



ANNA UNIVERSITY, CHENNAI

POSTGRADUATE CURRICULUM (NON-AUTONOMOUS AFFILIATED INSTITUTIONS)

Programme: Master of Business Administration (Business Analytics) **Regulations:** 2025

Abbreviations:

BS – Basic Science (Mathematics, Physics, Chemistry)

L – Laboratory Course

ES – Engineering Science (General (**G**), Programme Core (**PC**), Programme Elective (**PE**))

T – Theory

SD – Skill Development

LIT – Laboratory Integrated Theory

SL – Self Learning

PW – Project Work

OE – Open Elective

TCP – Total Contact Period(s)

Semester I

S. No.	Course Code	Course Title	Type	Periods per week			Total Contact Periods	Credits	Category
				L	T	P			
1.	MB25C02	Management Concepts and Organizational Behavior	T	4	0	0	4	4	ES (PC)
2.	MB25C03	Managerial Economics	T	4	0	0	4	4	ES (PC)
3.	MB25C01	Statistics for Management	T	3	1	0	4	4	ES (PC)
4.	MB25C04	Legal Aspects of Business	T	4	0	0	4	4	ES (PC)
5.	BN25C01	Managerial Decision Science	T	4	0	0	4	4	ES (PC)
6.	BN25C02	Data Management and Data Engineering	T	4	0	0	4	4	ES (PC)
7.	BN25C03	Financial Accounting and Management	T	3	1	0	4	4	ES (PC)
8.	MB25C05	Contemporary Business Communication	L	0	0	4	4	2	--
9.	BN25C04	Data Science Tools – I	L	0	0	4	4	2	--
Total Credits							36	32	

Semester II

S. No.	Course Code	Course Title	Type	Periods per week			Total Contact Periods	Credits	Category
				L	T	P			
1.	MB25C09	Human Resource Management	T	4	0	0	4	4	ES (PC)
2.	MB25C10	Marketing Management	T	4	0	0	4	4	ES (PC)
3.	MB25C11	Operations Management	T	3	1	0	4	4	ES (PC)
4.	BN25C05	Predictive Modeling for Business	T	4	0	0	4	4	ES (PC)
5.	MB25C08	Business Research Methods	T	3	1	0	4	4	ES (PC)
6.	MB25C07	Applied Operations Research	T	3	1	0	4	4	ES (PC)
7.	MB25C06	Entrepreneurship Development	T	3	0	0	3	3	ES (PC)
8.	BN25C06	Data Science Tools - II	L	0	0	4	4	2	--
9.	BN25C07	Social Media Content Creation	L	0	0	4	4	2	--
Total Credits							35	31	

Semester III

S. No.	Course Code	Course Title	Type	Periods per week			Total Contact Periods	Credits	Category
				L	T	P			
1.	MB25C12	Strategic Management	T	4	0	0	4	4	ES (PC)
2.	BN25301	Artificial Intelligence and Machine Learning	T	4	0	0	4	4	ES (PC)
3.		Programme Elective I	T	3	0	0	3	3	ES (PE)
4.		Programme Elective II	T	3	0	0	3	3	ES (PE)
5.		Programme Elective III	T	3	0	0	3	3	ES (PE)
6.		Programme Elective IV	T	3	0	0	3	3	ES (PE)
7.		Programme Elective V	T	3	0	0	3	3	ES (PE)
8.		Programme Elective VI	T	3	0	0	3	3	ES (PE)
9.	BN25302	R Programming	L	0	0	4	4	2	--
10.	BN25303	Cloud Computing and Big Data Tools for Data Analytics	L	0	0	4	4	2	--
11.	BN25304	Mini Project	L	0	0	4	4	2	--
Total Credits							38	32	

Semester – IV

S. No.	Course Code	Course Title	Type	Periods per week			Total Contact Periods	Credits	Category
				L	T	P			
1.	BN25401	Project Work	PW	0	0	24	24	12	SD
Total Credits							24	12	

Total : 107 Credits

Note: Students should select the Project topic for their project work only based on the selected area from the Professional Electives (**Specialization**).**OTAL: 105 CREDITS**

Note:

**Refer MBA - General Programme*

***Refer MBA - Artificial Intelligence and Data Science*

Programme Elective Courses – (PE)

Students can take six elective subjects

S. No.	Course Code	Course Title	Type	Periods Per Week			Total Contact Periods	Credits	Category
				L	T	P			
1.	BN25001	Human Resource Analytics	T	3	0	0	3	3	ES (PE)
2.	BN25002	Marketing and Social Media Web Analytics	T	3	0	0	3	3	ES (PE)
3.	BN25003	Financial Analytics	T	3	0	0	3	3	ES (PE)
4.	BN25004	Operation and Supply Chain Analytics	T	3	0	0	3	3	ES (PE)
5.	BN25005	Time Series Analysis	T	3	0	0	3	3	ES (PE)
6.	BN25006	Blockchain Technology	T	3	0	0	3	3	ES (PE)
7.	BN25007	Cloud Computing Tools and Techniques	T	3	0	0	3	3	ES (PE)
8.	BN25008	Enterprise Information System	T	3	0	0	3	3	ES (PE)
9.	BN25009	Big data Analytics	T	3	0	0	3	3	ES (PE)
10.	BN25010	Disruptive Technologies for Digital Transformation in Business	T	3	0	0	3	3	ES (PE)
11.	BN25011	Multivariate Data Analysis	T	3	0	0	3	3	ES (PE)
12.	BN25C08	Natural Language Processing	T	3	0	0	3	3	ES (PE)

Semester I

MB25C02	Management Concepts and Organizational Behavior	L	T	P	C
		4	0	0	4
<p>Course Objectives: This course aims to provides foundational understanding of management principles and organizational behavior. It equips them to analyze individual and group dynamics, and apply management theories to real-world business problems.</p>					
<p>Fundamentals of Management and Evolutionary Theories: Evolution of management Thought-Classical, Behavioral and Management Science Approaches Management- meaning, levels, management as an art or science, Managerial functions and Roles, Evolution of Management Theory- Classical era- Contribution of F.W.Taylor, Henri Fayol, NeoClassical-Mayo & Hawthorne Experiments. Modern era, system & contingency approach Managerial Skills..</p>					
<p>Planning, Decision-Making and Organizing for Effectiveness: Planning - Steps in Planning Process - Scope and Limitations - Forecasting and types of Planning - Characteristics of a sound Plan - Management by OBJECTIVE (MBO) - PoliciesandStrategiesScopeandFormulation- DecisionMaking-Types,Techniques and Processes. Organisation Structure and Design - Authority and Responsibility Relationships - Delegation of Authority and Decentralisation -Interdepartmental Coordination - - Impact of Technology on Organisational design - Mechanistic vs Adoptive Structures - Formal and Informal Organisation. Control: meaning, function, Process and types of Control.</p>					
<p>Fundamentals of Control and Modern Approaches: Impact of Technology on Organisational design - Mechanistic vs Adoptive Structures - Formal and Informal Organisation. Control: meaning, function, Process and types of Control.</p>					
<p>Individual Behavior in Organizations: Meaning of Organizational behavior, contributing disciplines, importance of organizational behavior, Perception and Learning - Personality and Individual Differences - Motivation theories and Job Performance - Values, Attitudes and Beliefs - Communication Types-Process - Barriers - Making Communication Effective.</p>					
<p>Group Dynamics, Leadership and Organizational Culture: Groups and Teams: Definition, Difference between groups and teams, Stages of Group Development, Group Cohesiveness, Types of teams, Group Dynamics - Leadership - Styles - Approaches - Power and Politics - Organisational Structure - Organisational Climate and Culture, Conflict: concept, sources, Types, Stages of conflict, Management of conflict Organisational Change and Development.</p>					
<p>Contemporary Perspectives in Organizational Behavior: Comparative Management Styles and approaches - Japanese Management Practices Organisational Creativity and Innovation - Organizational behavior across cultures- Conditions affecting cross cultural organizational operations, Managing International Workforce, Productivity and cultural contingencies, Cross cultural communication, Management of Diversity.</p>					
<p>Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.</p>					
<p>Assessment Methodology: Written Test I & II (60%) Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project (40%)</p>					
<p>References:</p> <ol style="list-style-type: none"> 1. DuBrin, A. J. (2020). Essentials of management (11th ed.). Thomson South Western. 2. Certo, S. C., & Certo, T. L. (2021). Modern management: Concepts & skills (16th ed.). Pearson Education. 3. Koontz, H., & Wehrich, H. (2020). Essentials of management: An international & leadership perspective (11th ed.). Tata McGraw Hill Education. 4. Robbins, S. P. (2023). Organizational behavior (19th ed.). PHI Learning/Pearson Education. 					

5. Luthans, F. (2015). Organizational behavior (14th ed.). McGraw Hill.
6. Nelson, D. L., Quick, J. C., & Khandelwal, P. (2018). ORGB – An innovative approach to learning & teaching (3rd ed.). Cengage Learning.
7. Pareek, U. (2020). Understanding organizational behavior (4th ed.). Oxford Higher Education.

E-Resources:

- ❖ NPTEL – Principles of Management and Organizational Behaviour (<https://nptel.ac.in>)

	CO description	PO Mapping	PSO1	PSO2
CO1	Demonstrate conceptual knowledge of management theories, planning, organizing, organization design and control, organizational behaviour, groups and leadership, and contemporary practices in organization behaviour.	PO5(1)	3	-
CO2	Interpret and relate to management theories, planning and organizing processes, perform organization design and execute control, organisational behavioural theories, groups, leadership, culture and contemporary practices in organization behaviour	PO1(1) PO5(3)	2	-
CO3	Apply theories and concepts of management to planning, organising, execution, design, control and individual and group behavior in organizations.	PO1(3) PO2(2)	3	-
CO4	Analyze management theories, planning, organizing, design, execution and control methodologies in organizational settings along with organizational behavioral practices.	PO1(3)	3	-
CO5	Evaluate the theories related to management and organizational behaviour to build model related to planning, organising, designs, execution, control and to group dynamics, team structures, and leadership styles for enhancing organizational performance.	PO1(3) PO2(2)	3	-
CO6	Develop contemporary practices, adapt and modify management theories, concept to all functions of management and to both individual and group behaviors to suit cross-cultural behaviour, diversity, and global workforce management.	PO3(2) PO4(3)	2	-

MB25C03	Managerial Economics	L	T	P	C
		4	0	0	4
Course Objectives: The course is designed to provide a strong foundation in economic principles and tools applicable to managerial decision-making. It introduces the concepts of scarcity, efficiency, and market mechanisms in both micro and macroeconomic settings.					
Introduction to Managerial Economics and Fundamental Concepts: The themes of economics, scarcity and efficiency, three fundamental economic problems, CREDITS: 3 8 society's capability, Production possibility frontiers (PPF), Productive efficiency Vs economic efficiency, economic growth & stability, Micro economics and Macro economics, the role of markets and government, Positive Vs negative externalities.					
Demand, Supply and Consumer Behavior: Market, Demand and Supply, Determinants, Market equilibrium, elasticity of demand and supply, consumer behavior, consumer equilibrium, Approaches to consumer behavior					
Production, Costs and Firm-Level Analysis: Production, Short-run and long-run Production Function, Returns to scale, economics Vs dis-economics of scale, Analysis of cost, Short-run and long-run cost function, Relation between Production and cost function - Production Pricing Model - Types of Pricing Model					
Market Structures and Factor Pricing: Product market—perfect and imperfect market—different market structures—Firm's equilibrium and supply, Market efficiency, Economic costs of imperfect competition, factor market—Land, Labour and capital—Demand and supply—determination of factor price—Interaction of product and factor market—General equilibrium and efficiency of competitive markets.					
Macroeconomic Performance Indicators: Macro-economic aggregates, circular flow of macroeconomic activity, National income determination, Aggregate demand and supply, Macroeconomic equilibrium, Components of aggregate demand and national income, multiplier effect, Demand side management, Fiscal policy in theory.					
Monetary Economics and Supply-Side Perspectives: Short-run and Long-run supply curve—Unemployment and its impact—Okun's law, Inflation and the impact—reasons for inflation—Demand Vs Supply factors—Inflation Vs unemployment trade off, Phillips curve —short- run and long-run — Supply side Policy and management- Money market- Demand and supply of money, money-market equilibrium and national income, the role of monetary policy.					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Written Test I & II (60%) Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project (40%)					
References: <ol style="list-style-type: none"> Samuelson, P. A., Nordhaus, W. D., Chaudhuri, S., & Sen, A. (2019). <i>Economics</i> (20th ed.). Tata McGraw Hill. Boyes, W., & Melvin, M. <i>Text book of economics</i>. Biztantra. (Note: No year provided—if you can share that, I can add it.) Mankiw, N. G. (2022). <i>Principles of economics</i> (8th ed., India release). Thomson Learning/Cengage India. Lipsey, R., & Chrystal, A. (2015). <i>Economics</i> (13th ed.). Oxford University Press. Case, K. E., & Fair, R. C. (2019). <i>Principles of economics</i> (13th global ed.). Pearson Education Asia. Panneerselvam, R. (2013). <i>Engineering economics</i> (2nd ed.). PHI Learning. 					

E-Resources:

- ❖ NPTEL: Managerial Economics (<https://nptel.ac.in>)
- ❖ RBI Bulletin and Monetary Policy Reports (<https://rbi.org.in>)

	CO description	PO Mapping	PSO1	PSO2
CO1	Demonstrate conceptual knowledge of managerial economics, fundamental concepts, demand and supply, production, costs, market structures, factor pricing, macroeconomic performance indicators, and monetary and fiscal policies.	PO5(3)	-	-
CO2	Interpret and relate foundational concepts, consumer behavior, production and cost functions, different market structures, macroeconomic aggregates, and the role of monetary and fiscal policies in influencing the business environment.	PO1(1) PO5(3)	-	-
CO3	Apply theories and concepts of management to planning, organising, execution, design, control and individual and group behavior in organizations.	PO1(3) PO4(2)	1	-
CO4	Analyze fundamental economic problems, consumer behavior, market structures, firm-level costs and pricing, macroeconomic indicators, and the effects of monetary and fiscal policies on business cycles.	PO1(3) PO3(1) PO4(2)	3	-
CO5	Evaluate the theories related to scarcity and efficiency, consumer demand, market structures, factor pricing, and macroeconomic policy frameworks to assess their impact on business performance in global and Indian contexts..	PO1(3)	3	-
CO6	Develop economic reasoning and apply contemporary practices to adapt managerial economic principles to address real-world business problems across various market structures, macroeconomic conditions, and policy landscapes.	PO3(2) PO4(2)	2	-

MB25C01	Statistics for Management	L	T	P	C
		3	1	0	4
<p>Course Objectives:</p> <p>This course aims to provide statistical tools for data-driven decision-making, emphasizing the application of probability, hypothesis testing, regression analysis, parametric and non-parametric methods to enhance analytical skills in business scenarios.</p>					
<p>Probability and Probability Distributions: Basic definitions and rules for probability, conditional probability independence of events, Baye's theorem, (Theory and Problem) and random variables, Probability distributions: Binomial, Poisson, Uniform and Normal distributions (Problem).</p>					
<p>Sampling and Estimation Techniques: Introduction to sampling distributions, sampling distribution of mean and proportion, application of central limit theorem (Theory and Problem), sampling techniques (Problem). Estimation: Point and Interval estimates for population parameters of large sample and small samples, determining the sample size (Problem).</p>					
<p>Hypothesis Testing – Parametric Methods (Problem): Hypothesis testing: one sample and two sample tests for means and proportions of large samples (z- test), one sample and two sample tests for means of small samples (t-test), F-test for two sample standard deviations. ANOVA one and two way</p>					
<p>Hypothesis Testing – Non-Parametric Methods (Problem): Chi-square test for single sample standard deviation. Chi-square tests for independence of attributes and goodness of fit. Sign test for paired data. Rank sum test. Kolmogorov-Smirnov, test for goodness of fit, comparing two populations. Mann, Whitney U test and Kruskal Wallis test. One sample run test.</p>					
<p>Correlation and Regression Analysis (Problem): Correlation, Coefficient of Determination, Rank Correlation, Regression, Estimation of Regressionline, Method of Least Squares, Standard Error of estimate.</p>					
<p>Business Analytics Applications & Software Tools: Application of statistics - data visualization and decision making - Case studies using Excel/SPSS/R, Interpretation of output - Business scenarios - applying regression, correlation, and hypothesis tests - Introduction to data-driven storytelling -dashboarding techniques (Theory and Problem)</p>					
<p>Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.</p>					
<p>Assessment Methodology: Written Test I & II (60%) Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project (40%)</p>					

References:

1. Levin, R. I., Rubin, D. S., Siddiqui, M. H., & Rastogi, S. (2023). *Statistics for management* (8th ed.). Pearson Education.
2. Mann, P. S. (2020). *Introductory statistics* (10th ed.). Wiley Publications.
3. Srivastava, T. N., & Rego, S. (2017). *Statistics for management* (3rd ed.). Tata McGraw Hill.
4. Black, K. (2023). *Applied business statistics* (11th ed.). Wiley India.
5. Anderson, D. R., Sweeney, D. J., Williams, T. A., Camm, J. D., & Cochran, J. J. (2024). *Statistics for business and economics* (15th ed.). Thomson/South Western Asia.
6. Gupta, S. C., & Kapoor, V. K. (2024). *Fundamentals of applied statistics*. Sultan Chand & Sons.

