effectively, ensuring that projects are delivered on time, within budget, and to the required quality standards.

Course Outcomes:

CO1.   Understand the principles and practices of project management
CO2.   Learn how to manage project scope, time, cost, quality, and risk
CO3.   Develop skills in project planning, scheduling, and resource allocation
CO4.   Understand stakeholder management and effective communication
CO5.   Learn best practices in project management methodologies and tools

Syllabus

Unit 1: Introduction to Project Management: Project Management concepts, Process Framework, Project Planning Life Cycle Models, Artifacts of the Project Management Process.

Unit 2: Project Planning and Scheduling: Project scope management, Work breakdown structure, Activity sequencing and scheduling, Critical path analysis

Unit 3: Resource Allocation and Risk Management: Resource allocation and leveling, Project risk management, Risk identification, analysis, and response planning, Project quality management

Unit 4: Stakeholder Management and Communication: Stakeholder analysis and management, Effective communication and collaboration, Change management, Introduction to information management, Information systems and data management, Data analytics and business intelligence, Cybersecurity and information governance

Reference/Text Books:

- Project Management: A Systems Approach to Planning, Scheduling, and Controlling by Harold Kerzner
- Information Management: Strategies for Gaining a Competitive Advantage with Data by William McKnight
- Effective Project Management: Traditional, Agile, Extreme by Robert K. Wysocki.

Course Code: EMDS212 [DSE] (L:3, T:0, P:0)
Course Title: Advanced Time Series and Forecasting
 Course Description:

 The objective of the Advanced Time Series and Forecasting course is to provide students with an in-depth understanding of time series analysis techniques and advanced forecasting methods. The course aims to develop students' skills in modeling and predicting time-dependent data patterns, enabling them to make accurate and informed forecasts. Students will learn advanced time series modeling techniques and gain hands-on experience in applying them to real-world data.

Course Outcomes: By the end of this course, students should be able to:
CO1.   Understand the fundamental concepts and principles of time series analysis.
CO2.   Apply statistical methods for analyzing and visualizing time series data.
CO3.   Identify different time series components and understand their implications.
CO4.   Build and evaluate forecasting models using classical time series methods.

CO5. Utilize advanced time series models, such as ARIMA, SARIMA, and exponential smoothing, for forecasting.

Syllabus :
Unit 1: Introduction to Time Series Analysis: Introduction to time series data and its characteristics, Time series components: trend, seasonality, and irregularity, Time series visualization and data preprocessing techniques
Unit 2: Classical Time Series Models: Autoregressive (AR) models and their properties Moving average (MA) models and their properties, Autoregressive Moving Average (ARMA) models, Model identification, estimation, and diagnostic checking
Unit 3: Advanced Time Series Models: Autoregressive Integrated Moving Average (ARIMA) models, Seasonal ARIMA (SARIMA) models, Exponential smoothing methods for time series forecasting
Unit 4: Seasonal Time Series Analysis: Seasonal decomposition of time series, Seasonal adjustment methods, such as X-12-ARIMA and STL, Seasonal forecasting techniques
Unit 5: Multivariate Time Series Analysis: Vector Autoregression (VAR) models and their applications, Granger causality and impulse response analysis, Forecasting with multivariate time series data, Evaluation and Performance of Time Series Forecasts, Accuracy measures for time series forecasts, Model selection and comparison techniques

Reference/ Text Books:
- Time Series Analysis and Its Applications: With R Examples by Robert H. Shumway and David S. Stoffer
- Forecasting: Principles and Practice by Rob J. Hyndman and George Athanasopoulos
- Introduction to Time Series Analysis and Forecasting by Douglas C. Montgomery, Cheryl L. Jennings, and Murat Kulahci
- Applied Time Series Analysis for the Social Sciences by Richard T. G. Walsh and John T. Scott
- Time Series Analysis: With Applications in R by Jonathan D. Cryer and Kung-Sik Chan

Course Code: EMDS213 [DSE] (L:3, T:0, P:0)
Course Title: Data Structure and Graph Algorithms for Data Sciences
Course Description: The objective of the Data Structure and Graph Algorithms for Data Sciences course is to provide students with a solid foundation in data structures and graph algorithms necessary for efficient data manipulation and analysis in the field of data sciences. The course aims to develop students' skills in implementing and analyzing data structures and algorithms to solve complex data-related problems. Students will gain practical knowledge and hands-on experience in handling and processing large datasets using appropriate data structures and graph algorithms.
Course Outcomes: By the end of this course, students should be able to:
CO1. Understand the fundamental concepts and principles of data structures and graph algorithms.
CO2. Implement and analyze various data structures, such as arrays, linked lists, stacks, queues, and trees.
CO3. Apply graph algorithms, including traversal, shortest path, and minimum spanning tree algorithms, to analyze and extract insights from graph-based data.
CO4. Evaluate the time and space complexity of algorithms and make informed decisions on their efficiency.
CO5. Utilize appropriate data structures and algorithms for efficient data manipulation and storage in data sciences.

Syllabus
Unit 1: Introduction to Data Structures: Introduction to data structures and their importance in data sciences, Arrays, linked lists, and their implementations, Stacks, queues, and their applications in data manipulation

Unit 2: Trees and Binary Search Trees: Binary trees and their properties, Binary search trees and their operations, Balanced binary search trees, such as AVL trees and Red-Black trees

Unit 3: Graph Theory Fundamentals: Introduction to graphs and their properties, Graph representations and graph traversal algorithms, Depth-First Search (DFS) and Breadth-First Search (BFS) algorithms, Social network analysis and community detection, Recommendation systems using graph algorithms

Unit 4: Shortest Path Algorithms: Dijkstra's algorithm for finding the shortest path, Bellman-Ford algorithm for negative weight edges, Floyd-Warshall algorithm for all pairs shortest path

Unit 5: Minimum Spanning Trees: Prim's algorithm for minimum spanning tree, Kruskal's algorithm for minimum spanning tree, Applications of minimum spanning trees in data sciences, Topological Sort

Reference/Text Books:
- Data Structures and Algorithms Made Easy in Java by Narasimha Karumanchi
- Algorithms in C++: Part 5: Graph Algorithms by Robert Sedgewick
- Introduction to the Design and Analysis of Algorithms by Anany Levitin
- Graph Algorithms in the Language of Linear Algebra by Jeremy Kepner and John Gilbert
- Data Structures and Algorithms in Python by Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser

Course Code: EMDS214 [DSE] (L:3, T:0, P:0)
Course Title: Advanced Machine Learning
Course Description: Data Sciences (Advanced Machine Learning) is an advanced course that provides students with a comprehensive understanding of advanced machine learning techniques and their applications. The course covers advanced topics such as deep learning, reinforcement learning, natural language processing, and time series analysis.