E-Resources:

- ❖ NPTEL: Business Statistics and Analytics for Decision Making (<https://nptel.ac.in>)
- ❖ Statistical Tools: R (<https://cran.r-project.org>), Python (pandas, scipy), IBM SPSS, MS Excel

	CO description	PO Mapping	PSO1	PSO2
CO1	Demonstrate conceptual knowledge of probability, sampling and estimation, parametric and non-parametric hypothesis testing, correlation, regression, and their application in business analytics and software tools.	PO5(3)	-	-
CO2	Interpret and relate probability distributions, sampling techniques, the outcomes of parametric and non-parametric hypothesis tests, correlation and regression analyses, and the output from statistical software to derive meaningful business insights.	PO1(1) PO5(3)	-	2
CO3	Apply statistical concepts, including probability theory, sampling methods, various hypothesis tests, and correlation and regression models, to solve real-world business problems and make data-driven decisions.	PO1(3)	2	3
CO4	Analyze probability distributions, sampling data, the results of parametric and non-parametric tests, and regression models to evaluate business scenarios and assess the validity of statistical conclusions.	PO1(3)	3	2
CO5	Evaluate the effectiveness of different statistical tools and techniques, such as various hypothesis tests and regression models, to select the most appropriate method for a given business problem and critically appraise statistical findings..	PO1(3)	3	-
CO6	Develop data-driven solutions and strategic insights by integrating knowledge of probability, sampling, hypothesis testing, correlation, and regression, and effectively use statistical software for business analytics and data storytelling.	PO1(3) PO2(2)	3	3

MB25C04	Legal Aspects of Business	L	T	P	C
		4	0	0	4
<p>Course Objectives:</p> <p>This course introduces the key Business laws and their practical applications across commercial contracts, company operations, industry regulations, taxation (including GST), and cyber laws in managing risks. It helps learners gain critical awareness of the legal framework.</p>					
<p>Commercial Laws and Business Contracts:</p> <p>The Indian Contract Act 1872: Definition of contract, essentials elements and types of a contract, Formation of a contract, performance of contracts, breach of contract and its remedies, Quasi contracts - Contract Of Agency: Nature of agency, Creation and types of agents, Authority and liability of Agent and principal: Rights and duties of principal and agents, termination of agency.</p> <p>The Sale of Goods Act 1930: Nature of Sales contract, Documents of title, risk of loss, Guarantees and Warranties, performance of sales contracts, conditional sales and rights of an unpaid seller -</p> <p>Negotiable Instruments Act 1881: Nature and requisites of negotiable instruments. Types of negotiable instruments, liability of parties, holder in due course, special rules for Cheque and drafts, discharge of negotiable instruments - The payment and settlement systems Act, 2007.</p>					
<p>Company Law and Competition Regulations:</p> <p>Company Act 1956 & 2013: Major principles, Nature and types of companies, Formation, Memorandum and Articles of Association, Prospectus, Power, duties and liabilities of Directors, winding up of companies, Corporate Governance. Competition Act 2002 - Introduction, Definitions, Enquiry into Certain Agreements and Dominant Position of Enterprise and Combinations.</p>					
<p>Industrial Relations and Labour Legislation: An Overview of Factories Act - Payment of Wages Act - Payment of Bonus Act - Industrial Disputes Act.</p>					
<p>Corporate Taxation and Goods & Services Tax (GST): Corporate Tax Planning, Corporate Taxes and Overview of Latest Developments in Indirect tax Laws relating to GST: An introduction including constitutional aspects, Levy and collection of CGST & IGST, Basic concept of time and value of supply, Input tax credit, Computation of GST Liability, Registration, Tax Invoice, Credit & Debit Notes, Electronic Way bill, Returns, Payment of taxes including Reverse Charge.</p>					
<p>Consumer Protection and Cyber Laws: Consumer Protection Act, Consumer rights, Procedures for Consumer grievances redressal, Types of consumer Redressal Machineries and Forums-- Cyber crimes, IT Act 2000 and 2002, Cyber Laws</p>					
<p>Intellectual Property Rights (IPR) in Business: Introduction of IPR Intellectual Property Laws- Introduction, Legal Aspects of Patents, Filing of Patent Applications, Rights from Patents, Infringement of Patents, Copyright and its Ownership, Infringement of Copyright, Civil Remedies for Infringement– Copy rights, Trade marks, Patent Act. Introduction, Right to Information Act, 2005.</p>					
<p>Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.</p>					
<p>Assessment Methodology: Written Test I & II (60%) Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project (40%)</p>					

References:

1. Kapoor, N. D. (2024). *Elements of mercantile law* (39th rev. ed.). Sultan Chand and Company.
2. Goel, P. K. (2023/24). *Business law for managers* (2nd ed.). Biztantra Publishers.
3. Pathak, A. (2022). *Legal aspects of business* (8th ed.). Tata McGraw Hill.
4. Kumar, R. (2016). *Legal aspects of business* (4th ed.). Cengage Learning.
5. Sinha, P. K., & Singhania, V. (2017/18). *Text book of indirect tax*. Taxmann Publication.
6. Taxmann. (2023). *GST manual with GST law guide & digest of landmark rulings* (12th ed.).

E-Resources:

- ❖ Ministry of Corporate Affairs: <https://www.mca.gov.in>
- ❖ GST Portal: <https://www.gst.gov.in>
- ❖ WIPO Intellectual Property Resources: <https://www.wipo.int>

	CO description	PO Mapping	PSO1	PSO2
CO1	Demonstrate conceptual knowledge of commercial laws, company law, industrial relations and labor legislation, corporate taxation (including GST), consumer protection, cyber laws, and intellectual property rights (IPR)..	PO5(3)	-	-
CO2	Interpret and relate key legal principles from contract law, company regulations, industrial acts, taxation frameworks, consumer protection laws, and intellectual property statutes to understand the legal environment of business.	PO1(1) PO5(3)	-	-
CO3	Apply legal principles and frameworks from commercial and company law, labor legislation, tax laws, and IPR to evaluate business contracts, corporate governance practices, compliance requirements, and the protection of business innovations.	PO1(3) PO4(3)	1	-
CO4	Analyze legal and regulatory frameworks, including competition law, industrial relations acts, corporate tax and GST provisions, cyber laws, and IPR, to assess their impact on business operations, risk management, and strategic decision-making.	PO1(3) PO3(1) PO4(2)	3	2
CO5	Evaluate the effectiveness of various legal provisions and frameworks, such as consumer protection and cyber laws, and IPR, to build compliance strategies, mitigate legal risks, and ensure ethical and sustainable business practices.	PO1(2) PO3(3)	3	2
CO6	Develop contemporary legal compliance and risk management strategies by integrating knowledge of commercial law, company law, industrial relations, taxation, and cyber and IPR laws to ensure effective and ethical business operations in a global context.	PO1(3) PO3(2)	3	2

BN25C01	Managerial Decision Science	L	T	P	C
		4	0	0	4
<p>Course Objectives:</p> <p>This course equips managers with skills in data analytics and visualization tools, including spreadsheets, Tableau, and project management software. It focuses on using data insights to solve business problems and make informed decisions in dynamic environments.</p>					
<p>Foundations of Data-Driven Decision Making: Role of Data Analytics in Decision Making, Business Analytics and Classification. Understanding the significance of data-driven decision-making in modern business, Influence of analytics on managerial decisions, Data analytics lifecycle, Choosing the right tool for the right task. Introduction to Spreadsheets, PowerBI, Tableau, and Project Management Tools, Setting up software tools and resources.</p>					
<p>Spreadsheet-Based Data Analysis: Spreadsheets for Data Analysis: Spreadsheets as fundamental data analysis tool, Basic operations, data entry, and cell references, Using formulas and functions for data manipulation. Understanding PivotTables and their role in data summarization, Creating PivotTables and Pivot Charts, Customizing PivotTables for effective analysis. Using advanced Spreadsheet functions (e.g., VLOOKUP, IF, INDEX-MATCH).</p>					
<p>Data Visualization Principles and Practices: Principles of effective data visualization. Choosing the right chart type for different data scenarios. Customizing charts for clarity. Creating Advanced Charts in Spreadsheets, Building advanced charts (e.g., trendlines, combo charts, and waterfall charts). Case studies and exercises applying advanced functions.</p>					
<p>Interactive Dashboards and Tableau Basics: Concepts of dashboards - real-time reporting - Introduction to Tableau – Connecting to data sources – Data transformation and joins - Creating dashboards with filters, parameters, and interactivity - Advanced visualizations: Geo maps, heatmaps, KPI tiles, forecasting in Tableau</p>					
<p>Storytelling with Data and Collaboration: Data storytelling: Frameworks and techniques – Narrative-driven dashboards - Building effective presentations using charts and visuals - Sharing dashboards and collaborating across teams using cloud platforms - Introduction to Power BI - comparison with Tableau</p>					
<p>Introduction to Project Management Tools and Integration: Basics of Project Management, Using popular Tools to understand Project Interface and Basics, Task Scheduling and Dependencies, Resource Allocation and Tracking, Gantt Charts and Reporting, Tracking project progress and updates.</p>					
<p>Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.</p>					
<p>Assessment Methodology: Written Test I & II (60%) Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project (40%)</p>					
<p>References:</p> <ol style="list-style-type: none"> 1. Dinesh Kumar, U. (2020). Business analytics: The science of data-driven decision making. Wiley India. 2. Evans, J. R. (2012). Business analytics: Methods, models and decisions. Pearson Education. 3. Winston, W. (2017). Microsoft Excel 2016 data analysis and business modelling. Microsoft Press. 4. Maheswari, U., & Sujatha. (2021). Introduction to data science: Practical approach with R and 					

Python. Wiley.

5. Milligan, J. N. (2022). Learning Tableau. Packt Publishing.

6. Deckler, G., Powell, B., & Gordon, L. (2022). Mastering Microsoft Power BI. Packt Publishing Ltd.

E-Resources:

- ❖ <https://powerbi.microsoft.com> – Microsoft Power BI resources
- ❖ <https://support.microsoft.com/excel> – Excel documentation and training
- ❖ <https://nptel.ac.in> – NPTEL courses on Business Analytics, Data Visualization

	CO description	PO Mapping	PSO1	PSO2
CO1	Demonstrate conceptual knowledge of data-driven decision-making, spreadsheet-based data analysis, data visualization principles, interactive dashboards using Tableau, data storytelling, and the use of project management tools for business problem-solving.	PO1(1) PO5(3)	1	1
CO2	Interpret and relate to the foundations of data-driven decision-making, advanced spreadsheet functions, data visualization principles, interactive dashboard creation, data storytelling techniques, and project management tools for planning and tracking.	PO1(2) PO5(3)	2	2
CO3	Apply data-driven decision-making concepts to practical problems using spreadsheet-based analysis, data visualization techniques, interactive dashboards with Tableau, data storytelling frameworks, and project management tools for execution and control.	PO1(3) PO5(1)	3	3
CO4	Analyze the role of data analytics in decision-making, complex spreadsheet functions, different data visualization scenarios, data transformation and insights from interactive dashboards, narrative-driven data storytelling, and the application of project management tools in a business context.	PO1(3) PO2(2)	3	3
CO5	Evaluate the significance of data-driven decision-making, the effectiveness of spreadsheet-based analysis, the clarity and impact of data visualizations, the insights derived from interactive dashboards, the power of data storytelling, and the utility of project management tools for enhancing organizational performance.	PO1(3) PO2(2) PO4(1)	3	3
CO6	Develop contemporary practices in data-driven decision-making, adapt spreadsheet and visualization techniques, modify interactive dashboards in Tableau, and create data storytelling presentations and project management plans to suit various business scenarios.	PO2(3) PO4(2)	3	3

BN25C02	Data Management and Data Engineering	L	T	P	C
		4	0	0	4
<p>Course Objectives:</p> <p>This course establishes foundational and practical knowledge of data management systems, big data technologies, and cloud computing. It focuses on applying these concepts to design, implement, and manage data pipelines for real-world business intelligence and analytics applications.</p>					
<p>Foundations of Data Management Systems: Database System Concepts – Database Architecture - Data model – Data Warehouse – Data Marts – Data Lake - Batch, Stream, and Micro-batch Processing - Concepts of ETL – SQL – The CAP Theorem - NOSQL Databases</p>					
<p>Big Data Ecosystem and Use Cases: What is Big Data? - Big Data Technologies Based on MapReduce and Hadoop - Hadoop Distributed File System (HDFS) – YARN– Case Study- Preventing Private Information Inference Attacks on Social Networks-Grand Challenge: Applying Regulatory Science and Big Data to Improve Innovation.</p>					
<p>Cloud Platforms and AWS Ecosystem: Cloud Computing – Overview of Google Cloud Platform and Microsoft Azure – Detailed study of AWS Ecosystem - AWS Analytics Services - AWS Data Movement Services - AWS Predictive Analytics & Machine Learning Services – Amazon Redshift – Amazon EMR – Amazon MSK – Amazon Kinesis - AWS Serverless - AWS Lambda</p>					
<p>Data Engineering and Governance: Key Data Mining Algorithms - Data Governance Tools – Data Stewardship, Data Quality, Master Data Management (MDM) - Data Security – Statistical Database Security – Flow Control - Encryption and Public Key Infrastructures..</p>					
<p>R Programming for Data Analytics: Overview, Programming structures: Control statements - Operators -Functions -Environment and scope issues - Recursion -Replacement functions, R data structures: Vectors -Matrices and arrays - Lists -Data frames - Classes, Input/output, String manipulations..</p>					
<p>Integration and Application in Business Contexts: Integration of R and SQL - data querying and reporting - Data pipelines and automation in business analytics - Trends in data engineering: DataOps, containerization, orchestration - Industry case studies in financial, healthcare, and retail analytics</p>					
<p>Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.</p>					
<p>Assessment Methodology: Written Test I & II (60%) Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project (40%)</p>					
<p>References:</p> <ol style="list-style-type: none"> Berthold, M., & Hand, D. J. (2007). Intelligent data analysis. Springer. Rajaraman, A., & Ullman, J. D. (2020). Mining of massive datasets. Cambridge University Press. Wickham, H., & Grolemund, G. (2016). R for data science: Import, tidy, transform, visualize, and model data. O'Reilly Media, Inc. Laudon, K. C., & Laudon, J. P. (2025). Management information systems: Managing the digital firm. Pearson. Panneerselvam, R. (2018). Database management systems. PHI Learning Matloff, N. (2011). The art of R programming: A tour of statistical software design. No Starch Press. 					

E-Resources:

- ❖ AWS Training and Certification: <https://aws.amazon.com/training>
- ❖ R Project for Statistical Computing: <https://cran.r-project.org>
- ❖ NPTEL: Data Science and Big Data Analytics (IIT Madras / IIT Kharagpur)
- ❖ Apache Hadoop Documentation: <https://hadoop.apache.org>

	CO description	PO Mapping	PSO1	PSO2
CO1	Demonstrate conceptual knowledge of foundational data management systems, big data ecosystems, cloud platforms (AWS), data engineering, governance practices, R programming for analytics, and the integration of these tools in a business context.	PO1(3) PO5(3)	2	2
CO2	Interpret and relate to database system architectures, big data technologies like Hadoop, the AWS ecosystem, data governance standards, R programming structures, and the application of data pipelines and automation in business analytics.	PO5(3)	2	2
CO3	Apply theories and concepts of data management, big data, AWS services, data governance, R programming, and data pipeline integration to solve real-world business analytics problems.	PO1(3) PO5(3)	3	3
CO4	Analyze data management systems, big data technologies and use cases, cloud platform services, data engineering and governance methodologies, R programming for data manipulation, and integrated data solutions in various business settings.	PO1(3)	3	3
CO5	Evaluate the theories and practices related to data management systems, big data technologies, cloud platforms, data governance, R programming, and data pipeline orchestration to build models for enhancing business intelligence.	PO1(3) PO4(2)	2	2
CO6	Develop contemporary practices, adapt and modify data management, big data, cloud computing, data governance, R programming, and integration concepts to suit modern data engineering trends and real-world business applications.	PO3(2)	2	2

BN25C03	Financial Accounting and Management	L	T	P	C
		3	1	0	4

Course Objectives:

To cultivate an understanding of financial accounting and management principles, enabling the application of analytical and strategic skills for informed financial decisions and efficient resource management in a business context.

Introduction to Financial Accounting and Reporting: Introduction to Financial, Cost and Management Accounting—Generally accepted accounting principles— Double Entry System— Preparation of Journal, Ledger and Trial Balance, Preparation of Final Accounts: Trading, Profit and Loss Account and Balance Sheet (Problem) - Reading the financial statements.