Course Outcomes:
CO1.   Understand the fundamental concepts and techniques of advanced machine learning
CO2.   Develop skills in designing and implementing machine learning algorithms
CO3.   Learn how to use popular machine learning libraries such as TensorFlow and PyTorch.
CO4.   Evaluate the interpretability of machine learning models trained using TensorFlow and PyTorch
CO5.   Develop critical thinking and problem-solving skills in advanced machine learning.

Syllabus:
Unit 1: Introduction to Advanced Machine Learning
Overview of Advanced Machine Learning Techniques, Applications of Advanced Machine Learning

Unit 2: Bayesian Learners Bayesian learners: Introduction, Bayes theorem and concept learning, maximum likelihood and least-squared error hypothesis, maximum likelihood hypothesis for predicting probabilities, minimum description length principle**.**
Unit 3: Deep Learning and Reinforcement Learning:

Convolutional Neural Networks, Recurrent Neural Networks, Autoencoders, Markov Decision Processes, Q-Learning, Deep Reinforcement Learning. Discovery and definition, in business problems; identification and determination in business; The learning task, Q learning, Non-deterministic rewards & actions, temporal difference learning.

Unit 4: Implementation of Advanced Machine Learning Techniques
Implementing Machine Learning Algorithms using TensorFlow and PyTorch, Model Optimization Techniques; applications in marketing and consumer applications; applications in finance, supply chain and other business domains.

Reference/Text Books:
- Deep Learning by Ian Goodfellow, Yoshua Bengio, and Aaron Courville.
- Machine Learning: A Probabilistic Perspective by Kevin P. Murphy
- Bayesian Reasoning and Machine Learning by David Barber
- Reinforcement Learning: An Introduction by Richard S. Sutton and Andrew G. Barto

Course Code: EMDS215 [DSE] (L:3, T:0, P:0)
Course Title: Cloud Computing
 Course Description: This course focuses on the study of High Performance Computing or Cloud Computing, which are critical technologies for processing large data sets and enabling complex computations. Students will learn the principles of cloud computing, parallel programming, and distributed systems. The course will also cover the use of cloud-based tools, software, and services to support computing and data analysis.

Course Outcomes:
CO1. Understand the principles of High Performance Computing or Cloud Computing
CO2. Learn how to design, develop, and deploy applications in a cloud-based environment
CO3. Gain practical experience with cloud-based tools, software, and services
CO4. Develop skills in parallel programming and distributed systems
CO5. Understand best practices for cloud computing security and compliance

Syllabus:
Unit 1: Introduction to Cloud Computing
Overview of Cloud Computing, Cloud Computing architecture, Cloud Computing service models, Cloud Computing deployment models
Unit 2: Cloud Computing Infrastructure
Cloud Computing providers, Virtualization and cloud computing, Storage and networking in the cloud, Security and compliance in the cloud
Unit 3: Parallel Programming and Distributed Systems
Parallel programming models, Distributed systems and architectures, Data-parallel and task-parallel programming, MapReduce and Hadoop
Unit 4: Cloud-based Applications and Services
Cloud-based application development, Web services and APIs, Big data processing and analytics, Machine learning and artificial intelligence in the cloud

Reference/Text Books:
- Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg, and Andrzej Goscinski
- High Performance Computing: Modern Systems and Practices by Thomas Sterling and Matthew Anderson
- Parallel Programming: Concepts and Practice by Sergiy Butenko and Panos Pardalos.

Course Code: EMDS216 [DSE] (L:3, T:0, P:0)
Course Title: Natural Language Processing
Course Description: The objective of the course is to provide an introduction to computation linguistics i.e. the study of computing systems that can process, understand or communicate in human language. Various Natural Language Processing problems, algorithms for effectively solving these problems, and evaluation methods are the core parts of the course.
Course Outcomes:
CO1. To demonstrate a comprehensive understanding of natural language processing fundamentals, including ambiguity, uncertainty, and linguistic structures.
CO2. Designing and implementing regular expressions for pattern matching and text processing tasks in natural language data.
CO3. To be able to analyze and parse natural language sentences using context-free grammars and parsing algorithms efficiently.
CO4. To cquire the skills to build probabilistic models such as n-grams and Hidden Markov Models for various natural language processing tasks, including part-of-speech tagging and language identification.

Syllabus:
Unit 1: Introduction: The study of Language, Introduction to NLP and various terms related to NLP-morphology, syntax, semantics, pragmatics, discourse, ambiguity. Regular Expression, Finite State Automata.
Unit 2. Word representation: Pre-processing: Tokenization, Lemmatization, Stemming. Frequency Based Methods: Count Vectorizer, Bag of Words, 1-hot encoding, TF, TF-IDF, Machine learning classifiers. Prediction Based Methods: Word Embeddings, LSTM/Transformer.
Unit 3. Lexical Semantics: Word Senses, WordNet, Synsets, Hypernyms, Hyponyms, Meronyms, Holonyms, Word Sense Disambiguation, Word Similarity, Semantic Role Labelling.
Unit 4 Natural language generation: Probabilistic Context-Free Grammars, Syntactic Parsing, Part- of-speech-tagging, Probabilistic Language Processing, N-gram language modelling. Encoder-decoder model for sequence-to-sequence learning, Attention mechanism
Unit 5. Applications of NLP: Intelligent Work Processors, Machine Translation, User Interfaces, Man-Machine Interfaces, Natural language Question-Answering Systems, Speech Recognition, Commercial use of NLP, Semantic Interpretation, Information Retrieval.
Reference/Text Books:
- James Allen, Natural Language Understanding, 2/e, Pearson Education ISBN 13: 9788131708958), 2003

- Foundation of Statistical Natural Language Processing, Manning and Schutze, (ISBN-13: 978-0262133609), 1998
- D. Jurafsky, J. H. Martin, Speech and Language Processing, Pearson Education, (ISBN-13: 978-8131716724), 2008
- Bharati, Chaitanya and Sangal: Natural Language Processing- a Paninian perspective(ISBN-13: 978-8120309210), 1995
- Leonard Bolc. (Ed.): Natural Language Parsing Systems, Springer Verlag, (ISBN-13: 978-0387175379) 1986

Course Code: EMDS217 [DSE] (L:3, T:0, P:0)
Course Title: Decision Making Techniques

Course Description:
This course provides a comprehensive introduction to various optimization and decision-making methodologies. It covers the basics of linear programming, including problem formulation, the simplex method, duality, and transportation and assignment problems. The course introduces the concept of utility theory, focusing on multi-attribute utility theory and various weighted functions. models for performance evaluation.