Financial Statement Analysis and Modeling: Financial ratio analysis, Interpretation of ratio for financial decisions – Dupont Ratios – comparative statements - common size statements. Cash flow (as per Accounting Standard 3) and Funds flow statement analysis (Problem) –Trend Analysis – Financial modeling

Financing and Dividend Decisions: Introduction of Finance – nature and scope of finance functions – Indian Capital Market – New issues of market – Secondary market – sources of long-term finance Leverages - Operating and Financial leverage (Problem) – measurement of leverages – degree of Operating & Financial leverage – Combined leverage, EBIT – EPS Analysis-Indifference point - Determinants of Capital structure. Dividend decision – Issues in dividend decisions, Importance – Factors determining dividend policy – Types of dividend policies – forms of dividend

Investment Decision-Making: Capital Budgeting: Principles and techniques - Nature of capital budgeting- Identifying relevant cash flows - Evaluation Techniques: Payback, Accounting rate of return, Net Present Value, Internal Rate of Return, Profitability Index (Problem) - Comparison of DCF techniques - Concept and measurement of cost of capital - Specific cost and overall cost of capital.

Working Capital Management: Principles of working capital: Concepts, Needs, Determinants, issues and estimation of working capital (Problem) - Receivables Management – Inventory management – Cash management – Working capital finance: Commercial paper, Company deposit, Trade credit, Bank finance.

Modern Financial Tools and Business Applications: Spreadsheet-based financial calculations and modeling - Real-time decision-making using finance dashboards - Digital transformation in financial accounting (ERP systems, Tally, Zoho Books) - Industry use-cases in capital budgeting, credit risk, and cash flow planning

References:

1. Narayanaswamy, R. (2022). Financial accounting (7th ed.). PHI.
2. Khan, M. Y., & Jain, P. K. (2021). Management accounting (8th ed.). Tata McGraw Hill.
3. Singhvi, N. M., & Bodhanwala, R. J. (2018). Management accounting: Text and cases (3rd ed.). PHI.
4. Pandey, M. (2021). Financial management (12th ed.). Vikas Publishing House Pvt. Ltd.
5. Bhattacharya, A. K. (2012). Introduction to financial statement analysis (latest ed.). Elsevier/PHI.

6. Reddy, T. S., & Murthy, A. (2024). Financial accounting (2024 ed.). Margham Publications.

E-Resources:

- ❖ <https://nptel.ac.in/courses/110105135> – NPTEL: Financial Accounting
- ❖ <https://www.investopedia.com> – Accounting & Financial Tools
- ❖ <https://corporatefinanceinstitute.com> – Financial Modeling Tutorials
- ❖ YouTube: Prasanna Chandra's Lectures on Finance
- ❖ Tally Education Portal – <https://www.tallyeducation.com>

	CO description	PO Mapping	PSO1	PSO2
CO1	Demonstrate conceptual knowledge of financial accounting and reporting, financial statement analysis, financing and dividend decisions, investment decision-making techniques, working capital management, and modern financial tools and their applications in business.	PO5(3)	2	-
CO2	Interpret and relate to accounting principles, financial modeling and ratio analysis, financing and dividend policies, capital budgeting techniques, working capital concepts, and the use of digital tools and dashboards for real-time reporting.	PO5(3)	2	-
CO3	Apply the theories and concepts of financial accounting to prepare and analyze financial statements, make financing and dividend decisions, evaluate investment proposals using capital budgeting techniques, manage working capital efficiently, and utilize spreadsheet-based financial modeling for business applications.	PO1(3) PO5(3)	3	1
CO4	Analyze the methodologies of financial accounting, financial statement modeling, financing and dividend decisions, capital budgeting techniques, working capital management, and the use of modern financial tools in various organizational settings.	PO1(3) PO4(2)	3	-
CO5	Evaluate the theories and practices related to financial accounting and reporting, financial statement analysis, financing and dividend decisions, investment decision-making, working capital management, and modern financial tools to build models for enhancing organizational performance.	PO1(3) PO3(2) PO4(2)	3	-
CO6	Develop contemporary practices, adapt and modify the concepts of financial accounting and management to all finance functions, including financial statement preparation, ratio analysis, financing decisions, capital budgeting, working capital management, and the use of digital tools and dashboards to suit cross-functional business scenarios.	PO1(3) PO4(2)	3	3

MB25C05	Contemporary Business Communication	L	T	P	C
		0	0	4	2
Course Objectives: This course aims to equip essential business communication skills required for modern managerial roles. It emphasizes both oral and written communication for various Business contexts such as interviews, meetings, presentations, professional correspondence..					
Communication Fundamentals and Managerial Speech Practice: Introduction to Business Communication: Principles of effective communication, Target group profile, Barriers of Communication, Reading Skills, Listening, Feedback., Principles of Nonverbal Communication: Professional dressing and body language. Role Playing, Debates and Quiz. Types of managerial speeches - Presentations and Extempore, speech of introduction, speech of thanks, occasional speech, theme speech., Group communication: Meetings, group discussions. , Other Aspects of Communication: Cross Cultural Dimensions of Business Communication Technology and Communication, Ethical & Legal Issues in Business Communication.					
Business Writing and Corporate Communication Tools: Business letters, Routine letters, Bad news and persuasion letters, sales letters, collection letters, Maintaining a Diary, Resume/CV, job application letters, proposals. Internal communication through, notices, circulars, memos, agenda and minutes, reports. Case Studies. Exercises on Corporate Writing, Executive Summary of Documents, Creative Writing, Poster Making, Framing Advertisements, Slogans, Captions, Preparing Press Release and Press Notes					
Presentation and Public Speaking Skills: Principles of Effective Presentations, Principles governing the use of audiovisual media.					
Interviewing and Job Preparedness: Mastering the art of giving interviews in, selection or placement interviews, discipline interviews, appraisal interviews, exit interviews, web /video conferencing, tele-meeting.					
Business Networking and Personal Branding: Business networking techniques – Ice-breakers, small talk, digital etiquette – Conversational intelligence – Professional dining etiquette – Social media presence and grooming – Self-confidence and image management – Real-life simulations and feedback.					
Report Writing and Analytical Communication: Objectives of report, types of report, Report Planning, Types of Reports, Developing an outline, Nature of Headings, Ordering of Points, Logical Sequencing, Graphs, Charts, Executive Summary, List of Illustration, Report Writing.					
Note: The emphasis of the entire subject should be on practical aspects.					
Practical: This module introduces both written and spoken communication skills to students to build their confidence in delivering clear and logical messages to their audience. They will develop written communication skills through crafting Business messages such as Business letters, emails, and meeting minutes. In addition, students will work through presentations and simulated meetings to refine their spoken communication skills, discussion techniques and people skills.					
Practical: This module builds on the foundation of Business Communication 1 and creates opportunities for students to strengthen their oral and written communication. Students will be required to enhance their presentation skills through impromptu speeches. Students will also learn how to prepare a formal Business report. Job hunting and employment skills will be introduced to prepare students for a positive start to their careers. Students will be taught to write application letters and resumes. Additionally, students will learn job interview techniques through role-plays and simulations					
Practical: This practical module aims to help students be persuasive in the Business world. Students will learn listening and data gathering skills to better understand their target audience's needs and requirements and persuasive skills to convince the audience to accept a new					

policy/suggestion/product through role-playing a boardroom presentation. Students will also be taught Business networking skills including conversation techniques, dining etiquette and personal branding through role-plays and simulations.

References:

1. Pal, R., & Korlahalli, J. S. (2011). *Essentials of business communication* (13th rev. ed.). Sultan Chand.
2. Raman, M., & Singh, P. (2012). *Business communication* (2nd ed.). Oxford.
3. Sharma, R. C., & Mohan, K. (2020). *Business correspondence & report writing* (6th ed.). Tata McGraw Hill.
4. Goodale, M. *Professional presentations: Developing communication skills*. Cambridge University Press.
(Note: Year not provided; please share if you have it.)
5. Adair, J. *Effective communication*. Pan Macmillan.
(Note: Year not provided; please share if you have it.)
6. Thill, J. V., & Bovee, G. L. (2023/2024). *Excellence in business communication* (14th ed.). McGraw Hill.

E-Resources:

- ❖ NPTEL – Soft Skills https://onlinecourses.nptel.ac.in/noc21_hs76
- ❖ MindTools – Communication Skills Portal www.mindtools.com/cawh8bu/communication-skills
- ❖ TEDx – Effective Speaking & Personal Branding <https://www.youtube.com>

	CO description	PO Mapping	PSO1	PSO2
CO1	Demonstrate effective verbal and non-verbal communication skills, including public speaking, written correspondence, interviewing, professional networking, and report writing, in various business contexts.	PO2(3) PO5(3)	-	-
CO2	Interpret and relate the principles of effective communication, business writing, presentation techniques, job preparedness, and professional networking to develop clear and persuasive communication strategies.	PO2(3) PO5(3)	-	-
CO3	Apply communication fundamentals, business writing techniques, public speaking skills, interviewing strategies, networking etiquette, and report writing principles to solve real-world business communication challenges.	PO1(1) PO2(3) PO4(2)	-	-
CO4	Analyze business communication scenarios, including managerial speeches, written correspondence, interviews, and networking interactions, to adapt communication styles for different audiences and purposes.	PO2(3)	2	2
CO5	Evaluate the effectiveness of various communication methods, including presentations, professional correspondence, and reports, to build a personal brand, foster professional relationships, and enhance business communication.	PO2(3) PO3(2) PO5(3)	-	-
CO6	Develop a comprehensive communication plan and strategy by integrating knowledge of communication fundamentals, written correspondence, public speaking, job preparedness, networking, and analytical reporting to effectively lead and manage in a modern business environment.	PO2(3) PO3(2)	3	2

BN25C04	Data Science Tools – I	L	T	P	C
		0	0	4	2
<p>Course Objectives: This course aims to build practical competency in data handling, statistical analysis, and predictive modeling using industry-standard tools. The objective is to apply these skills through hands-on practice with spreadsheets, Power BI, Tableau, and Python, enabling the development of analytical dashboards and models to support business decision-making.</p>					
<p>Spreadsheet-Based Data Manipulation and Analytics: Sorting and filtering data, Formulas and functions for data manipulation, PivotTables and Pivot Charts for data summarization.</p> <p>Practical Exercise 1: Sales Data Analysis and Reporting: Use a provided dataset of sales transactions. Apply filters to identify sales from a specific region and for a particular product category. Use formulas like SUM, AVERAGE, and COUNTIF to calculate key metrics such as total revenue, average order value, and the number of orders per customer segment. Create a PivotTable to summarize total sales by Product and Region, and then generate a Pivot Chart to visualize this summary.</p> <p>Practical Exercise 2: Human Resources (HR) Data Management: Given an employee dataset with columns like Employee ID, Department, Hire Date, and Salary, sort the data by Salary in descending order to find the highest earners. Use a custom filter to display employees hired within the last two years. Create a PivotTable to show the average salary for each department and job title. Use a calculated field within the PivotTable to compute the total annual cost per department.</p>					
<p>Statistical Analysis and Modeling in Excel: Descriptive Statistics - Measures of central tendency and variability, Frequency distributions and histograms, Summary statistics in Excel. Inferential Statistics - Analysis of variance (ANOVA). Chi square test - Regression Analysis – Understanding regression analysis, Simple linear regression, Multiple linear regression.</p> <p>Practical Exercise 1: Marketing Campaign Effectiveness: Use a dataset with Advertising Spend and Sales Revenue for several months. Generate descriptive statistics for both variables using the Data Analysis Toolpak. Create a histogram for Sales Revenue to visualize its distribution. Perform a simple linear regression to determine the relationship between Advertising Spend and Sales Revenue. Interpret the regression output, focusing on the R-squared value and the p-value of the independent variable.</p> <p>Practical Exercise 2: Quality Control and Process Improvement: Given data on product defects from two different manufacturing lines, use an ANOVA test to determine if there is a statistically significant difference in the average number of defects between the two lines. For a separate dataset of product classifications (e.g., Good, Defective) across different factories, use a Chi-square test to see if there is a relationship between Factory and Product Classification.</p>					
<p>Data Visualization with Tableau: Getting Started with Tableau, Dimensions vs. Measures, Discrete vs Continuous, Application of Discrete and Continuous Fields, Aggregation in Tableau. Working with Metadata, Filters in Tableau, Applying Analytics to the worksheet, Dashboard in Tableau, Modifications to Data Connections, Edit Data Source, Unions, Joins Data blending.</p> <p>Practical Exercise 1: Visualizing Financial Performance: Connect to a financial dataset containing sales, profit, and expense information. Create a line chart showing the trend of Sales over time. Build a packed bubble chart to visualize Profit by Product Category. Combine these and other relevant visualizations into a dashboard. Ensure the dashboard is interactive, allowing users to filter all charts by a specific Region.</p> <p>Practical Exercise 2: HR Analytics Dashboard: Use an HR dataset with information on Department, Job Role, Salary, and Performance Score. Create a bar chart showing the average Salary by Department. Use a scatter plot to analyze the relationship between Years of Service and Performance Score. Build a dashboard that includes these visuals along with filters for Department and Job Role.</p>					

Power BI for Interactive Visualization and Reporting: Introduction to PowerBI – Working with data – Importing from flat files, excel files, other Sources, Data Sources in Power BI Desktop, Loading Data in Power BI Desktop, Views in Power BI Desktop, Query Editor in Power BI, Transform, Clean, Shape, and Model Data Manage Data Relationship, editing a Relationship, Cross Filter Direction, Saving Workfile Measures. Data Analysis Expressions – Introduction to Power Query – Introduction to Power View – Power View visualizations – Power View filtering options – Introduction to Power Map – Preparing geospatial data – Publish from Power BI desktop – Publish Dashboard to Web.

Practical Exercise 1: Supply Chain and Logistics Report: Import a sales CSV file and a product Excel file into Power BI Desktop. Use the Power Query Editor to clean the data, such as removing columns or splitting text. Create a relationship between the two tables based on a common Product ID. Build a report with visualizations that include a map showing total sales by country, a bar chart of sales by product, and a filter for order date.

Practical Exercise 2: Marketing and Customer Insights Dashboard: Import a dataset that contains customer data, including Customer ID, Purchase Frequency, and Purchase Amount. Create DAX measures to calculate the average purchase amount per customer. Build a dashboard that includes a donut chart showing the distribution of customer segments, a card for the total number of customers, and a bar chart showing purchase amount by customer segment. Publish the final dashboard to the Power BI Service.

Introduction to Business Analytics Using Python: Overview of business analytics and its applications. Introduction to Python for data analysis. Setting up Python environment (Anaconda, Jupyter Notebooks). Introduction to python variable declaration, Keywords, Indents in Python, Python input/output operations, Python's Built-in Data types, Conditional Statements & Loop Conditional Statements, Function in python, File Processing. Modules - Concept of modularization, Importance of modules in python, Importing modules, Built in modules (ex: Numpy)

Practical Exercise 1: Data Exploration with Python: In a Jupyter Notebook, write a Python script to declare variables of different types (e.g., a string for Product Name, a float for Unit Price, and a list of Regions). Read a provided CSV file into a Pandas DataFrame. Use basic DataFrame functions like head(), describe(), and shape to understand the data. Filter the DataFrame to select rows where a specific condition is met, such as sales greater than a certain value.

Practical Exercise 2: Python Functions and Control Flow: Write a Python function that takes a list of numbers (e.g., Sales Amounts) and returns the sum. Create another function that uses conditional statements (if-elif-else) to classify a customer as High Value, Medium Value, or Low Value based on their total spending. Use a for loop to iterate through a list of departments and print a message for each.

Integration, Application & Capstone Mini Project: End-to-end business case: data import → clean → analyze → visualize - Cross-platform case implementation (e.g., Excel + Power BI or Python + Tableau) - Designing analytical dashboards and models for decision support - Capstone mini-project with real-world data from marketing, finance, or HR analytics.

Practical Exercise 1: Cross-Platform Business Case: Start with a messy dataset in Python (Jupyter Notebooks). Use the Pandas library to handle missing values, correct data types, and remove duplicates. Save the cleaned data to a new CSV file. Connect to this cleaned CSV file in Tableau and build a dynamic, interactive dashboard to present key insights from the data, such as sales performance and regional trends.

Practical Exercise 2: Comprehensive Capstone Project: Given a real-world dataset (e.g., from marketing or HR), define a business problem to solve. Use Python to import and prepare the data. Conduct a statistical analysis in Excel to test a hypothesis. Build a comprehensive, interactive dashboard in Power BI that visualizes the results. Prepare a short report summarizing the findings and providing actionable recommendations.

References:

1. Motwani, B. (2022). Data analysis using Python (6th ed. or later). Wiley.
2. Hyman, J. A. (2025, December). Microsoft Power BI for dummies (2nd ed.). Wiley.
3. Manohar, H. L. (2017). Data analysis and business modelling using Excel. PHI.
4. Wickham, H., & Grolemund, G. (2016). R for data science. O'Reilly.
5. Stevenson, W. J., & Ozgur, C. (2009). Introduction to management science with spreadsheet. Tata McGraw-Hill.

E-Resources:

- ❖ <https://powerbi.microsoft.com> – Microsoft Power BI training
- ❖ <https://realpython.com> – Python tutorials
- ❖ <https://www.kaggle.com> Practice datasets and notebooks

	CO description	PO Mapping	PSO1	PSO2
CO1	Demonstrate conceptual knowledge of spreadsheet-based data manipulation, statistical analysis in Excel, data visualization with Tableau, interactive reporting with Power BI, Python programming for data analysis, and the integration of these tools for a capstone project.		-	-
CO2	Interpret and relate to data manipulation and analytics in spreadsheets, statistical and regression models, data visualization principles in Tableau, interactive dashboards in Power BI, Python data types and structures, and the application of these tools for end-to-end business cases.	PO2(1) PO5(3)	-	-
CO3	Apply the theories and concepts of spreadsheet analytics, statistical modeling, data visualization in Tableau, interactive reporting in Power BI, Python programming, and cross-platform integration to solve real-world business analytics problems.	PO5(3)	-	-
CO4	Analyze methodologies for data manipulation and summarization in spreadsheets, statistical and regression analysis, data visualization in Tableau, data transformation and modeling in Power BI, Python for data analysis, and integrated analytical dashboards for decision support.	PO2(3) PO4(2) PO5(3)	2	2
CO5	Evaluate the theories and practices related to spreadsheet analytics, statistical and regression modeling, interactive dashboards in Tableau and Power BI, Python programming, and cross-platform integration to build models for enhancing business decision-making.	PO2(2) PO4(2) PO5(3)	-	-
CO6	Develop contemporary practices, adapt and modify data manipulation techniques, statistical models, visualizations, interactive reports, Python scripts, and tool integration concepts to suit various business analytics problems and capstone projects.	PO2(2) PO4(2) PO5(3)	3	2

Semester II

Course Objectives:

This course aims to provide an in-depth understanding of strategic and operational aspects of Human Resource Management (HRM) in modern organizations. It equips students with competencies in manpower planning, recruitment, training, performance management, employee engagement, and digital HR practices. The course emphasizes current trends such as HR analytics, self-development, knowledge management, and technology-enabled HR practices within the Indian and global Business contexts. Students will gain exposure to real-time HR challenges and how to align HR strategy with organizational goals.

Strategic Perspectives in Human Resource Management

Evolution of human resource management – The importance of the human capital – Role of human resource manager – Challenges for human resource managers - trends in Human resource policies – Computer applications in human resource management – Human resource accounting and audit – Introduction to HR analytics.

Workforce Planning and Talent Acquisition

Importance of Human Resource Planning – Forecasting human resource requirement – matching supply and demand - Internal and External sources - Organizational Attraction - Recruitment, Selection, Induction and Socialization - Theories, Methods and Process – Legal and ethical issues in hiring.

Training, Development and Knowledge Management

Types of training methods –purpose- benefits- resistance. Executive development programme – Common practices - Benefits – Self development – Knowledge management systems and practices.

Motivation, Compensation, and Career Engagement

Compensation plan – Reward – Motivation – Application of theories of motivation – Career management – Mentoring - Development of mentor – Protégé relationships- Job Satisfaction, Employee Engagement, Organizational Citizenship Behavior: Theories, Models.

Performance Management and Employee Movement

Method of performance evaluation – Feedback – Industry practices. Promotion – Demotion, Transfer and Separation – Implication of job change. The control process – Importance – Methods – Requirement of effective control systems grievances – Causes Implications – Redressal methods.

HR Governance and Emerging Issues

HR control processes – Legal compliance in HRM – Diversity and Inclusion – Ethical HR practices – Employee wellbeing – Future of work: AI in HRM, remote workforce management – HR metrics and dashboards – Global HRM trends – Sustainable HRM practices.

References:

1. Gary Dessler & Biju Varkkey, Human Resource Management, 16th Ed., Pearson Education, 2024.

2. David A. DeCenzo, Stephen P. Robbins, Susan L. Verhulst, Fundamentals of Human Resource Management, Wiley, 13th Ed., 2024
3. Uday Kumar Haldar, Juthika Sarkar, Human Resource Management, Oxford University Press, 2nd Ed., 2023.
4. Wayne F. Cascio, Managing Human Resources: Productivity, Quality of Work Life, Profits, McGraw Hill, 12th Ed., 2024.
5. Michael Armstrong, Armstrong's Handbook of Strategic Human Resource Management, Kogan Page, 8th Ed., 2023.
6. Luis R. Gomez-Mejia et al., Managing Human Resources, Pearson, 8th Ed., 2023.
7. Dipak Kumar Bhattacharyya, HR Analytics: Understanding Theories and Applications, Sage Publications, 2nd Ed., 2022.
8. Ivancevich, Human Resource Management, McGraw Hill, 14th Ed., 2023.
9. Bernardin, Human Resource Management, Tata McGraw Hill, 11th Ed., 2022.

E-Resources:

- ❖ [SHRM India Knowledge Center](#)
- ❖ [HBR Human Resource Management Articles](#)
- ❖ [Coursera – HR Management Specialization](#)
- ❖ [LinkedIn Learning – Human Resources Courses](#)
- ❖ [AIHR – Academy to Innovate HR](#)
- ❖ [People Matters](#)

Course Outcomes

On successful completion of this course, the student will be able to:

- **CO1:** Demonstrate conceptual knowledge of strategic HRM, workforce planning, talent acquisition, training and development, compensation, performance management, employee relations, and emerging HR trends and governance.
- **CO2:** Interpret and relate the evolution of HRM, human resource planning, training and development programs, motivational theories, performance evaluation methods, and emerging HR trends to the overall organizational context.
- **CO3:** Apply HRM principles and practices, including workforce planning, recruitment, selection, training methods, compensation models, and grievance redressal, to solve real-world organizational challenges.
- **CO4:** Analyze human resource strategies, talent acquisition processes, training and development needs, compensation plans, performance management systems, and emerging HR trends to align them with organizational goals.
- **CO5:** Evaluate different HR practices, including training programs, motivational theories, performance management systems, and legal frameworks, to make informed decisions and build a robust HR governance model.
- **CO6:** Develop contemporary HR policies and strategies by integrating knowledge of HR planning, talent management, performance evaluation, and emerging trends like HR analytics and AI to foster a diverse, engaged, and ethical workforce.

Internal Assessment Methodology – Total: 100 Marks

Component	Weightage
Written Test I & II	60%
Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project	40%

CO–PO–PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	3	2	2	2	3	2
CO2	3	3	3	2	2	3	3
CO3	2	3	3	2	3	2	2
CO4	3	2	3	3	2	3	2
CO5	3	3	3	3	2	3	3
CO6	3	3	3	3	3	3	3

Note: 1 – Low, 2 – Medium, 3 – High

MB25C10

Marketing Management

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Course Objectives:

This course aims to develop a comprehensive understanding of marketing fundamentals, strategic planning, and marketing mix decisions in dynamic global and digital environments. Students will learn to analyze buyer behavior, develop market-driven strategies, and apply contemporary tools in digital and social media marketing. The course also equips learners with skills in customer relationship management, ethical marketing practices, and data-driven decision-making. Emphasis is placed on real-world application through case analysis, marketing research, and simulations aligned with global and Indian Business scenarios.

Foundations of Marketing and Business Environment

Defining Marketing – Core concepts in Marketing – Evolution of Marketing – Marketing Planning Process – Scanning Business environment: Internal and External – Value chain – Core Competencies – PESTEL – SWOT Analysis – Marketing interface with other functional areas – Production, Finance, Human Relations Management, Information System – Marketing in global environment – International Marketing – Rural Marketing – Prospects and Challenges.

Strategic Marketing and Market Segmentation

Marketing strategy formulations – Key Drivers of Marketing Strategies - Strategies for Industrial Marketing – Consumer Marketing – Services marketing – Competition Analysis – Analysis of consumer and industrial markets – Influence of Economic and Behavioral Factors – Strategic Marketing Mix components.

Product, Pricing, and Channel Decisions

Product planning and development – Product life cycle – New product Development and Management – Defining Market Segmentation – Targeting and Positioning – Brand Positioning and Differentiation – Channel Management – Managing Integrated Marketing Channels – Managing Retailing, Wholesaling and Logistics – Advertising and Sales Promotions – Pricing OBJECTIVE, Policies and Methods

Consumer and Organizational Buyer Behavior

Understanding Industrial and Consumer Buyer Behavior – Influencing factors – Buyer Behaviour Models – Online buyer behaviour – Building and measuring customer satisfaction – Customer relationships management – Customer acquisition, Retaining, Defection – Creating Long Term Loyalty Relationships.

Marketing Research and Data-Driven Decision Making

Marketing Information System – Marketing Research Process – Concepts and applications: Product – Advertising – Promotion – Consumer Behaviour – Retail research – Customer driven organizations - Cause related marketing – Ethics in marketing – Online marketing trends - social media and digital marketing.

Contemporary Trends and Ethical Marketing

Cause-Related and Sustainable Marketing – Ethical and Legal Aspects in Marketing – Green Marketing – Social Media Marketing – Influencer and Content Marketing – Mobile and Digital Marketing Trends – Personalization and Marketing Automation – Emerging Tools in Digital Marketing (SEO, SEM, Email, Analytics) – Customer-Centric Marketing Organizations.

References:

1. Philip Kotler & Kevin Lane Keller, Marketing Management, 16th Ed., Pearson, 2022
2. Paul Baines, Chris Fill, Kelly Page, Marketing, Oxford University Press, 6th Ed., 2023
3. V.S. Ramaswamy & S. Namakumari, Marketing Management: Global Perspective Indian Context, Macmillan, 7th Ed., 2023
4. Lamb, Hair, Sharma, McDaniel, Marketing: South Asian Perspective, Cengage Learning, 2012
5. K.S. Chandrasekar, Marketing Management – Text and Cases, Tata McGraw Hill, 2012
6. Rajan Saxena, Marketing Management, McGraw Hill Education, 6th Ed., 2023
7. Michael Solomon, Consumer Behavior: Buying, Having, and Being, Pearson, 14th Ed., 2023
8. Jean-Noël Kapferer, The New Strategic Brand Management, Kogan Page, 6th Ed., 2020

E-Resources:

- ❖ [HubSpot Academy – Digital Marketing](#)
- ❖ [Google Digital Garage – Fundamentals of Digital Marketing](#)
- ❖ [Think with Google – Consumer Insights](#)

- ❖ Statista – Marketing Statistics
- ❖ [HBR Marketing Resources](#)
- ❖ [Coursera – Marketing in a Digital World \(Illinois\)](#)

Course Outcomes

On successful completion of this course, students will be able to:

- **CO1:** Demonstrate conceptual knowledge of marketing fundamentals, strategic marketing, product and pricing decisions, consumer behavior, marketing research, and contemporary trends like digital and ethical marketing.
- **CO2:** Interpret and relate marketing concepts, environmental analysis, strategic marketing mix components, consumer behavior models, and marketing research processes to understand the dynamics of a market.
- **CO3:** Apply marketing principles to develop market segmentation, targeting, and positioning strategies; design product, pricing, and channel decisions; and create customer relationship management programs.
- **CO4:** Analyze the marketing environment, strategic marketing mix components, consumer and industrial buyer behavior, and marketing information systems to make data-driven decisions and develop effective marketing strategies.
- **CO5:** Evaluate the effectiveness of different marketing strategies, including product and pricing decisions, advertising campaigns, and digital marketing trends, to build a competitive and sustainable brand.
- **CO6:** Develop a comprehensive marketing strategy by integrating knowledge of marketing fundamentals, consumer behavior, market research, and emerging digital and ethical practices to achieve organizational goals.

Internal Assessment Methodology – Total: 100 Marks

Component	Weightage
Written Test I & II	60%
Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project	40%

CO–PO–PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	2	3	3	2	3	2
CO2	3	3	3	2	3	3	3
CO3	3	2	3	3	2	2	3
CO4	3	3	3	2	3	3	2
CO5	2	3	3	3	3	3	3
CO6	3	3	2	3	3	3	3

Note: 1 – Low, 2 – Medium, 3 – High

Course Objectives:

This course provides a holistic understanding of operations management as a vital function in achieving strategic and operational excellence in organizations. It covers tools, techniques, and strategies to design, plan, control, and improve manufacturing and service operations. Emphasis is placed on capacity planning, product design, supply chain strategies, quality management, and lean operations. Students will explore recent trends including digital operations, sustainable practices, and data-driven decision-making to gain competitive advantage in the global market.

Overview of Operations Management and Strategic Alignment

Operations Management – Nature, Importance, historical development, transformation processes, differences between services and goods, a system perspective, functions, challenges, current priorities, recent trends. Operations Strategy – Strategic fit, framework. Productivity; World-class manufacturing practices

Capacity, Facility and Supply Chain Decisions

Capacity Planning – Long range, Types, Developing capacity alternatives, tools for capacity planning. Facility Location – Theories, Steps in Selection, Location Models. Sourcing and procurement - Strategic sourcing, make or buy decision, procurement process, managing vendors.

Process, Product and Layout Design

Product Design - Criteria, Approaches. Product development process - stage-gate approach - tools for efficient development. Process - design, strategy, types, analysis. Facility Layout – Principles, Types, Planning tools and techniques – Service blueprinting – Role of design in lean and agile systems.

Forecasting, Resource and Inventory Planning

Demand Forecasting – Need, Types, OBJECTIVE and Steps - Overview of Qualitative and Quantitative methods. Operations planning - Resource planning - Inventory Planning and Control. Operations Scheduling - Theory of constraints - bottlenecks, capacity constrained resources, synchronous manufacturing

Quality Management and Lean Thinking

Definitions of quality, The Quality revolution, quality gurus; TQM philosophies; Quality management tools, certification and awards. Lean Management - philosophy, elements of JIT manufacturing, continuous improvement. Six sigma and DMAIC methodology.

Emerging Trends in Operations Management

Digital transformation in operations – Industry 4.0 and smart factories – Sustainable operations and green manufacturing – Service operations and scalability – Operations analytics – Blockchain in supply chains – Resilience and risk mitigation – Global operations strategy – Case studies on Indian and global practices.

References:

1. Richard B. Chase, Ravi Shankar, F. Robert Jacobs, Operations and Supply Chain Management, McGraw Hill, 17th Ed., 2023
2. B. Mahadevan, Operations Management: Theory and Practice, Pearson, 4th Ed., 2018
3. William J. Stevenson, Operations Management, McGraw Hill, 14th Ed., 2022
4. Cecil C. Bozarth & Robert B. Handfield, Introduction to Operations and Supply Chain Management, Pearson, 5th Ed., 2023
5. Norman Gaither & Gregory Frazier, Operations Management, Cengage, 11th Ed., 2022
6. R. Paneerselvam, Production and Operations Management, PHI Learning, 3rd Ed., 2017
7. Nigel Slack, Operations Management, Pearson, 10th Ed., 2023
8. S. Chopra & P. Meindl, Supply Chain Management: Strategy, Planning, and Operation, Pearson, 8th Ed., 2024
9. Russel & Taylor, Operations Management, Wiley, 11th Ed., 2022

E-Resources:

- ❖ MIT OpenCourseWare – Operations Management
- ❖ [Coursera – Operations Management by Wharton](#)
- ❖ [LinkedIn Learning – Operations Strategy](#)
- ❖ [ASQ – American Society for Quality](#)
- ❖ [Harvard Business Review – Operations Insights](#)

Course Outcomes

After completing this course, students will be able to:

- **CO1:** Demonstrate conceptual knowledge of operations management, operations strategy, capacity planning, supply chain decisions, product and process design, forecasting, quality management, lean thinking, and emerging trends like Industry 4.0 and sustainability.
- **CO2:** Interpret and relate the principles of operations management, capacity planning, supply chain strategies, product and process design, forecasting techniques, TQM, lean manufacturing, and the impact of digital and sustainable practices on operational excellence.
- **CO3:** Apply operational management tools and techniques, including capacity and location models, product and process design methods, forecasting models, and quality management tools, to solve real-world business problems.
- **CO4:** Analyze operations strategies, facility layouts, supply chain decisions, demand forecasts, and quality management systems to evaluate operational efficiency and identify areas for improvement.
- **CO5:** Evaluate various operational strategies, including capacity planning and sourcing, process and product design, forecasting methods, and quality management philosophies, to make informed decisions for achieving competitive advantage.
- **CO6:** Develop contemporary operations strategies by integrating knowledge of operations management, supply chain, design, forecasting, quality, and emerging trends to foster sustainable and resilient operations in a global market.