Course Outcomes: Upon completing this course, students will be able to:
  CO1. Formulate and solve linear programming problems using the simplex method.
  CO2. Apply utility theory and multi-attribute utility theory to evaluate decision-making scenarios.
  CO3. Utilize the Analytic Hierarchy Process (AHP) for ranking and weighting information.
  CO4. Implement the TOPSIS and VIKOR methods for determining optimal solutions in multi-criteria decision making.
  CO5. Analyze and measure performance efficiency using Data Envelopment Analysis (DEA) models.

Syllabus:
Unit 1: Introduction to Linear programming, problem formulation, simplex method, Duality, Transportation and Assignment Problems.
Unit2: Concept of utility theory, Multi attribute utility theory and various weighted functions.
Unit 3: Analytic hierarchy process (AHP) for ranking and weighting information using eigen vector method and approximation methods, Ranking and weighting information using Technique for order of preference by similarity to ideal solution (TOPSIS) method, VIseKriterijumska Optimizacija I Kompromisno Resenje (VIKOR) method for ranking and determining the solution closest to ideal solution.
Unit 4: Data envelopment analysis (DEA): Charne's, Cooper and Rhodes (CCR) model, Banker, Charne's and Cooper (BCC) model

Reference/Text Books:
- Po-Lung Yu (2012) Multiple-Criteria Decision Making: Concepts, Techniques, and Extensions: Springer
- Tzeng, G.-H., & Huang, J.-J. (2011). Multiple attribute decision making: methods and

applications. Florida: CRC Press.

- Cooper, W. W., Seiford, L. M., & Tone, K. (2007). Data envelopment analysis: a comprehensive text with models, applications, references and DEA- solver software. New York: Springer.
- Steuer, R. E. (1986). Multiple criteria optimization-theory, computation, and application.
- Wiley Series in Probability and Mathematical Statistics-Applied, Wiley.

Course Code: EMDS218 [DSE] (L:3, T:0, P:0)
Course Title: Swarm Optimization and Evolutionary Computing
Course Description: The "Evolutionary Computing and Optimization" course provides an in-depth exploration of nature-inspired algorithms for solving complex global optimization problems. It introduces the foundational concepts of evolutionary computing, covering evolutionary strategies, fitness functions, and learning classifier systems. Students delve into swarm intelligence, focusing on the Particle Swarm Optimization algorithm and its application to optimization problems.
Course Outcomes: Upon completing this course, students will be able to:

CO1. Implement and analyze evolutionary algorithms for global optimization problems.
CO2. Apply Particle Swarm Optimization to various optimization challenges.
CO3. Utilize genetic algorithms for solving complex problems involving population-based search strategies.
CO4. Integrate hybrid and multi-objective evolutionary algorithms in practical applications.
CO5. Employ recent nature-inspired algorithms to real-world optimization tasks in diverse fields.

Syllabus:
Unit 1: Introduction to Evolutionary Computing Global Optimization, Components of an evolutionary algorithm, Evolution strategies, Fitness Functions, Learning Classifier systems, Parameter Control.
Unit2: Swarm Intelligence Introduction to Swarm Intelligence and its application to optimization problems, Particle Swarm Optimization algorithm, position and velocity updation.
Unit 3: Genetic Algorithm Genetic algorithm basics: Population and generation of chromosomes, Fitness function, survival of the fittest, reproduction, cross-over and mutation, Genetic algorithm convergence, Genetic programming.
Unit 4: Hybrid Methods and Multi-objective Evolutionary Algorithms Variants of Particle Swarm optimization and Genetic Algorithm, Hybridization of Particle Swarm and Genetic based optimizations.
Unit 5: Recent nature-inspired evolutionary algorithms, Cuckoo search algorithm, Artificial Bee Colony Optimization, Ant Colony Optimization, Fire-fly algorithm, Bacterial Foraging.

Reference/Text Books
- "Computational Intelligence", Second Edition, by Andries P. Engelbrech, John Wiley & Sons, ISBN: 978-0-470-03561-0, 2008
- "Introduction to Evolutionary Computing", A.E Eiben and J.E. Smith, Springer, second edition, 2007

- "Evolutionary Computation", D. Dumitrescu et al. CRC Press, 2000

Course Code: EMDS219 [DSE] (L:3, T:0, P:0)
Course Title: Predictive Modeling

Course Description: This offers a comprehensive exploration of regression analysis, correlation, and statistical testing techniques. It covers the key concepts and goals of regression analysis, regression models, and the role of data in analysis. Additionally, it delves into data preparation, including measures of central tendency, dispersion, histogram analysis, outlier analysis, and correlation analysis. The course introduces statistical tests and attribute reduction methods like principal component analysis.

Course Outcomes: Upon completing this course, students will be able to:

CO1.   Understand regression analysis principles for informed decision-making.
CO2.   Utilize statistical tools like SPSS for data preparation and analysis.
CO3.   Identify and mitigate bias while interpreting correlation in data analysis.
CO4.   Analyze complex data sets using regression and mean comparison techniques.
CO5.   Apply non-parametric models and factor analysis to diverse data scenarios.

Syllabus:
Unit 1: Introduction, Classification & prediction, Key ingredients of predictive models, Goals of a regression analysis. Regression models, Data in a regression analysis.