Internal Assessment (Total: 100 Marks)

Component	Weightage
Written Test I & II	60%
Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project	40%

CO–PO–PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	2	3	3	2	2	2
CO2	3	3	3	2	3	3	2
CO3	3	2	3	3	3	2	3
CO4	3	3	3	2	3	3	3
CO5	3	3	3	3	2	3	2
CO6	3	3	3	3	3	3	3

Note: 1 – Low, 2 – Medium, 3 – High

BN25C05

Predictive Modeling for Business

L T P C

4 0 0 4

Course Objectives:

This course aims to equip students with a foundational and advanced understanding of predictive analytics, including its role in business decision-making. The course introduces key concepts in regression, classification, ensemble learning, clustering, association rules, and neural networks. Students will learn to use tools such as R, Python, TensorFlow, and Scikit-learn to develop predictive models and interpret outputs using business use cases. Emphasis is placed on hands-on model evaluation and validation, enabling learners to apply analytics-driven insights in real-world business scenarios.

Fundamentals of Predictive Analytics and Statistical Foundation

Introduction -Overview of Analytics and Predictive Analytics - Applications of Predictive Analytics in Business -Predictive Analytics Software (e.g., R, Python, SAS)- Supervised and Unsupervised Learning - Overview of Learning Types: Supervised vs. Unsupervised Introduction to Regression Models – Introduction to Classification Models - Basic Statistical Tools for Prediction - Descriptive Statistics, Inferential Statistics, Basic Statistical Techniques for Predictive Modeling

Regression and Basic Classification Models

Regression Analysis - Simple and Multiple Regression, Iterative Regression Techniques - Classification Models - K-Nearest Neighbors (KNN) - Evaluation Techniques for Classification (Confusion Matrix, ROC Curve) - Model Evaluation & Validation - Metrics for Model Evaluation: MSE, Accuracy, Precision, Recall - Techniques for Model Validation

Ensemble Learning and Advanced Predictive Models

Ensemble Models - Overview of Ensemble Learning- Bagging and Boosting Techniques Bootstrapping - Introduction to Bootstrapping - Applications and Method- Advanced Classification Techniques - In-depth Study of Advanced Classification Models

Clustering and Association Rule Mining

Clustering Techniques - Introduction to Clustering - K-Means Clustering, Hierarchical Clustering - Association Models - Association Rules, Market Basket Analysis, Algorithms for Association Rules (e.g., Apriori, FP-Growth)

Neural Networks and Deep Learning

Introduction to Neural Networks - Basics of Neural Networks, Multi-Layer Perceptrons (MLP) - Introduction to Deep Learning - Overview of Deep Learning, Basic Deep Learning Architectures - Applications of Deep Learning - Use Cases and Real-world Applications, Tools and Libraries for Deep Learning (e.g., Tensor Flow, Keras) - Review and Case studies, Comprehensive Review of Key Concepts - Case Studies

Case Studies, Review and Emerging Trends

Comprehensive review of all predictive techniques – Case Studies: Retail, Finance, Marketing, and Healthcare – Responsible AI and Ethical Considerations in Predictive Modeling – Explainable AI – Role of predictive analytics in Industry 4.0 – Latest Trends in Business Predictive Modeling – Capstone Use Case.

References :

1. Dursun Delen, Predictive Analytics: Data Mining, Machine Learning and Data Science for Practitioners, 3rd Ed., Pearson, 2024
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, 2nd Ed., Springer, 2017
3. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016
4. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 3rd Ed., O'Reilly Media, 2022
5. John Fox, Applied Regression Analysis and Generalized Linear Models, 4th Ed., Sage, 2024
6. Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006
7. Zhi-Hua Zhou, Ensemble Methods: Foundations and Algorithms, Chapman and Hall/CRC, 2012
8. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015
9. David R. Anderson, Statistical Methods for Business and Economics, 14th Ed., Cengage Learning, 2024
10. Ian Witten, Eibe Frank, Mark Hall, Data Mining: Practical Machine Learning Tools and Techniques, 4th Ed., Elsevier, 2016

11. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, 2nd Ed., Springer, 2017

E-Resources:

- ❖ Google AI – Learn with Google AI
- ❖ Kaggle – Predictive Modeling Datasets & Tutorials
- ❖ TensorFlow Tutorials
- ❖ Scikit-learn Documentation
- ❖ Analytics Vidhya – Business Use Cases
- ❖ Coursera – Applied Data Science with Python (UMich)

Course Outcomes

Upon completion of the course, students will be able to:

- **CO1: Demonstrate** conceptual knowledge of the fundamentals of predictive analytics and statistical foundations, regression and classification models, ensemble learning, clustering and association rule mining, neural networks and deep learning, and emerging trends and ethical considerations in business.
- **CO2: Interpret and relate** to the different types of predictive models (supervised and unsupervised), regression and classification techniques, ensemble learning methods, clustering and association rules, deep learning architectures, and the outcomes of real-world case studies for business decisions.
- **CO3: Apply** theories and concepts of predictive analytics, regression, and classification to business problems, utilize advanced ensemble and clustering techniques, implement neural networks and deep learning, and integrate these models to solve real-world industry use cases.
- **CO4: Analyze** predictive analytics methodologies, including regression and classification models, advanced ensemble and clustering techniques, neural network architectures, and the role of emerging trends and explainable AI in organizational settings.
- **CO5: Evaluate** the theories and performance of various predictive models, including regression, classification, ensemble learning, clustering algorithms, and neural networks, to build models for enhancing business decision-making across different domains.
- **CO6: Develop** contemporary practices, **adapt** and **modify** predictive models and techniques related to statistical foundations, regression, ensemble learning, clustering, neural networks, and deep learning to suit real-world business use cases and address ethical considerations in the field.

Internal Assessment Methodology (100 Marks)

Component	Weightage
Written Test I & II	60%
Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project	40%

CO–PO–PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	3	2	2	3	3	3
CO2	3	3	3	3	2	3	3
CO3	3	2	3	3	3	3	3
CO4	3	2	3	3	2	3	2
CO5	2	3	3	3	3	3	3
CO6	3	3	3	2	3	3	3

Note: 1 – Low, 2 – Medium, 3 – High

MB25C08

Business Research Methods

**L T P C
3 1 0 4**

Course Objectives:

This course aims to develop a research-oriented mindset by imparting the principles and practices of scientific Business research. It enables students to systematically approach real-world Business problems using exploratory, descriptive, and causal research designs. Emphasis is placed on quantitative and qualitative research techniques, instrument design, statistical analysis using software tools, and ethical report writing. The course also trains students to critically evaluate research studies and independently prepare Business research reports for data-driven decision-making.

Foundations of Business Research and Scientific Inquiry

Business Research – Definition and Significance – the research process – Types of Research – Exploratory and causal Research – Theoretical and empirical Research – Cross –Sectional and time – series Research – Research questions / Problems – Research objectives – Research hypotheses – characteristics – Research in an evolutionary perspective – the role of theory in research.

Research Design and Measurement Techniques

Research design – Definition – types of research design – exploratory and causal research design – Descriptive and experimental design – different types of experimental design – Validity of findings – internal and external validity – Variables in Research – Measurement and scaling – Different scales – Construction of instrument – Validity and Reliability of instrument.

Data Collection Methods and Sampling Techniques

Types of data – Primary Vs Secondary data – Methods of primary data collection – Survey Vs Observation – Experiments – Construction of questionnaire and instrument – Types of Validity –

Sampling plan – Sample size – determinants optimal sample size – sampling techniques – Sampling methods.

Data Preparation and Analytical Techniques

Data Preparation – editing – Coding –Data entry – Validity of data – Qualitative Vs Quantitative data analyses – Applications of Bivariate and Multivariate statistical techniques, Factor analysis, Discriminant analysis, Cluster analysis, Multiple regression and Correlation, Multidimensional scaling – Conjoint Analysis – Application of statistical software for data analysis.

Report Writing and Research Communication

Research report –Types – Contents of report – need for executive summary – chapterization – contents of chapter – report writing – the role of audience – readability – comprehension – tone – final proof – report format – title of the report – ethics in research – Ethics in research – Subjectivity and Objectivity in research.

Integrity and Trends in Business Research

Research Integrity – Emerging Trends: Digital Surveys, AI in Research, Online Panels, Real-Time Analytics – Case Studies on Ethical Dilemmas in Research.

References:

1. Donald R. Cooper, Pamela S. Schindler, J. K. Sharma, Business Research Methods, McGraw Hill, 13th Ed., 2021
2. Uma Sekaran & Roger Bougie, Research Methods for Business: A Skill Building Approach, Wiley, 7th Ed., 2020
3. William G. Zikmund et al., Business Research Methods – South Asian Perspective, Cengage, 9th Ed., 2018
4. Alan Bryman & Emma Bell, Business Research Methods, Oxford University Press, 5th Ed., 2019
5. R. Paneerselvam, Research Methodology, PHI Learning, 2nd Ed., 2015
6. Mark Saunders, Philip Lewis, Adrian Thornhill, Research Methods for Business Students, Pearson, 8th Ed., 2022
7. Davis Bunn & Jennie Tranter, Business Research and Statistics Using Excel, Wiley, 1st Ed., 2021

E-Resources:

- ❖ [Harvard Business Review – Research Insights](#)
- ❖ [SAGE Research Methods Library](#)
- ❖ [Elsevier – Researcher Academy](#)
- ❖ [StatSoft Textbook – Statistics and Analytics](#)
- ❖ [Coursera – Data-Driven Decision Making \(PwC\)](#)
- ❖ [Google Forms & SurveyMonkey – Data Collection Tools](#)

Course Outcomes

After completing this course, students will be able to:

- **CO1:** Demonstrate conceptual knowledge of the research process, various research designs, data collection methods, analytical techniques, report writing, and emerging trends and ethical considerations in business research.
- **CO2:** Interpret and relate research questions and objectives to appropriate research designs, measurement scales, sampling techniques, and data analysis methods for conducting scientific inquiry.
- **CO3:** Apply research design principles, instrument construction, data collection methods, and statistical software to collect, prepare, and analyze both qualitative and quantitative data.
- **CO4:** Analyze the validity and reliability of research instruments, the outcomes of bivariate and multivariate statistical analyses, and the ethical implications of a research project to derive meaningful insights and conclusions.
- **CO5:** Evaluate different research methodologies, data analysis techniques, and ethical dilemmas in business research to ensure the integrity, objectivity, and reliability of research findings.
- **CO6:** Develop a comprehensive, ethically sound business research report by integrating knowledge of research design, data collection, analytical methods, and emerging technologies to support data-driven managerial decision-making.

Internal Assessment Methodology – 100 Marks

Component	Weightage
Written Test I & II	60%
Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project	40%

CO–PO–PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	3	2	3	2	3	2
CO2	3	3	3	3	3	3	3
CO3	3	2	3	3	2	3	3
CO4	3	3	3	3	3	3	2
CO5	3	3	3	2	2	2	3
CO6	2	3	3	3	3	3	3

Note: 1 – Low, 2 – Medium, 3 – High

Course Objectives:

This course equips students with analytical and quantitative tools essential for modeling and solving complex Business problems. It emphasizes linear programming, decision theory, inventory models, queuing systems, and simulation techniques, enabling data-driven decision-making in logistics, finance, operations, and project management. Learners will gain proficiency in applying optimization and statistical modeling techniques using spreadsheet-based tools and modern software applications. The course prepares students to assess real-time scenarios with practical, strategic, and computational approaches to decision-making.

Introduction to Quantitative Decision Models

Relevance of quantitative techniques in management decision making. Linear Programming formulation, solution by graphical and simplex methods (Primal - Penalty, Two Phase), Special cases. Sensitivity Analysis. **(Theory and Problem)**

Extensions of Linear Programming – Transportation & Assignment (Problems)

Transportation Models (Minimising and Maximising Problems) – Balanced and unbalanced Problems – Initial Basic feasible solution by N-W Corner Rule, Least cost and Vogel's approximation methods. Check for optimality. Solution by MODI / Stepping Stone method. Case of Degeneracy. Transshipment Models. Assignment Models (Minimising and Maximising Problems) – Balanced and Unbalanced Problems. Solution by Hungarian and Branch and Bound Algorithms. Travelling Salesman problem. Crew Assignment Models.

Decision Theory and Game Theory Applications (Theory and Problem)

Decision making under risk – Decision trees – Decision making under uncertainty. Game Theory- Two-person Zero sum games-Saddle point, Dominance Rule, Convex Linear Combination (Averages), methods of matrices, graphical and LP solutions.

Inventory Control and Replacement Models (Theory and Problem)

Inventory Models – EOQ and EBQ Models (With and without shortages), Quantity Discount Models. Replacement Models-Individual replacement Models (With and without time value of money) – Group Replacement Models.

Queuing Models and Monte Carlo Simulation (Problem)

Queuing Theory - single and multi-channel models – infinite number of customers and infinite callingsource. Monte Carlo simulation – use of random numbers, application of simulation techniques

Emerging Trends and Tools for Quantitative Decision-Making**(Theory and Problem)**

Integration of quantitative techniques in Business analytics – Use of Excel Solver, R, and Python in operations research – Introduction to prescriptive analytics.

References:

1. Hamdy A. Taha, Operations Research: An Introduction, 11th Ed., Pearson Education, 2022

2. G. Srinivasan, Operations Research: Principles and Applications, PHI Learning, 2nd Ed., 2011
3. N. D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill, 2010
4. R. Paneerselvam, Operations Research, PHI Learning, 4th Ed., 2018
5. Frederick Hillier & Mark Hillier, Introduction to Management Science, McGraw Hill India, 6th Ed., 2023
6. Bernard W. Taylor III, Introduction to Management Science, Pearson, 9th Ed., 2020
7. S. Kalavathy, Operations Research, Vikas Publishing House, 4th Ed., 2022
8. Nagraj B., Barry R. & Ralph M. S. Jr., Managerial Decision Modelling with Spreadsheets, Pearson Education, 2nd Ed., 2007

E-Resources:

- ❖ MIT OpenCourseWare – Operations Research
- ❖ OR-Tools by Google
- ❖ Analytics Vidhya – Decision Science Tutorials
- ❖ [Coursera – Business Analytics: Decision Making Using Data \(Wharton\)](#)
- ❖ [Khan Academy – Linear Programming and Optimization](#)
- ❖ YouTube – Prof. G. Srinivasan’s NPTEL Operations Research Series

Course Outcomes

Upon completion of the course, students will be able to:

- **CO1:** Demonstrate conceptual knowledge of quantitative decision models, linear programming, transportation and assignment problems, decision theory, game theory, inventory control, replacement models, queuing systems, simulation, and emerging trends and software tools.
- **CO2:** Interpret and relate the principles of linear programming, transportation and assignment models, decision theory, game theory, inventory and replacement models, queuing theory, and simulation to identify and frame business problems.
- **CO3:** Apply analytical and quantitative tools, including linear programming, transportation and assignment methods, decision trees, inventory models, and queuing theory, to solve complex business problems.
- **CO4:** Analyze business problems across different domains, such as logistics, operations, and project management, using techniques like linear programming, game theory, inventory models, and simulation to assess alternative solutions and their impacts.
- **CO5:** Evaluate the effectiveness of various operations research techniques, including transportation and assignment models, decision theory, and queuing models, to make informed and optimal decisions under real-world constraints and uncertainties.
- **CO6:** Develop data-driven solutions and strategic recommendations by integrating knowledge of linear programming, inventory management, queuing theory, and simulation, and utilizing modern software tools to solve complex managerial decision problems.