 Unit 2:   Data Preparation & Statistical Tests , Analyzing the metric data: Measures of central tendency, measures of dispersion, data distribution, histogram analysis, outlier analysis, correlation analysis. Attribute Reduction Methods: Univariate Analysis, Correlation-based Feature Selection, Attribute Extraction: Principal Component Analysis. Overview of statistical tests: Categories, one-tail and two tail, Type I and Type II errors, interpreting significance results.

Unit 2: Bias and Correlation, Concept of Bias, Spotting and reducing bias, Correlation: Modelling Relationships Data Entry for Correlation Analysis Using SPSS, Bivariate Correlation, Partial Correlation, Comparing Correlations, Calculating the Effect Size, Correlation Coefficients.

Unit 3: Regression and Comparison of means, Regression Using SPSS: One Predictor, Multiple Regression, Regression with Several Predictors Using SPSS, Interpreting Multiple Regression. Comparing Two Means: The t-test, Assumptions, Independent t-test using SPSS, Paired sample t-test using SPSS., Logistic Regression.

Unit 4: Non-parametric Models ,When to Use Non-parametric Tests, General Procedure on Non-parametric Tests in SPSS, Comparing Two Independent Conditions: The Wilcox Rank-sum Test and Mann-Whitney Test, Comparing Two Related Conditions: the Wilcoxon Signed-rank Test, Differences Between Several Independent Groups: The Kruskal-Wallis Test, Differences Between

Several Related Groups: Friedman's ANOVA, Exploratory Factor Analysis When to use Factor Analysis, Factors and Components, Discovering Factors.

Reference/Text Books

- Field, A. (2013), Discovering Statistics using IBM SPSS Statistics, Sage Publications, Fourth Edition.
- Chatterjee, S. and Hadi, A. (2012). Regression Analysis by Example, John Wiley, Fifth Edition.
- Frees, E. E, Derrig, E. W, and Meyers, G. (2014). Predictive Modeling Techniques
- in Actuarial Science, Vol. I: Predictive Modeling Techniques. Cambridge University Press.
- Siegel, E. (2016), Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die, Wiley.
- Meyers, L.S., Gamst, G.C. &Guarino, A.J. (2015), Performing Data Analysis using IBM SPSS, Wiley.
- Cunningham J.B. (2012), Using SPSS: An Interactive Hands-on Approach, SAGE South Asia.

Course Code: EMDS220 [DSE] (L:3, T:0, P:0)
Course Title: Recommender Systems

Course Description: This comprehensive course provides an in-depth exploration of recommender systems, covering foundational concepts, methodologies, and evaluation techniques. Participants will gain a solid understanding of recommender system functions, linear algebra notation, collaborative filtering, content-based recommendation, knowledge-based recommendation, and evaluation methods.

Course Outcomes: Upon completing this course, students will be able to:

CO1. Utilize the foundational concepts, methodologies, and evaluation techniques of recommender systems.

CO2. Expertise in implementing collaborative filtering techniques for personalized recommendations.

CO3. Gain skill in designing content-based recommendation systems based on item profiles and user preferences.

CO4. Mastery of knowledge-based recommendation methodologies for personalized and context-aware suggestions.

CO5. Ability to critically evaluate recommender systems for accuracy, relevance, and user satisfaction.

Syllabus:

Unit 1: Introduction: Recommender system functions, Linear Algebra notation: Matrix addition, Multiplication, transposition, and inverses; covariance matrices, Understanding ratings, Applications of recommendation systems, Issues with recommender system.

Unit 2: Collaborative Filtering: User-based nearest neighbour recommendation, Itembased nearest neighbour recommendation, Model based and pre-processing based approaches, Attacks on collaborative recommender systems

Unit 3: Content-based recommendation: High level architecture of content-based systems, Advantages and drawbacks of content-based filtering, Item profiles, Discovering features of documents, Obtaining item features from tags, Representing item profiles, Methods for learning user profiles, Similarity based retrieval, Classification algorithms.

Unit 4: Knowledge based recommendation: Knowledge representation and reasoning, Constraint based recommenders, Case based recommenders.

Unit 5: Evaluating Recommender System: Introduction, General properties of evaluation research, Evaluation designs, Evaluation on historical datasets, Error metrics, Decision-Support metrics, User-Centred metrics.

Reference/Text Books:
- Jannach D., Zanker M. and FelFering A., Recommender Systems: An Introduction, Cambridge University Press(2011), 1st ed.
- Ricci F., Rokach L., Shapira D., Kantor B.P., Recommender Systems Handbook, Springer(2011), 1st ed.
- Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems For Learning, Springer (2013), 1st ed

Course Code: EMDA211 [DSE] (L:3, T:0, P:0)
Course Title: Pricing Analytics
Course Description:
The course aims to impart knowledge to perform both price analysis along with cost analysis to ensure that pricing is correct with respect to its reasonableness, profitability and customer expectations. The course would determine the choice of best pricing framework by evaluating various pricing strategies, price levels and pricing metrics.

Course Outcomes:
1. Understand the importance of pricing decisions in business strategy and profitability.
2. Analyze pricing data using statistical and analytical techniques to derive actionable insights.
3. Explore different pricing strategies and models employed in various industries.
4. Apply pricing analytics tools and methodologies to optimize pricing decisions.
5. Evaluate the impact of pricing on consumer behavior, market dynamics, and competitive positioning.

Syllabus:
Unit 1: Introduction: Tactical Pricing and Pricing Strategy
Changing the Pricing Game to Drive Profitable Growth, Why Pricing Is Often Ineffective, The Cost-Plus Delusion, Customer-Driven Pricing, Competition-Driven Pricing, The Discipline of Strategic Pricing. Pricing Strategy: An Integrated Approach, The Strategic Pricing Pyramid, Value Creation, Price Structure, Price and Value Communication, Pricing Policy, Price Level.

Unit2: Value Creation and Price Structure
The Source of Pricing Advantage, The Role of Value in Pricing, Economic Value Estimation: An Illustration, The High Cost of Shortcuts, How to Estimate Economic Value, The Strategic Importance of EVE,Value-Based Market Segmentation; Price Structure: Segmentation Pricing

Tactics for Separating Markets, Price Metrics, Performance-Based Metrics,The Need for Cost-Based Metrics: Segmentation Pricing Fences,Segmenting by Buyer Identification, by Purchase Location, by Time of Purchase, by Purchase Quantity, by Product Bundling, by Tie-ins and Metering, by Product Design, Importance of Segmented Pricing

Unit 3: Pricing policy & Price Communication
Strategies to Influence Willingness-to-Pay, Value Communication, The Cost-Benefit Mix
Pricing Policy- Managing Customer Expectations and Behaviors, Organizing for Policy
Pricing, Creating and Managing Pricing Policies Strategically, Diagnosis, Policy
Development, Implementing Policies

Unit 4: Price Levels
Price Level: Finding the Right Price for the Right Customer, The Price-Setting Process, Preliminary Segment Pricing, Price Optimization, Implementing New Prices.

Reference/Text Books
- Nagle, T., Hogan J., Zale J. (2013), The strategy and tactics of pricing, Routledge, Fifth Edition.
- Smith, T.J. (2012), Pricing Strategy: Setting Price Levels, Managing Price Discounts and Establishing Price Structures, Cengage Learning, First Edition.
- Ferguson, M. &Bodea, T. (2012), Pricing Segmentation and Analytics, Business Expert Press.
- Meehan, J.M., Simonetto, M., MOntan, L. &Goodin, C. (2011), Pricing and Profitability Management: A Practical Guide for Business Leaders, John Wiley & Sons.
- Ferguson, M. &Bodea, T. (2014), Segmentation, Revenue and Pricing Analytics, Routledge.
- Schindler, M. (2012), Pricing Strategies: A Marketing Approach, SAGE Publications, First Edition.

Course Code: EMDA212 [DSE]   (L:3, T:0, P:0)
Course Title: Marketing, Web and Social Media Analytics
Course Description: This course covers the principles and practices of marketing, web, and social media analytics. Students will learn how to measure and analyze online marketing campaigns, track website traffic, and monitor social media engagement. The course will also cover data visualization, data interpretation, and best practices in digital marketing.

Course Outcomes:
1. Understand the principles of marketing, web, and social media analytics
2. Learn how to measure and analyze online marketing campaigns
3. Track website traffic and monitor social media engagement
4. Develop skills in data visualization and data interpretation
5. Learn best practices in digital marketing

Syllabus:
Unit 1: Introduction to Marketing Analytics
Overview of marketing analytics, Marketing metrics and KPIs, Customer segmentation and profiling
Unit 2: Web Analytics

Introduction to web analytics, Website traffic tracking, Conversion tracking and optimization, A/B testing and multivariate testing

Unit 3: Social Media Analytics

Introduction to social media analytics, Social media monitoring and listening, Social media engagement tracking, Social media advertising analytics

Unit 4: Practices in Digital Marketing

Overview of digital marketing channels, Digital marketing strategy development, Measuring digital marketing success, Future trends in digital marketing

Reference / Text Books:
- Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity by Avinash Kaushik
- Social Media Analytics: Effective Tools for Building, Interpreting, and Using Metrics by Marshall Sponder
- Digital Marketing Analytics: Making Sense of Consumer Data in a Digital World by Chuck Hemann and Ken Burbary

Course Code: EMDA213 [DSE] (L:3, T:0, P:0)

Course Title: HR Analytics

Course Description: This course provides an introduction to HR analytics, which involves the use of data analytics and machine learning techniques to analyze HR data and make informed decisions. Students will learn about the principles of HR analytics, the techniques and tools used to analyze HR data, and the challenges and limitations of HR analytics. The course will also cover case studies of successful HR analytics applications and ethical considerations in the use of HR analytics.

Course Outcomes:
1. Understand the principles of HR analytics
2. Learn the techniques and tools used to analyze HR data
3. Understand the challenges and limitations of HR analytics
4. Learn about successful HR analytics applications through case studies
5. Gain hands-on experience working with HR analytics tools and technologies

Syllabus:

Unit 1: Introduction to HR Analytics

Overview of HR analytics and its applications, Data analytics and machine learning techniques used in HR analytics, Types of HR data and their characteristics, HR analytics and organizational performance

Unit 2: Assessing an HR program, Engagement and turnover, Finding the money in analytics, dispeller of myths, linking HR data to operational performance, building your linkage map

Unit 3: Data Challenges and Building capabilities, Data Challenges, Hiring analytical employees, the analytical leader.

Unit 4: Strategic Workforce Planning, its evolution, purpose, how will it help my company, the role of business strategy, determine the roles of interest, establish the current state, determine desired forecasting scenarios, perform gap assessments Benchmarking and best practices, Staffing, supply

and demand forecasting, Selling the concept, challenges to successful implementation, implementation planning, when selling the concept just didn't work, measuring success, roles and responsibilities, Workforce planning connection to HR activities.

Reference/Text Books:
- Smith, T. (2013), HR Analytics: The What, Why & How, CreateSpace Independent Publishing Platform.
- Smith, T. (2012), Strategic Workforce Planning: A practical guide, CreateSpaceIndependent Publishing Platform.
- Edwards, M. & Edwards, K. (2016), Predictive HR Analytics: Mastering the HR Metric, Kogan Page Limited.
- Soundarajan, R. & Singh, K. (2016), Winning on HR Analytics: Leveraging Data for Competitive Advantage, SAGE Publications.
- Bhattacharyya, D.K. (2017), HR Analytics: Understanding Theories and Applications, SAGE Publications.
- Bassi L., Carpenter, R. &McMurrer, D. (2012), HR Analytics Handbook, McBassi& Company.

Course Code: EMDA214 [DSE] (L:3, T:0, P:0)
Course Title: CRM and Marketing Analytics
Course Description: The objective of the CRM and Analytics course is to provide students with a comprehensive understanding of Customer Relationship Management (CRM) strategies and the utilization of analytics in managing customer data. The course aims to develop students' skills in leveraging CRM systems, analyzing customer data, and applying analytics techniques to enhance customer relationships and drive business growth.

Course Outcomes: By the end of this course, students should be able to:
1. Understand the concept and importance of Customer Relationship Management (CRM).
2. Analyze customer data and derive actionable insights using CRM systems.
3. Apply analytics techniques to segment customers and target specific market segments.
4. Develop customer loyalty and retention strategies using CRM and analytics.
5. Utilize CRM analytics for personalized marketing and customer experience management.