Internal Assessment Methodology – 100 Marks

Component	Weightage
Written Test I & II	60%
Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project	40%

CO–PO–PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	3	3	3	3	3	2
CO2	3	2	3	2	2	3	3
CO3	3	3	2	2	3	2	2
CO4	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	2
CO6	3	3	3	3	3	3	3

Note: 1 – Low, 2 – Medium, 3 – High

MB25C06	Entrepreneurship Development	L	T	P	C
		3	0	0	3
<p>Course Objectives: This course aims to equip the knowledge and skills to identify entrepreneurial opportunities, develop a comprehensive business plan, and manage the lifecycle of a startup, from launch to sustainable growth. It integrates theoretical frameworks with practical applications of the entrepreneurial ecosystem and ethical business practices.</p>					
<p>Entrepreneurial Mindset and Competencies: Entrepreneurship concept – Entrepreneurship as a Career – Entrepreneurial Personality - Characteristics of Successful Entrepreneurs – Knowledge and Skills of an Entrepreneur.</p>					
<p>Entrepreneurial Ecosystem and Policy Support: Entrepreneurial Environment – Role of Family, Society and Culture – Government Industrial Policies – State and Central Schemes (Startup India, Stand-Up India, PMPGP, MSME) – Role of DICs, SIDBI, EDII, TBI, DST, NSIC – Role of Industry Associations and Support Services – Incubation Centers and Accelerators – International Policy Ecosystem (Global Innovation Index, GEM).</p>					
<p>Opportunity Identification and Business Planning: Sources of Product for Business - Prefeasibility Study - Criteria for Selection of Product - Ownership - Capital Budgeting- Project Profile Preparation - Matching Entrepreneur with the Project - Feasibility Report Preparation and Evaluation Criteria.</p>					
<p>Launching the Startup and Funding Mechanisms: Finance and Human Resource Mobilisation - Operations Planning - Market and Channel Selection -Growth Strategies - Product Launching – Incubation, Venture capital, Start-ups.</p>					
<p>Managing and Scaling the Business: Small Business Operations – Inventory, Finance, and People Management – Customer Acquisition and Retention – Digital Tools for Small business – Measuring Business Performance – Managing Uncertainty and Change – Business Model Innovation – Lean Startup Strategy – Scaling Frameworks – Case Studies on Growth-Oriented Startups.</p>					
<p>Business Sustainability, Exit Strategies, and Ethics: Monitoring and Evaluation of Business - Business Sickness - Prevention and Rehabilitation of Business Units - Effective Management of small Business - Case Studies.</p>					
<p>References:</p> <ol style="list-style-type: none"> 1. Khanka, S. S. (2020). Entrepreneurial development (Rev. ed.). S. Chand & Company Ltd. 2. Hisrich, R. D., Peters, M. P., & Shepherd, D. A. (2024). Entrepreneurship (12th ed.). McGraw Hill. 3. Roy, R. (2020). Entrepreneurship (3rd ed.). Oxford University Press. 4. Kumar, A. (2012). Entrepreneurship. Pearson Education. 5. Chandra, P. (2023). Projects – Planning, analysis, selection, implementation and review (10th ed.). Tata McGraw Hill. 6. Murthy, N., & Tata, R. Biographical and interview compilations. 					
<p>E-Resources:</p> <ol style="list-style-type: none"> 1. Startup India Portal https://www.startupindia.gov.in/ 2. YourStory https://yourstory.com/ 					

Course Outcomes

After completing the course, students will be able to:

- **CO1:** Demonstrate conceptual knowledge of entrepreneurial mindset and competencies, the entrepreneurial ecosystem, opportunity identification, business planning, startup funding, operations management, and business sustainability and ethics.
- **CO2:** Interpret and relate the characteristics of successful entrepreneurs, government policies, business planning processes, funding mechanisms, operational strategies, and business sustainability frameworks to identify and evaluate entrepreneurial opportunities.
- **CO3:** Apply entrepreneurial competencies, government schemes, business planning tools, resource mobilization strategies, and operational management principles to launch and manage a new venture.
- **CO4:** Analyze business opportunities, the entrepreneurial ecosystem, business plans, growth strategies, and sustainability frameworks to make informed decisions about venture creation and management.
- **CO5:** Evaluate different business models, funding mechanisms, operational strategies, and exit plans to ensure the growth, sustainability, and ethical conduct of a new enterprise.
- **CO6:** Develop a comprehensive business plan by integrating knowledge of entrepreneurial principles, policy support, opportunity analysis, funding, operations, and sustainability to create a successful and socially responsible venture.

Internal Assessment Methodology – 100 Marks

Component	Weightage
Written Test I & II	60%
Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project	40%

CO–PO–PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	3	3	2	2	3	3
CO2	3	3	3	3	2	2	3
CO3	3	3	3	3	3	3	2
CO4	3	2	3	3	3	3	3
CO5	3	2	3	3	2	3	2
CO6	2	3	3	2	3	3	3

Note: 1 – Low, 2 – Medium, 3 – High

Course Objectives:

This course enables students to apply practical data science skills using Python for real-world business analytics. It equips them with the ability to clean, manipulate, analyze, and visualize data for strategic insights. Students will gain hands-on experience with statistical and predictive modeling, time series forecasting, and clustering using modern libraries such as Pandas, NumPy, Scikit-learn, Matplotlib, and Seaborn. The course emphasizes project-based learning and integrates contemporary case studies across business functions.

Data Analysis Environment and Manipulation Techniques

Introduction to Business Analytics and Python, Overview of business analytics and its applications. Introduction to Python for data analysis. Setting up Python environment (Anaconda, Jupyter Notebooks). Data Manipulation with Pandas : Introduction to Pandas library for data manipulation. , Working with Series and Data Frames., Data cleaning and preprocessing techniques.

Descriptive and Inferential Statistics with NumPy and SciPy

Descriptive Statistics with NumPy , Introduction to NumPy library for numerical computing. Calculating descriptive statistics (mean, median, variance, etc.). Exploring data distributions. Data Visualization with Matplotlib, Introduction to Matplotlib library for data visualization. Creating line plots, scatter plots, histograms, and bar charts. Customizing plot aesthetics and adding annotations.

Data Visualization and Dashboarding

Inferential Statistics :- Hypothesis testing with Python (t-tests, chi-square tests). Confidence intervals and hypothesis testing for proportions. Introduction to ANOVA for comparing means across groups. Predictive Modeling with Scikit-learn, Introduction to machine learning with Scikit-learn. ,Building and evaluating predictive models (linear regression, logistic regression). Model selection and hyper parameter tuning.

Supervised Learning with Scikit-learn

Time Series Analysis - Introduction to time series data., Exploratory data analysis for time series. Building time series forecasting models (ARIMA, Exponential Smoothing). Real-world case studies applying business analytics techniques with Python.

Advanced Predictive Modeling and Time Series Analysis

Advanced Predictive Modeling, Introduction to decision trees and ensemble methods (Random Forest, Gradient Boosting). Evaluating model performance (cross - validation, ROC curves, AUC)., Introduction to feature engineering and selection.

Clustering and Capstone Business Application

Unsupervised Learning – K-Means and Hierarchical Clustering – Evaluation using Silhouette Score – Real- world Business Use Cases – Final Mini Project: From Data Collection to Dashboard – Case Presentation – GitHub/Google Colab Submission.

TOTAL: 60 PERIODS**List of exercises:**

Data Manipulation with Pandas:

- ❖ Load a dataset into a Pandas Data Frame and inspect its structure.
- ❖ Perform basic data manipulation tasks such as selecting columns, filtering rows, and sorting data.
- ❖ Handle missing values by imputing or removing them from the dataset.

Descriptive Statistics with NumPy:

- ❖ Calculate descriptive statistics (mean, median, mode, variance, standard deviation) for numerical variables using NumPy.
- ❖ Explore data distributions and visualize them using histograms or density plots.

Data Visualization with Matplotlib:

- ❖ Create basic line plots, scatter plots, and bar charts to visualize relationships between variables.
- ❖ Customize plot aesthetics such as colors, labels, and titles.
- ❖ Generate subplots and combine multiple plots into a single figure.

Inferential Statistics with SciPy:

- ❖ Conduct hypothesis testing (t-tests, chi-square tests) to make inferences about population parameters.
- ❖ Calculate confidence intervals to estimate the range of plausible values for a population parameter.
- ❖ Perform correlation analysis to explore relationships between variables.

Predictive Modeling with Scikit-learn:

- ❖ Split the dataset into training and testing sets for model evaluation.
- ❖ Build and evaluate predictive models using linear regression, logistic regression, and decision trees.
- ❖ Apply cross-validation techniques to assess model performance and generalization.

Feature Engineering and Selection:

- ❖ Create new features by transforming existing variables (e.g., polynomial features, logarithmic transformations).
- ❖ Select relevant features using techniques such as correlation analysis, feature importance, or recursive feature elimination.

Time Series Analysis:

- ❖ Convert a dataset into a time series format and visualize temporal patterns.
- ❖ Apply time series decomposition to separate trend, seasonality, and noise components.
- ❖ Build and evaluate time series forecasting models (e.g., ARIMA, Exponential Smoothing).

Clustering Analysis with Scikit-learn:

- ❖ Explore unsupervised learning techniques such as K-means clustering to identify natural groupings in the data.
- ❖ Visualize clustering results using scatter plots or heat maps.
- ❖ Evaluate clustering performance using metrics such as silhouette score or Davies - Bouldin index.
- ❖ Implement unsupervised learning techniques and visualize business analytics results.

References:

1. Eric Matthes, "Python Crash Course, A Hands-on Project-Based Introduction to Programming", 3rd Edition, No Starch Press, 2022
2. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 3rd Edition, O'Reilly Publishers, July 2024
3. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly Media, 3rd Edition, 2022
4. John V. Guttag, Introduction to Computation and Programming Using Python, MIT Press, 3rd Ed., 2021
5. Yuli Vasiliev, Python for Data Science Handbook, No Starch Press, 2022
6. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017
7. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 2nd Edition, 2024
8. G. Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021

E-Resources:

- ❖ Kaggle Datasets and Competitions
- ❖ Google Colab Notebooks
- ❖ Scikit-learn Documentation
- ❖ Seaborn and Matplotlib Gallery
- ❖ Python for Data Science – IBM on Coursera
- ❖ Real Python – Python Tutorials
- ❖ Analytics Vidhya – Data Science Projects

Course Outcomes

Upon completion of the course, students will be able to:

- **CO1: Demonstrate** conceptual knowledge of Python for data analysis, descriptive and inferential statistics, data visualization and dashboarding, supervised and advanced predictive modeling, time series analysis, and clustering for business applications.
- **CO2: Interpret and relate** to Python-based data manipulation, descriptive and inferential statistics, data visualization techniques, predictive modeling with Scikit-learn, time series forecasting, and unsupervised learning methods like clustering.

- **CO3: Apply** the theories and concepts of Python for data cleaning, statistical analysis with NumPy and SciPy, data visualization with Matplotlib, supervised learning models, advanced predictive modeling, and clustering to solve real-world business analytics problems.
- **CO4: Analyze** methodologies for data manipulation with Pandas, descriptive and inferential statistics, data visualization and dashboarding, predictive and advanced modeling techniques, time series analysis, and clustering algorithms in various organizational settings.
- **CO5: Evaluate** the theories related to data analysis with Python, statistical modeling, data visualization, supervised and advanced predictive models, time series analysis, and clustering to build models for enhancing business decision-making.
- **CO6: Develop** contemporary practices, **adapt** and **modify** data analysis concepts related to Python, statistical and predictive modeling, time series analysis, and clustering to suit real-world business applications and capstone projects.

CO–PO–PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	3	2	2	3	3	3
CO2	3	3	3	2	2	3	3
CO3	2	3	3	3	2	2	2
CO4	3	2	3	3	3	3	2
CO5	3	3	2	3	3	3	3
CO6	3	3	3	3	3	3	3

Note: 1 – Low, 2 – Medium, 3 – High

Course Objectives:

This course equips students with the creative, technical, and strategic skills to craft impactful content across social media platforms. It focuses on understanding audience behavior, selecting appropriate content formats, and using design tools like Canva to build visually engaging posts. Students learn to create platform-specific content, apply analytics to optimize performance, and use digital storytelling to engage followers. Emphasis is also placed on ethical content use, branding consistency, and building community through content.

Foundations of Social Media and Audience Insights

Overview of major social media platforms (Facebook, Instagram, Twitter, LinkedIn, TikTok, etc.) Importance of social media in modern marketing - Understanding audience demographics and behaviors

Content Planning, Copywriting, and Content Strategy

Defining content goals and objectives - Creating a content calendar - Identifying target audience and personas- Developing a brand voice and style guide.

Content Types and Formats - Understanding different content types (text, images, videos, stories, live streams, etc.) Best practices for each content type - Using multimedia to enhance engagement Writing for Social Media - Crafting compelling headlines and captions - Writing for different platforms - SEO and keyword strategies for social media.

Visual Content Creation Using Canva

Basics of graphic design - Tools for creating visual content (Canva, Adobe Spark, etc.) - Canva Introduction, Canva Pro & Free , Beginner Canva Hacks , Master Your Canva Workflow.

Social Media Design Lab with Canva

Inspirational Quote Graphics , Interactive Instagram Stories, Post Your Instagram Stories , Master Transparent Backgrounds , Create Instagram Highlights, Add Highlights to Your Profile , Captivating Carousels , GIFs & Memes ,Turn Yourself Into a GIF, Easy Instagram Reels , Plan Your Grid in Canva , GIFs & Memes , Easy Instagram Reels , Facebook Banners , LinkedIn Cover Story & Banner , YouTube Channel Banner , Clickable YouTube Thumbnails , Animated YouTube End Screens , YouTube Intro Video Social Media Video Ads Advanced Reel Tricks.

Canva for Business

Design Amazing eBooks ,Clickable & Fillable PDFs , Compress Images & PDFs, Impressive Business Cards , Animate Your Email Signature Powerful Presentations, Design a Simple Website , Make Stunning Mockups ,Add Flair to Your Desktop , Tips for creating eye-catching visuals

Content Management, Analytics & Community Engagement

Understanding metrics: reach, engagement, impressions, shares, saves, CTR – Tools: Meta Business Suite, Instagram Insights, YouTube Studio, Buffer – Campaign monitoring and A/B testing – Negative comment handling – Customer service in DMs – Social listening – Building and moderating communities – Crisis management.

Practical Exercises:

Video Content Creation:

Basics of video production, Tools for creating and editing videos Best practices for live streaming , Content Creation and User-Generated Content , Strategies for curtaining content , Encouraging and leveraging user- generated content Legal and ethical considerations.

Social media Analytics and Metrics:

Understanding social media metrics (engagement, reach, impressions, etc.) , Tools for tracking and analyzing performance , Using data to refine content strategy, Collaborating with influencers, Handling negative feedback and crises ,Building and nurturing an online community, Best practices for customer service on social media.

References:

1. Gary Vaynerchuk, *Crushing It!: How Great Entrepreneurs Build Their Business and Influence*, Harper Business, 2018
2. Jenn Herman, *Instagram for Dummies*, 2nd Ed., Wiley, 2022
3. Ann Handley, *Everybody Writes*, Harper Business, 2nd Edition, 2022
4. Joe Pulizzi, *Content Inc.*, McGraw Hill, Second Edition, 2021
5. Courtney Rose, *Social Media Content Creation (Canvas Mastery)*, UGC Creators Press, 2023
6. Sreehari Sreekumar, *Digital Marketing Made Simple*, Notion Press, 2025 Edition

E-Resources

- ❖ <https://www.canva.com/learn/> – Canva tutorials
- ❖ <https://later.com/blog/> – Instagram tips & content calendars
- ❖ <https://blog.hootsuite.com/> – Social strategy guides
- ❖ <https://creators.instagram.com/> – Instagram Creator Portal
- ❖ <https://www.socialmediaexaminer.com/> – Industry updates
- ❖ <https://www.buffer.com/> – Social analytics tools
- ❖ <https://sproutsocial.com/insights/> – Case studies and trends

Course Outcomes

Upon completion, students will be able to:

- **CO1: Demonstrate** conceptual knowledge of social media platforms and audience insights, content planning and strategy, visual content creation with Canva, advanced design using Canva, Canva for business applications, and content management and analytics.
- **CO2: Interpret and relate** to social media audience behaviors, content planning and copywriting, visual content creation principles, the functionality of Canva for design projects, using Canva for business, and social media metrics for community engagement.
- **CO3: Apply** the theories and concepts of social media platforms, content strategy, visual design with Canva, advanced Canva techniques, business-oriented content creation, and analytics tools to create and manage engaging content and build a community.
- **CO4: Analyze** methodologies for understanding social media audiences, creating content calendars and brand voice, visual content creation with Canva, platform-specific design, business applications of Canva, and content management and analytics in various business settings.

- **CO5: Evaluate** the theories related to social media platforms, content planning and copywriting, visual design, advanced Canva tools, business applications of Canva, and content management and analytics to build models for enhancing digital brand presence and community engagement.
- **CO6: Develop** contemporary practices, **adapt** and **modify** social media content creation concepts to all aspects of content, including audience insights, planning and strategy, visual design, business applications of Canva, and analytics, to suit different platforms and ethical considerations.

CO–PO–PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	3	2	2	2	3	2
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	2	2	3
CO4	3	2	3	3	3	3	3
CO5	3	3	3	3	3	3	3
CO6	3	3	2	3	3	2	3

Note: 1 – Low, 2 – Medium, 3 – High

Semester III

Course Objectives:

This course equips students with a comprehensive understanding of strategic management frameworks and their application across dynamic Business environments. It focuses on strategic thinking, environmental analysis, corporate governance, competitive advantage, and Business model innovation. Students will learn to formulate, implement, and evaluate strategies that align with organizational goals in global and local contexts. Emphasis is placed on real-world case analysis, ethical decision-making, and adapting to technological and global disruptions.

Strategic Foundations and Stakeholder Analysis

Concept of strategy and strategic management - Strategic management process and hierarchy of strategy - Mission, vision, objectives and goal setting - Stakeholder analysis – Corporate governance and social responsibility - Strategic intent and ethical -considerations – Case analysis

Environmental and Competitive Analysis

External environment: PESTEL and SWOT framework - Porter's Five Forces and strategic group mapping - Globalisation and industry structure – Role of national advantage - Internal analysis: Resources, capabilities, core competencies - Sustainable competitive advantage and barriers – Case analysis

Strategic Formulation at Corporate and Business Levels

Corporate-level strategies: Stability, expansion, retrenchment, combination - Business-level strategies: Cost leadership, differentiation, focus - Strategic alliances, mergers and acquisitions, vertical integration - Tools: ETOP, Strategic Advantage Profile, BCG matrix, GE 9 Cell, McKinsey 7S, Gap Analysis - Balanced Scorecard for strategic alignment – Case analysis

Strategy Implementation and Organizational Design

Strategy implementation framework – Role of structure and systems - Resource allocation – Strategic control systems - Leadership, power, and politics in strategy execution - Organizational design: structure-culture fit - Managing strategic change and resistance – Case analysis - Conflict techniques in strategic evolution.