Syllabus:
Unit 1: Introduction to CRM and Customer Analytics, Introduction to Customer Relationship Management (CRM) and its significance, Understanding customer analytics and its role in CRM Key components of CRM systems and data management
Unit 2: Customer Data Analysis and Insights, Data collection and cleansing for CRM analytics Exploratory data analysis techniques for customer data, Customer segmentation and profiling using analytics
Unit 3: Customer Retention and Loyalty Strategies, Analyzing customer churn and retention rates Designing customer loyalty programs and strategies, Cross-selling and upselling techniques using CRM analytics
Unit 4: Personalized Marketing and Customer Experience Management, Targeted marketing campaigns using customer data, Customer journey mapping and experience enhancement Personalization strategies and one-to-one marketing

Unit 5: CRM Analytics for Sales and Revenue Optimization, Sales forecasting and pipeline management, Pricing optimization and revenue management, Analyzing sales performance using CRM analytics, Predictive Analytics in CRM

Reference/Text Books:
- Customer Relationship Management: Concepts and Technologies by Francis Buttle
- Customer Analytics for Dummies by Jeff Sauro and Michael H. Lowenstein
- CRM at the Speed of Light: Essential Customer Strategies for the 21st Century by Paul Greenberg
- Data-Driven: Creating a Data Culture by Hilary Mason and DJ Patil
- Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die by Eric Siegel

Course Code: EMDA215 [DSE]   (L:3, T:0, P:0)
Course Title: Retail Analytics
Course Description: The objective of the course Retail Analytics is to equip students with the knowledge and skills to effectively analyze data in the retail industry. The course aims to provide an understanding of the concepts, techniques, and tools used in retail analytics to support data-driven decision-making. It emphasizes the application of analytics to optimize retail operations, improve customer experience, and enhance overall business performance. By the end of the course, students will be able to leverage data analytics to gain insights, solve retail-related problems, and drive strategic initiatives in the retail sector.

Course Outcomes: Upon successful completion of this course, students will be able to:
1. Understand the significance of data analytics in the retail industry.
2. Analyze retail data using various statistical and data mining techniques.
3. Utilize retail analytics to forecast demand and optimize inventory management.
4. Apply customer analytics to enhance customer segmentation and personalization.
5. Identify opportunities to improve retail performance and efficiency through data insights.

Syllabus:
Unit 1: Introduction to Retail Analytics, Definition and Scope of Retail Analytics
Role of Analytics in Retail Decision Making, Key Performance Indicators (KPIs) in Retail
Unit 2: Data Collection and Preparation, Data Sources and Data Collection Methods in Retail
Data Cleaning and Preprocessing Techniqu es, Data Integration and Transformation
Unit 3: Descriptive Analytics in Retail, Data Visualization for Retail Insights, Retail Data Exploration and Summary Statistics, Customer Segmentation and Market Basket Analysis
Unit 4: Predictive Analytics in Retail, Demand Forecasting Techniques, Inventory Optimization and Supply Chain Analytics, Price Optimization and Revenue Management
Unit 5: Customer Analytics in Retail, Customer Lifetime Value (CLV) Analysis
Customer Churn Prediction, Personalization and Recommendation Systems, Store Performance Analysis, Retail Workforce Management and Optimization, Fraud Detection and Loss Prevention

Reference/Text Books:
- Rud, O. P., & Iyer, B. (2019). Retail Analytics: The Secret Weapon. Wiley.
- Davenport, T. H., & Harris, J. G. (2018). Competing on Analytics: Updated, with a New Introduction. Harvard Business Press.

- Baesens, B., Roesch, E., & Verstraeten, G. (2017). Analytics in a Big Data World: The Essential Guide to Data Science and its Applications. John Wiley & Sons.
- Levine, M. D., Stephan, D. F., & Szabat, K. A. (2019). Statistics for Managers Using Microsoft Excel. Pearson.
- Provost, F., & Fawcett, T. (2013). Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking. O'Reilly Media.

Course Code: EMDA216 [DSE] (L:3, T:0, P:0)
Course Title: Operations and Supply Chain Analytics
Course Description: This course provides an introduction to operations and supply chain analytics, which involves the use of data analytics and machine learning techniques to improve operational efficiency and supply chain performance. Students will learn about the principles of operations and supply chain analytics, the techniques and tools used to analyze operations and supply chain data, and the challenges and limitations of operations and supply chain analytics. The course will also cover case studies of successful operations and supply chain analytics applications and ethical considerations in the use of operations and supply chain analytics.

Course Outcomes:
1. Understand the principles of operations and supply chain analytics
2. Learn the techniques and tools used to analyze operations and supply chain data
3. Understand the challenges and limitations of operations and supply chain analytics
4. Learn about successful operations and supply chain analytics applications through case studies
5. Gain hands-on experience working with operations and supply chain analytics tools and technologies

Syllabus:
Unit 1: Introduction to Operations and Supply Chain Analytics
Forecasting for Supply Chain Planning and Management: Introduction to forecasting, same case studies, time series data, some simple forecasting methods. The forecaster's toolbox: Time series graphics, seasonal or cyclic? Autocorrelation, forecast residuals, white noise, evaluating forecast accuracy. Introduction to Multiple Regression and Stepwise Selection of Predictive Variables, Model Overfitting, the Parsimony Principle and Model CrossValidation, Selection of Variates in Linear Regression: Forward, Backward and Best Subset Selection, Model Shrinkage Methods and Selection of Variates in Linear Regression: The Lasso, Using Cross-Validation for Model Selection in The Lasso.

Unit 2: Demand Forecasting
Introduction to Demand Forecasting Simple Exponential Smoothing Model FPP, Holt's
Model and Holt-Winters Model FPP, State-Space Approach to Exponential Smoothing.

Unit 3: Forecasting Models
Hierarchical Forecasting Models Top-Down, Bottom-Up, and Middle-Out Approaches to Forecasting, Modeling Interventions: Model Selection and Calibration, Modeling Interventions: Forecasting.

Unit 4 Managing Cross-Functional Drivers in Supply Chain Sourcing decisions in a supply chain, pricing and revenue management in a supply chain, information technology in a supply chain, coordination in a supply chain, Aggregate production Planning & Inventory Management Forecasting Aggregate Production Planning: Tradeoffs and Decision Levers, Linear Programming, Demand Shaping, Pricing and Advertising

Reference/Text Books:
- Hyndman, R. J., &Athanasopoulos, G. (2014). Forecasting: principles and practice, Online OpenAccess Textbooks.
- James, G., Witten, D., Hastie, T., &Tibshirani, R. (2013). An introduction to
- statistical learning: with application in R, Springer, New York.
- Makridakis, S., Wheelwright, S. C., & Hyndman, R. J. (1997). Forecasting methods and applications. John Wiley & Sons. Third Edition.
- Nahmias, S. (2008). Production and operations analysis, McGraw-Hill/Irwin, Sixth
- Edition..

Course Code: EMDA217 [DSE] (L:3, T:0, P:0)
Course Title: Semantic Web and Web Mining
 Course Description: The objective of the course is to learn the use of data mining techniques for structuring and organizing unstructured sources such as text andWeb data into meaningful machine processable information; computational aspects of information extraction and data linkage; discovery and prediction tasks where text serves as data.

Course Outcomes:
CO1.   Understand and apply foundational WWW technologies and protocols for effective web resource identification and utilization.
CO2.   Perform advanced text analysis techniques, including indexing, lexical processing, and content-based ranking, for improved information retrieval.
CO3.   Implement link analysis algorithms and advanced crawling techniques to enhance web data extraction and exploration.
CO4.   Integrate and model semantic web data using RDF, OWL, and other tools to enable meaningful data relationships and interoperability.
CO5.   Utilize semantic web technologies to publish, query, and manage linked data, ensuring robust data integration and application.hands-on experience working with social network analytics tools and technologies

Syllabus:
Unit 1: WWW technologies & Web Graphs, Web Documents, Resource Identifiers: URI, URL, URN. Protocols, Log files, Search engines. Internet and Web Graphs, Generative models, Applications.
Unit 2: Text Analysis
Indexing, Lexical Processing, Content-based Ranking, Probabilistic retrieval, latent semantic analysis, text categorization, exploiting hyperlinks, document clustering, Information Extraction.
Unit 3: Link Analysis and Advanced crawling Techniques Link Analysis introduction: Early approaches, nonnegative matrices and dominant eigenvectors, hubs and authorities, Pagerank,

stability, probabilistic link analysis, limitations. Advanced Crawling Techniques: Selective crawling, Focused crawling, Distributed Crawling, Web Dynamics.

Unit 4: Introduction to Semantic Web Data Integration across the Web, Traditional Data Modelling methods, Semantic Relationships, Metadata, Building the unexpected, Perpetual Beta. Expression Meaning: An Example, building a simple triple store, merging graphs, adding and querying movie data, Ontology and Publishing Semantic Data What Is It Good For?, An Introduction to Data Modeling, Just Enough OWL, Using Protégé, Just a Bit More OWL, Some Other Ontologies, Embedding Semantics, Dealing with Legacy Data, RDF Lib to Linked Data, RDF Object Examples, RDF Object Framework, How RDF Object Works.

Reference/Text Books:
- Seqaran, T., Evans, C. & Taylor, J. (2009), Programming the Semantic Web: Build Flexible Applications with Graph Data, O Reilly Publications.
- Baldi, P., Frasconi, P. & Smyth, P. (2003), Modeling the Internet and the Web: Probabilistic Methods and Algorithms, Foundations of Statistical Natural
- Szeredi, P., Lukacsy, G. & Benko, T. (2014)The Semantic Web Explained: The Technology and Mathematics behind Web 3.0, Cambridge University Press.
- Gartner, R. (2016), Metadata: Shaping Knowledge from Antiquity to the Semantic Web, Springer.

Course Code: EMDA218 [DSE]   (L:3, T:0, P:0)
Course Title: Financial Analytics
Course Description: This course provides an in-depth understanding of financial analytics, which involves the application of data analytics and machine learning techniques to financial data to make better business decisions. Students will learn how to use various financial data analytics tools, techniques and concepts to analyze data, and gain hands-on experience working with financial data analytics software.

Course Outcomes:
At the end of course student will be able to:
CO1. Assess financial evaluation of a scenario given historical data.
CO2. Learn various portfolio models.
CO3. Understand the valuation of options and bonds.
CO4. Learn simulation of stock prices.

Unit 1: Corporate Finance and Valuation – I :Basic Financial Calculations: Overview, Present Value and Net Present Value, Internal Rate of Return (IRR) and Loan Tables, Multiple IRR, Flat Payment Schedules, Future Values and Applications, Pension Problem, Continuous Compounding, Discounting Using Dated Cash Flows. Corporate Valuation Overview: Four Methods to Compute Enterprise Value, Using Accounting Book Values to Value a Company, Efficient Markets Approach, Enterprise Value & Free Cash Flows, Consolidated Statement of Cash Flows. Calculating the Weighted Average Cost of Capital (WACC): Overview, Computing Firm's Equity, Firm's Debt, Firm's Tax Rate, Firm's Cost of Debt, Firm's Cost of Equity, Implementing the Gordon Model.

Unit 2: Corporate Finance and Valuation – II

Valuation Based on the Consolidated Statement of Cash Flows: Overview, Free Cash Flow (FCF): Measuring the Cash Produced by the Business, Reverse Engineering the Market Value. Pro Forma Financial Modeling: Overview, How Financial Models Work: Theory and an Initial Example, Free Cash Flow (FCF): Measuring Cash Produced by Business, Using FCF to Value the Firm, Valuation Procedure, Modeling of Fixed Assets, Sensitivity Analysis, Debt as a Plug, Incorporating in Pro Forma.

Unit 3 : Portfolio Models

Portfolio Models—Introduction: Overview, Computing Returns for Apple (AAPL) and Google (GOOG), Portfolio Means and Variances, Envelope Portfolios. Calculating Efficient Portfolios: Overview, Definitions and Notation, Five Propositions on Efficient Portfolios and the CAPM. Calculating the Variance-Covariance Matrix: Overview, Computing the Sample Variance-Covariance Matrix, Correlation Matrix, Computing the Global Minimum Variance Portfolio (GMVP),Four Alternatives to the Sample Variance Covariance, Using Option Information to Compute the Variance Matrix.