Innovation, Disruption, and Strategic Technology Management

Strategic innovation and technology adoption - Business models in the digital era – Platform economy and gig models - Strategic issues in non-profit and social enterprises - Innovation ecosystems and open innovation models - New economy strategies and global innovation – Case analysis

Emerging Trends and Challenges in Strategy

Strategic management in uncertain and volatile environments - Cultural alignment and organizational development - Change management strategies - Strategic agility, foresight, and scenario planning - Strategic management in a post-pandemic global economy

References:

1. Hill, Schilling & Jones, Strategic Management: An Integrated Approach, Cengage, 14th Ed., 2024
2. Azhar Kazmi, Strategic Management and Business Policy, Tata McGraw-Hill, 5th Ed., 2024
3. John A. Parnell, Strategic Management: Theory and Practice, Biztantra,
4. Lawrence G. Hrebiniak, Making Strategy Work, Pearson, 2nd Ed., 2013
5. Lafley A. G. & Martin R. L., Playing to Win: How Strategy Really Works, HBR Press, 2013
6. Gupta, Gollakota & Srinivasan, Business Policy and Strategic Management, PHI, 2005
7. John Pearce & Richard Robinson, Strategic Management, McGraw Hill, 14th Ed., 2019

E-Resources:

- ❖ NPTEL: Strategic Management (IIM Bangalore) – <https://nptel.ac.in>
- ❖ McKinsey Insights – Strategy & Corporate Finance – <https://www.mckinsey.com>
- ❖ BCG Perspectives – <https://www.bcg.com>
- ❖ Harvard Business Review Strategy Articles – <https://hbr.org>
- ❖ Coursera: Strategic Management by Copenhagen Business School

Course Outcomes

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

- **CO1:** Demonstrate conceptual knowledge of strategic management, environmental and competitive analysis, corporate and business-level strategies, strategy implementation, innovation management, and emerging trends and challenges in strategy.
- **CO2:** Interpret and relate the concepts of strategy, competitive advantage, corporate and business-level strategies, organizational design, innovation, and strategic agility to understand the strategic management process.
- **CO3:** Apply strategic frameworks, analytical tools (e.g., PESTEL, Porter's Five Forces), and strategic alternatives to formulate and implement strategies at both corporate and business levels.
- **CO4:** Analyze the internal and external environments, different strategic alternatives, and organizational design models to evaluate competitive advantage, manage change, and ensure effective strategy implementation.
- **CO5:** Evaluate corporate and business-level strategies, innovation models, and change management approaches to make informed decisions and address strategic challenges in dynamic environments.
- **CO6:** Develop a comprehensive strategic plan by integrating knowledge of strategic analysis, formulation, implementation, innovation, and emerging trends to foster a culture of strategic agility and competitive advantage in a global context.

Internal Assessment Methodology (100 Marks):

Component	Weightage
Written Test I & II	60%
Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project	40%

CO–PO–PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	3	2	2	2	3	2
CO2	3	3	3	2	2	3	3
CO3	3	3	3	3	2	3	3
CO4	3	2	3	3	2	3	3
CO5	2	3	3	3	3	3	3
CO6	3	3	3	3	3	3	3

Note: 1 – Low, 2 – Medium, 3 – High

BN25301

Artificial Intelligence and Machine Learning

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Course Objectives:

This course provides foundational and advanced insights into Artificial Intelligence (AI) and Machine Learning (ML) for business analytics applications. It aims to equip students with theoretical knowledge of intelligent systems and learning algorithms and practical skills in applying appropriate models to real-world data problems. Students will explore planning, knowledge representation, classification, clustering, Bayesian models, and advanced neural network architectures. Emphasis is placed on the integration of AI and ML into managerial decision-making.

Introduction to Intelligent Systems and Problem Solving

Introduction to Artificial Intelligence – Intelligent systems and applications – State-space search – Exhaustive and heuristic search – Tic-Tac-Toe and general problem-solving paradigms – Control strategies – Foundations and goals of AI.

Knowledge Representation and Expert Systems

Approaches to knowledge representation – Semantic networks – Frames – Planning systems – Truth maintenance – Blackboard architecture – Expert systems: design, components, and applications – Role in business and analytics.

Expert Systems and Applications: Blackboard Systems - Truth Maintenance Systems - Applications of Expert Systems.

Introduction to Machine Learning

Human vs machine learning – Types: supervised, unsupervised, reinforcement – Data structures and types – Data quality, remediation and preprocessing – Model building: selection, representation, training – Evaluation metrics and performance improvement.

Bayesian Models and Probabilistic Learning

Bayes Theorem – Concept learning – Maximum likelihood hypothesis – Least squares and probabilistic inference – Naive Bayes classifier – Bayesian belief networks – EM algorithm – Minimum description length principle – Gibbs algorithm.

Supervised Learning and Neural Networks

Classification models – Algorithm comparison – Artificial neuron – ANN architecture – Activation functions – Supervised learning steps – Applications in business analytics – Regression vs classification – Evaluation methods.

Unsupervised Learning and Advanced Techniques

Clustering techniques – Association rule mining – PCA and dimensionality reduction – Topic modeling – Introduction to deep learning – Recent trends in AI and ML in business – Real-world case applications – Open-source platforms and tools.

References:

1. Saroj Kaushik, "Artificial Intelligence", Cengage Learning, Second Edition, 2022
2. Deepak Khemani, "A First Course in Artificial Intelligence", McGraw Hill, 2013
3. Saikat Dutt, Subramanian Chandramouli, Amit Das, "Machine Learning", Pearson, 2019
4. Gopinath Rebala et al., "Introduction to Machine Learning", Springer, 2019
5. Tom Mitchell, "Machine Learning", McGraw Hill, 2017
6. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, 3rd Ed., 2014
7. Anuradha Srinivasaraghavan & Vincy Joseph, "Machine Learning", Wiley, 2019

E-Resources:

- ❖ NPTEL: Artificial Intelligence by IIT Madras – <https://nptel.ac.in/courses/106106126>
- ❖ Coursera: Machine Learning by Andrew Ng – <https://www.coursera.org/learn/machine-learning>
- ❖ Google AI Hub – <https://ai.google/tools/>
- ❖ Kaggle Learning – <https://www.kaggle.com/learn>
- ❖ OpenAI documentation – <https://platform.openai.com/docs>

Course Outcomes

Upon completion of the course, students will be able to:

- **CO1: Demonstrate** conceptual knowledge of intelligent systems and problem solving, knowledge representation and expert systems, machine learning fundamentals, Bayesian and probabilistic learning, supervised learning and neural networks, and unsupervised learning and advanced AI/ML techniques.
- **CO2: Interpret and relate** to state-space search and heuristic methods, knowledge representation models, various machine learning approaches, Bayesian learning frameworks, supervised learning algorithms and ANNs, and unsupervised learning techniques to solve business analytics problems.

- **CO3: Apply** theories and concepts of intelligent systems, expert systems, machine learning, Bayesian models, supervised learning and neural networks, and unsupervised learning to a wide range of business analytics problems and real-world data.
- **CO4: Analyze** methodologies for problem solving in AI, knowledge representation, data preprocessing for machine learning, probabilistic inference using Bayesian models, supervised learning and classification, and clustering/dimensionality reduction in organizational settings.
- **CO5: Evaluate** the theories and performance of intelligent systems, expert systems, various machine learning approaches, Bayesian models, supervised learning techniques and neural networks, and unsupervised learning to build models for enhancing managerial decision-making.
- **CO6: Develop** contemporary practices, **adapt** and **modify** AI and ML concepts related to intelligent systems, knowledge representation, machine learning, Bayesian models, supervised learning, and unsupervised learning to suit real-world business applications and address recent trends.

Internal Assessment Methodology (100 Marks)

Component	Weightage
Written Test I & II	60%
Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project	40%

CO-PO-PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	3	2	2	2	3	2
CO2	3	3	3	2	2	3	3
CO3	3	3	3	3	2	3	3
CO4	3	2	3	3	2	3	3
CO5	2	3	3	3	3	3	3
CO6	3	3	3	3	3	3	3

Note: 1 – Low, 2 – Medium, 3 – High

Course Objectives:

This course aims to provide learners with practical knowledge and skills in R programming to solve complex business analytics problems. The curriculum is designed to familiarize students with data wrangling, statistical modeling, machine learning algorithms, and data visualization techniques using R. Emphasis is placed on real-world data applications, problem-solving skills, and the use of R packages for deriving business insights. Learners will gain hands-on experience through extensive exercises using real and simulated datasets aligned with modern business needs.

Introduction to R Programming and Exploratory Data Analysis

Overview of R Language – Installation of R and RStudio – Scripts and IDEs – Data Types and Data Structures – Packages, Operators, and Functions in R – Data Extraction and Wrangling – Data Import/Export Techniques – Pre-processing of Data – Exploratory Data Analysis.

Data Visualization for Business Insights using R

Data Visualization Tools – ggplot2, Lattice, High charter, RColor Brewer, Plotly – Graphical Techniques – Perceptual Mapping – Business Charts, Graphs, and Maps – Visualizing Trends and Patterns.

Inferential Statistics using R

Testing Assumptions – Parametric and Non-Parametric Tests – Correlation – Linear & Logistic Regression – Dimensionality Reduction (EFA & PCA) – Multidimensional Scaling – ANOVA – Time Series Analysis: Stationarity, AR, MA, ARIMA Models – Forecasting Techniques.

Classification and Clustering Techniques

Cluster Analysis – Hierarchical and Non-Hierarchical Clustering – K-means, C-means – KNN Classification – Decision Tree – Random Forests – Performance Evaluation – Business Case Applications.

Machine Learning and Data Mining using R

Text Mining – Sentiment Analysis – Supervised & Unsupervised Learning – Caret, e1071, XG Boost, Random Forest – Data.table Package – Algorithm Evaluation – Model Interpretation.

Advanced Analytics Applications in R

Shiny for Interactive Dashboards – Web-based Data Visualization – Time Series Forecasting – Predictive Modeling – Market Basket Analysis – Customer Segmentation – Real-life Case Studies – Reporting & Business Insights.

Practical Exercises:**The learners are required to:**

1. Conduct an exploratory study on real data.
2. Apply R and obtain the results from a data set regarding data visualisation.
3. Evaluate the survey results of a pilot study related to primary data.

4. Analyze the results related to the Decision Tree by taking primary data.
5. Collect a stock market data set and apply data mining tools.

List of exercises suitable for a Business Analytics course using R programming:

DATA IMPORT AND CLEANING:

- ❖ Import a dataset from a CSV file into R using `read.csv()` or other appropriate functions.
- ❖ Identify and handle missing values, outliers, and duplicates in the dataset.
- ❖ Convert data types and ensure consistency in variable naming and formatting.

DATA MANIPULATION WITH DPLYR:

- ❖ Use dplyr functions (`filter()`, `select()`, `mutate()`, `arrange()`, `group_by()`, `summarize()`) to manipulate and summarize data.
- ❖ Chain multiple dplyr functions together using the pipe operator (`%>%`).

DESCRIPTIVE STATISTICS:

- ❖ Calculate summary statistics (mean, median, standard deviation, etc.) for numerical variables.
- ❖ Generate frequency tables and histograms for categorical variables.
- ❖ Explore relationships between variables using correlation analysis.

INFERENTIAL STATISTICS:

- ❖ Conduct hypothesis testing (t-tests, chi-square tests, ANOVA) to make inferences about population parameters.
- ❖ Calculate confidence intervals for population means and proportions.
- ❖ Perform regression analysis to examine relationships between variables.

PREDICTIVE MODELING WITH CARET:

- ❖ Split the dataset into training and testing sets for model evaluation.
- ❖ Build predictive models using machine learning algorithms (e.g., linear regression, logistic regression, decision trees, random forests) with the caret package.
- ❖ Evaluate model performance using metrics such as accuracy, precision, recall, and ROC curves.

TIME SERIES ANALYSIS:

- ❖ Import time series data into R and convert it into a time series object.
- ❖ Explore temporal patterns and trends using time series plots and decomposition techniques.
- ❖ Build time series forecasting models (e.g., ARIMA, exponential smoothing) and assess forecast accuracy.

DATA VISUALIZATION WITH GGPLOT2:

- ❖ Create various types of plots (scatter plots, line plots, bar plots, box plots) using ggplot2.
- ❖ Customize plot aesthetics (titles, labels, colors, themes) and add annotations.

- ❖ Generate faceted plots and combine multiple plots into a single visualization.

INTERACTIVE DATA VISUALIZATION WITH SHINY:

- ❖ Develop interactive web applications for data visualization using the Shiny package.
- ❖ Create reactive components (input controls, output plots) and define server logic to update visualizations dynamically.

TEXT MINING AND SENTIMENT ANALYSIS:

- ❖ Preprocess text data by tokenizing, stemming, and removing stop words.
- ❖ Perform sentiment analysis to assess the sentiment polarity of textual content.
- ❖ Visualize sentiment scores using word clouds, bar plots, or sentiment heat maps.

CUSTOMER SEGMENTATION AND MARKET BASKET ANALYSIS:

- ❖ Use clustering algorithms (e.g., K-means clustering) to segment customers based on demographic or behavioral attributes.
- ❖ Perform market basket analysis to identify frequently co-occurring products and association rules.

References:

1. Gardner, M. (2012). *Beginning R: The Statistical Programming Language*. John Wiley & Sons.
2. Wickham, H., & Grolemund, G. (2016). *R for Data Science*. O'Reilly Media. — 2nd edition (June 2023)
3. Field, A., Miles, J., & Field, Z. (2012). *Discovering Statistics using R*. Sage Publications. — 2nd edition (2021)
4. Kumar, M. (2022). *Business Analytics using R. Excellence Brings Success*. (*still latest*)
5. Cornillon, P. A., et al. (2012). *R for Statistics*. CRC Press. — Newer international softcover edition (2017)
6. Eric Pimpler. (2017). *Data Visualization and Exploration with R*. Amazon Asia-Pacific. (*2018 print/digital release*)
7. Dalgaard, P. (2002). *Introductory Statistics with R*. Springer-Verlag. — 2nd edition (latest version)

E-Resources:

- ❖ <https://www.rstudio.com/>
- ❖ <https://cran.r-project.org/>
- ❖ <https://www.datacamp.com/>
- ❖ <https://www.kaggle.com/>
- ❖ <https://shiny.rstudio.com/>

Course Outcomes

Upon completion of the course, students will be able to:

- **CO1: Demonstrate** conceptual knowledge of R programming for data wrangling, data visualization, inferential statistics, classification and clustering techniques, machine learning, and advanced analytics applications.

- **CO2: Interpret** and **relate** to R language fundamentals, data visualization tools and techniques, statistical analysis and forecasting models, classification and clustering algorithms, machine learning concepts and packages, and advanced analytics applications like interactive dashboards.
- **CO3: Apply** the theories and concepts of R programming for data manipulation and visualization, inferential statistics and forecasting, classification and clustering, machine learning, and interactive dashboard development to solve real-world business analytics problems.
- **CO4: Analyze** methodologies for data extraction and wrangling, data visualization, inferential statistics, classification and clustering techniques, machine learning algorithms and their evaluation, and advanced analytics applications in business settings.
- **CO5: Evaluate** the theories and performance of various R programming techniques, including data visualization, statistical models, classification and clustering algorithms, machine learning packages, and advanced analytics applications to build models for enhancing business insights.
- **CO6: Develop** contemporary practices, **adapt** and **modify** R programming concepts related to data wrangling, visualization, statistical analysis, machine learning, and advanced analytics to suit various business needs and case studies.

CO–PO–PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	3	2	2	2	3	2
CO2	2	3	3	3	2	3	2
CO3	3	2	3	3	2	3	2
CO4	3	3	3	2	3	3	2
CO5	3	3	3	3	2	3	3
CO6	2	2	3	3	3	3	3

Note: 1 – Low, 2 – Medium, 3 – High

Course Objectives:

This course aims to provide students with hands-on experience in cloud computing and virtualization technologies, including public cloud platforms like AWS and private setups using Hadoop and VirtualBox. Learners will gain practical exposure to cloud-based development environments, data storage, and distributed processing frameworks. The course also introduces Big Data tools such as Hadoop, Hive, and MapReduce, enabling students to solve real-time data-driven business problems using cloud platforms. The course prepares students to design, deploy, and manage scalable cloud and big data solutions in a business context.

Cloud Virtualization and Installation

Installation and setup of VirtualBox/VMware with various OS environments – C compiler installation – Running programs in virtual machines – Virtual machine intercommunication – Trystack/OpenStack virtual machine deployment – Practical insights into virtualization and setup.

App Development and Simulation Platforms

Installing Google App Engine (GAE) – Hello World apps using Python/Java – Using GAE Launcher – Simulating cloud environments using CloudSim – Executing scheduling algorithms in CloudSim.