Unit 4: Valuation of Options

Introduction to Options: Overview, Basic Option Definitions, Option Payoff and Profit Patterns, Option Strategies, Option Arbitrage Propositions. The Binomial Option Pricing Model: Overview, Two-Date Binomial Pricing, State Prices. The Black-Scholes Model: Overview, The Black-Scholes Model, Black-Scholes Pricing Function, Calculating the Volatility, Implied Volatility, Dividend Adjustments to the Black-Scholes, Pricing Structured Securities, Bang for the Buck with Options, Black (1976) Model for Bond Option Valuation.

Unit 5: Valuing Bonds

Duration: Overview, Duration Patterns, Bond with Uneven Payments, Non-Flat Term Structures and Duration. Immunization Strategies: Overview, Model of Immunization, Convexity. Modeling the Term Structure: Overview, Basic Example, Several Bonds with the Same Maturity, Fitting a Functional Form to the Term Structure, The Properties of the Nelson-Siegel Term Structure, Term Structure for Treasury Notes, Monte Carlo Methods

Reference /Text Books

- Benninga, S. (2014), Financial Modeling, MIT Press, Fourth Edition.
- Winston, W. (2010), Financial Models Using Simulation and Optimization II, Palisade Corp.
- Lemieux, V.L. (2012), Financial Analysis and Risk Management: Data
- Governance, Analytics and Life Cycle Management, Springer.
- Van Deventer, D.R. & Imai, K. (1996), Financial Risk Analytics: A Term Structure
- Model Approach for Banking, Insurance and Investment Management, Irwin Professional Publishing.
- Ryzhov, P. (2013), Haskell Financial Data Modeling and Predictive Analytics, Packt Publishing.

Course Code: EMDA219   (L:3, T:0, P:0)
Course Title: Cyber Analytics
Course Description: This course provides an introduction to cyber analytics, which involves the use of data analytics and machine learning techniques to detect and prevent cyber attacks. Students will learn about the principles of cyber analytics, the techniques and tools used to analyze cyber data, and the challenges and limitations of cyber analytics. The course will also cover case studies of successful cyber analytics applications and ethical considerations in the use of cyber analytics.
Course Outcomes:
CO1.   Understand the principles of cyber analytics
CO2.   Learn the techniques and tools used to analyze cyber data
CO3.   Understand the challenges and limitations of cyber analytics
CO4.   Learn about successful cyber analytics applications through case studies
CO5.   Gain hands-on experience working with cyber analytics tools and technologies

Syllabus:
Unit 1: Introduction to Cyber Analytics
Overview of cyber analytics and its applications, Data analytics and machine learning techniques used in cyber analytics, Types of cyber-attacks and their characteristics, Cybersecurity and privacy concerns.
Unit 2: Cyber Data Analytics Techniques
Data processing and cleaning techniques, Descriptive and predictive analytics, Machine learning techniques for cyber analytics, Use cases of cyber analytics techniques in detecting and preventing cyber attacks.
Unit 3: Cyber Analytics tools
Overview of popular cyber analytics tools and technologies, Introduction to Splunk, ELK Stack, and other cybersecurity tools.
Unit 4: Applications of Cyber Analytics
Successful applications of cyber analytics in various domains, Future directions and emerging trends in cyber analytics, Ethical considerations in the use of cyber analytics, Hands-on exercises with real-world case studies.

Reference/Text Books:
- Cyber Analytics: A Big Data Approach to Cybersecurity by Mohit Arora and Samir Shah
- Data Analytics for Cybersecurity: Concepts, Techniques, and Tools by Jesus Mena
- Cybersecurity Analytics: Technology, Automation, and Real-Time Analysis by Ridhima Sharma and Madhusudan Singh

Course Code: EMDA220   (L:3, T:0, P:0)
Course Title: Advanced Database Management Systems
Course Description: This course delves into advanced concepts of SQL and database management, covering topics such as SQL data types, schemas, and advanced features. It explores query processing and optimization techniques, ensuring efficient database operations. The recovery system unit addresses various failure classifications and recovery strategies, emphasizing log-based and

advanced recovery techniques. The course also examines database-system architectures, including centralized, client-server, parallel, and distributed systems, highlighting the design and functionality of parallel databases and various forms of parallelism.

Course Outcomes:
CO1. Demonstrate proficiency in advanced SQL, including data types, schemas, integrity constraints, and recursive queries.
CO2. Apply query optimization techniques to enhance database performance and efficiency.
CO3. Implement robust recovery strategies to maintain database integrity and availability in case of failures.
CO4. Analyze and design various database-system architectures, understanding their benefits and limitations.
CO5. Evaluate and utilize parallelism techniques to optimize database operations in large-scale and distributed environments.

Syllabus:
Unit 1: Advanced SQL : SQL Data Types and Schemas, Integrity Constraints, Authorization, Embedded SQL, Dynamic SQL, Functions and Procedural Constructs, Recursive Queries, Advanced SQL Features

Unit 2: Query Processing and Query Optimization: Measures of Query Cost, Selection Operation, Sorting, Join Operation, Other Operations, Evaluation of Expressions, Transformation of Relational Expressions, Estimating Statistics of Expression Results, Choice of Evaluation Plans, Materialized Views..

Unit 3: **Recovery System:** Failure Classification, Storage Structure, Recovery and Atomicity, Log-Based Recovery, Recovery with Concurrent Transactions, Buffer Management, Failure with Loss of Nonvolatile Storage, Advanced Recovery Techniques, Remote Backup Systems.

Unit 4: Database-System Architectures: Centralized and Client –Server Architectures, Server System Architectures, Parallel Systems, Distributed Systems, Network Types, Parallel Databases, I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation Parallelism, Interoperation Parallelism, Design of Parallel Systems.

Reference/Text Books:
- Silberchatz, Korth, Sudershan,"Database System Concepts", Tata MC Graw Hills Publishing, 5th Edition, 2005
- RamezElmasri&ShamkantNavathe, "Database Management Systems", Pearson Education Asia, 6th Edition, 2010
- Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", McGraw Hill, 3rdEdition 2004
- N.Tamer Ozsu, Patrick Valduriez, "Principles of Distributed Database Systems", Prentice Hal International Inc., 1999
- Carlo Zaniolo, Stefano Ceri, Christos Faloustsos, R.T.Snodgrass, V.S.Subrahmanian, "Advanced Database Systems", Morgan Kaufman Series, 1997