AWS Cloud Environment Setup

Navigating AWS Console – IAM setup with users, roles, and MFA – EC2 instance deployment and auto-scaling – S3 bucket configuration and policy management – RDS instance setup, backup, and operations – VPC architecture design, subnetting, security rules, and peering configuration.

Hadoop Ecosystem Essentials

Single-node Hadoop cluster installation – HDFS file operations – Automation using shell scripts – File system permissions and ownership – Introduction to distributed file systems in business data.

MapReduce and Hive Programming

MapReduce: Word count, average temperature, and frequency analysis – Optimization using combiners and memory tuning – Hive: Table creation, loading data, joins, filtering, and aggregation queries.

Integration for Business Applications

End-to-end integration: Collecting, processing, storing, and analyzing data using combined AWS, Hadoop, and Hive tools – Application of Big Data tools in real-world business analytics scenarios – Business decision support via cloud-enabled architectures.

LIST OF EXPERIMENTS FOR CLOUD COMPUTING:

1. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs.

3. Install Google App Engine. Create hello world app and other simple web applications using python/java.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
8. Install Hadoop single node cluster and run simple applications like word count.

List of experiments for AWS:

1. Foundational Exercises: AWS Management Console Navigation, Explore the AWS Management Console. Understand how to navigate and use basic features. Setting Up IAM Users and Policies: Create IAM users, groups, and roles. Assign permissions using IAM policies. Set up Multi-Factor Authentication (MFA).
2. Core AWS Services: Amazon EC2 (Elastic Compute Cloud): Launch, connect to, and manage an EC2 instance. Configure security groups and key pairs. Automate deployment using EC2 Auto Scaling. Amazon S3 (Simple Storage Service): Create and configure S3 buckets. Upload, retrieve, and manage objects. Set bucket policies and enable versioning. Amazon RDS (Relational Database Service): Launch and configure an RDS instance. Connect to the database and perform basic operations. Implement automated backups and snapshots.
3. Advanced Services and Scenarios: Amazon VPC (Virtual Private Cloud): Design and configure a VPC with subnets, route tables, and gateways. Set up security groups and network ACLs. Implement VPC Peering. List of exercises suitable for learning open-source Hadoop:
4. Setting up a Single-Node Hadoop Cluster: Install Hadoop on your local machine and configure it as a single-node cluster. Perform basic file operations on HDFS such as creating directories, uploading files, and listing files. 47
5. HDFS Operations: Write scripts to automate common HDFS operations such as copying files, moving files, and deleting files. Explore the HDFS file system using command-line tools and perform tasks like checking file status, setting permissions, and changing ownership.
6. Map Reduce Programming: Write a Map Reduce program in Java to count the occurrences of words in a text file. Implement a Map Reduce program to calculate the average temperature from a dataset containing temperature readings. Develop a Map Reduce program to find the most frequent words in a large collection of documents.
7. Map Reduce Optimization: Experiment with different data partitioning techniques and observe their impact on job performance. Implement a Combiner function to optimize the intermediate data processing in a Map Reduce job. Tune the memory configuration and parallelism settings to optimize the performance of a Map Reduce job.
8. Hive Exercises: Create tables in Hive and load data into them from existing datasets. Write Hive QL queries to perform data manipulation tasks such as filtering, sorting, and aggregating. Practice joining multiple tables in Hive to perform more complex analytical queries.

References:

1. Paul Zikopoulos & Chris Eaton, Understanding Big Data, McGraw Hill, 2012.
2. Paul Zikopoulos et al., Harness the Power of Big Data, McGraw Hill Osborne, 2012.
3. Glenn J. Myatt, Making Sense of Data I, Wiley, 2nd Edition (2014).
4. Tom White, Hadoop: The Definitive Guide, O'Reilly, 4th Edition.

5. Rajkumar Buyya et al., Mastering Cloud Computing, McGraw Hill, 2013. — 2nd edition (March 1, 2026)
6. Mark Wilkins, Learning Amazon Web Services (AWS), O'Reilly Media, 2019.

E-Resources:

- ❖ AWS Training: <https://aws.amazon.com/training>
- ❖ Hadoop Tutorials: <https://hadoop.apache.org/docs/>
- ❖ CloudSim Documentation: <https://www.cloudbus.org/cloudsim/>
- ❖ Hive Language Manual: <https://cwiki.apache.org/confluence/display/Hive/LanguageManual>
- ❖ VirtualBox Docs: <https://www.virtualbox.org/wiki/Documentation>

Course Outcomes

Upon completion of the course, students will be able to:

- **CO1: Demonstrate** conceptual knowledge of cloud virtualization and installation, app development and simulation platforms, AWS cloud environment setup, the Hadoop ecosystem, MapReduce and Hive programming, and the integration of these tools for business applications.
- **CO2: Interpret and relate** to cloud virtualization techniques, cloud app development and simulation, core AWS services (EC2, S3, RDS, VPC), the Hadoop ecosystem and HDFS, MapReduce and Hive programming, and the end-to-end integration of these technologies for business analytics.
- **CO3: Apply** the theories and concepts of cloud virtualization, cloud app development, AWS services, the Hadoop ecosystem, MapReduce and Hive, and tool integration to design, deploy, and manage scalable cloud and big data solutions for real-world business problems.
- **CO4: Analyze** methodologies for cloud virtualization and setup, app development and simulation platforms, AWS cloud services, Hadoop cluster installation and HDFS operations, MapReduce and Hive programming, and the integration of these tools to support business decision-making.
- **CO5: Evaluate** the theories and performance of cloud virtualization, cloud app development, AWS services, the Hadoop ecosystem, MapReduce and Hive programming, and integrated architectures to build models for enhancing business analytics and decision support.
- **CO6: Develop** contemporary practices, **adapt** and **modify** cloud computing and big data concepts related to virtualization, cloud platforms, Hadoop, MapReduce, and Hive to suit modern data-driven business problems and real-world applications.

CO–PO–PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	2	-	-	-	2	3
CO2	3	2	3	-	-	3	3

CO3	3	3	2	2	-	3	3
CO4	2	2	3	2	2	3	2
CO5	2	3	3	-	2	3	2
CO6	2	3	2	2	2	3	3

Note: 1 – Low, 2 – Medium, 3 – High

BN25304

Mini Project (MP) / Course of Independent Research

**L T P C
0 0 4 2**

Course Objectives:

To provide hands-on experience in solving real-world business or analytics problems through organizational exposure or independent research. To enable students to apply tools and techniques of Business Analytics on primary or secondary data for insightful outcomes. To inculcate critical thinking, structured problem-solving, and research skills through live project/internship-based or independent analytics investigations. To expose students to open data sources and advanced analytical frameworks and encourage domain-specific exploration. To document business functions or research findings in a systematic and professional manner through project reports, research papers, or case studies.

The Students will be carrying out a Mini Project for **4 weeks**. This Internship encourages the student to attach with an organization in order to understand the working and its functional activities.

In this regard, a student shall look for doing a mini project in a business organization / A startup / an NGO in which they study and report the functioning of an organization. A work completion certificate issued by the organization must be present in the report.

Alternatively, a student need not attach themselves to any organization, but may select to do a Course of Independent Research (CIR) under a faculty supervisor. The student may carry out a research study wherein the selected research topic may entail data collection (primary/secondary), application of tools & techniques of Business Analytics. The same may be submitted as research report/industry report/working paper to the University.

Students may be encouraged to use secondary open data sources like Kaggle, NIC, World Bank, IMF, RBI DBIE, etc with due citations for their Mini Project work. A Certificate from the Organization must be submitted in the report.

Project Planning and Orientation

Introduction to mini project and CIR (Course of Independent Research) – Proposal formulation – Problem identification – Industry/NGO/startup attachment planning – Faculty-guided research model – Ethics and documentation.

Organization/Domain Understanding

Functional departments of the organization – Processes, policies, operations – Analytics maturity in organizations – Sectoral challenges – Secondary research and bench marking.

Data Collection and Preprocessing

Collection of primary or secondary data – Exploratory Data Analysis (EDA) – Data cleaning, missing value treatment – Tools: Excel, R, Python, or Power BI (as relevant).

Application of Business Analytics Tools

Tool-based application depending on topic: Descriptive statistics, Inferential analytics, Forecasting, Classification, Clustering, Market Basket Analysis, Sentiment Analysis, etc.

Report Development and Recommendations

Drafting of report – Interpretation of results – Development of recommendations or learnings – Validation through academic/industry mentor – Industry/Faculty evaluation.

Presentation and Reflection

Final presentation – Peer and faculty review – Self-reflection and learning outcomes – Suggestions for future work – Submission of Certificate (if internship-based) and final report.

References:

1. Ramesh Sharda, Dursun Delen, Efraim Turban – Business Intelligence, Analytics, and Data Science: A Managerial Perspective, Pearson, 5th Edition.
2. Hair, Black, Babin, Anderson – Multivariate Data Analysis, Cengage, 8th Edition.
3. U. Dinesh Kumar – Business Analytics: The Science of Data-Driven Decision Making, Wiley, 2nd Edition.
4. Bernd Scherer – Analytics and Data Science: A Systematic Approach, Springer.
5. Catherine Dawson – Practical Research Methods, How To Books, 5th Edition.
6. Cooper & Schindler – Business Research Methods, McGraw Hill, 12th Edition.

E-Resources:

- ❖ <https://www.kaggle.com> – Datasets and competitions
- ❖ <https://data.gov.in> – Indian government open data
- ❖ <https://databank.worldbank.org> – Global data portal
- ❖ <https://dbie.rbi.org.in> – RBI Database on Indian Economy
- ❖ <https://ourworldindata.org> – Thematic data and insights
- ❖ <https://shodhganga.inflibnet.ac.in> – Indian theses and dissertations

Course Outcomes

Upon completion of the course, students will be able to:

- **CO1: Demonstrate** conceptual knowledge of project planning and orientation, organization/domain understanding, data collection and preprocessing, application of business analytics tools, report development and recommendations, and presentation and reflection on a mini-project or independent research.
- **CO2: Interpret and relate** to problem identification and proposal formulation, organizational functions and analytics maturity, data collection and preprocessing techniques, various business analytics tools, project report drafting, and presenting findings and reflecting on the learning process.

- **CO3: Apply** the theories and concepts of project planning, organizational understanding, data collection and cleaning, business analytics tools and techniques, report writing, and presentation skills to solve a real-world business or research problem.
- **CO4: Analyze** methodologies for project planning, understanding an organization or domain, data collection and preprocessing, applying business analytics tools, drafting recommendations, and presenting findings in a professional manner.
- **CO5: Evaluate** the theories related to project planning, organizational understanding, data collection and preprocessing, business analytics tools, and report development to build a comprehensive mini-project or research paper that provides valuable insights and recommendations.
- **CO6: Develop** contemporary practices, **adapt** and **modify** project management and research concepts related to planning, data analysis, tool application, report development, and presentation to suit a mini-project or independent research and reflect on the learning outcomes.

CO – PO – PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	2	2	-	-	2	1
CO2	3	3	3	2	-	3	2
CO3	3	2	3	2	2	3	3
CO4	2	3	3	3	2	3	2
CO5	2	2	3	2	3	3	2
CO6	3	2	2	2	2	2	3

Note: 1 – Low, 2 – Medium, 3 – High

Semester IV

Course Objectives:

To enable students to undertake in-depth research and apply business analytics methodologies in real-world or data-driven scenarios. To promote critical thinking and analytical problem-solving using statistical, predictive, and prescriptive models in various business domains. To foster independent learning through faculty-guided research and/or industry-attached project work. To build skills in data acquisition, processing, visualization, and presentation of findings through professional project reports. To expose learners to real-time data platforms and domain-specific analytics tools relevant to HR, Finance, Marketing, Operations, and emerging sectors.

MAJOR PROJECT:

The students are expected to carry out a major project for duration of 16 weeks. The students are encouraged to carry out their Project work in any of the following domains:

- ◆ Financial Analytics
- ◆ Human Resource Analytics
- ◆ Marketing Analytics
- ◆ Operations Analytics
- ◆ Any other Analytics domain

Here the student is expected to attach themselves to any organization and choose to do the Course of Organization based Research under a faculty supervisor. The student can carry out a research study wherein the chosen research topic requires data collection (primary/secondary), application of tools & techniques of business analytics, and submit a research report/industry report/working paper to the University. Students can also use secondary open data sources like Kaggle, NIC, World Bank, IMF, RBI DBIE, etc with due citations for their research work. A Project completion Certificate from the Organization must be submitted in the Project report.

Problem Identification and Proposal

Selection of analytics domain (e.g., Finance, HR, Marketing, Operations) – Problem definition – Feasibility and scope assessment – Review of literature – Proposal finalization and approval.

Industry/Research Engagement

Industry attachment or research alignment with faculty – Organizational/sectoral understanding – Stakeholder discussion – Objective finalization – Data source identification (Kaggle, IMF, RBI DBIE, etc.).

Data Collection and Preparation

Design of data collection instruments (if primary) – Secondary dataset acquisition – Data cleansing, normalization, and transformation – Tools: Python, R, Excel, Power BI, etc.

Analytics Application

Statistical testing, Machine Learning, Visualization, Forecasting, Optimization – Application of techniques like Regression, Clustering, Classification, PCA, NLP, Association Rule Mining – Tool-based implementation.

Interpretation and Insight Generation

Model validation – Discussion of findings in business/research context – Alignment with project objectives – Recommendations and future implications.

Project Report and Viva

Compilation of report as per university/project format – Certificate of completion from organization – Presentation and viva voce – Peer review and faculty evaluation – Submission of project outcome.

References:

1. U. Dinesh Kumar – Business Analytics: The Science of Data-Driven Decision Making, Wiley, 2nd Edition.
2. Hair, Black, Babin, Anderson – Multivariate Data Analysis, Cengage, 8th Edition.
3. Bernd Scherer – Analytics and Data Science: A Systematic Approach, Springer.
4. Ramesh Sharda, Dursun Delen – Business Intelligence and Analytics, Pearson, 10th Edition.
5. Thomas H. Davenport – Competing on Analytics, Harvard Business Review Press, Revised Edition (2017).

E-Resources:

- ❖ <https://www.kaggle.com> – Open datasets and competitions
- ❖ <https://data.gov.in> – Indian government open data
- ❖ <https://databank.worldbank.org> – World Bank data
- ❖ <https://dbie.rbi.org.in> – RBI Database on Indian Economy
- ❖ <https://ourworldindata.org> – Global data insights and charts
- ❖ <https://shodhganga.inflibnet.ac.in> – Indian academic research repository

Course Outcomes (COs)

Upon completion of the course, students will be able to:

- **CO1: Demonstrate** conceptual knowledge of problem identification and proposal, industry/research engagement, data collection and preparation, analytics application, interpretation and insight generation, and project report and viva.
- **CO2: Interpret and relate** to problem definition and literature review, organizational understanding, data cleansing and normalization, various analytics tools and techniques, model validation and findings, and the components of a professional project report and viva.
- **CO3: Apply** theories and concepts of problem formulation, industry/research engagement, data preparation, analytics application, insight generation, and professional reporting to conduct a major project or research study.
- **CO4: Analyze** methodologies for problem identification and proposal, industry/research engagement, data collection and preparation, the application of business analytics tools, the interpretation of findings, and project report compilation and presentation.
- **CO5: Evaluate** the theories and performance of problem definition, industry/research engagement, data preparation, various analytics tools, and the generation of insights to build a comprehensive project that provides valuable recommendations and demonstrates ethical conduct.

- **CO6: Develop** contemporary practices, **adapt** and **modify** project work concepts related to problem identification, data management, analytics application, interpretation, and reporting to suit a specific business or research domain and reflect on the learning experience.

CO – PO – PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	3	2	2	-	3	2
CO2	3	2	3	3	2	3	3
CO3	2	3	3	3	2	2	3
CO4	3	3	3	3	2	3	2
CO5	3	2	2	3	2	2	3
CO6	3	2	3	3	2	3	3

Note: 1 – Low, 2 – Medium, 3 – High

BN25001

Human Resource Analytics

**L T P C
3 0 0 3**

Course Objectives:

This course aims to equip learners with the conceptual knowledge and analytical capabilities to define, measure, and apply HR metrics aligned with organizational strategy. It emphasizes the use of people analytics to understand workforce dynamics and optimize human capital investment. Learners will explore the application of analytics across HR functions including recruitment, training, employee engagement, career progression, and workforce diversity. The course integrates modern tools and KPIs to make evidence-based HR decisions and fosters data-driven problem-solving in HRM contexts.

Foundations of HR Analytics

Definition and scope of HR Analytics – People Analytics in business context – Stages of HR Analytics maturity – Human Capital in the Value Chain and its business impact – Difference between HR Analytics and HR Metrics – Key HR KPIs and Performance Dashboards.

Recruitment Metrics and Workforce Planning

Analytics in recruitment: Fill-up ratio – Time to hire – Cost per hire – Quality of hire – Early turnover – Employee referral vs agency hires – Lateral hires – Recruitment cost vs HR cost – Workforce forecasting and planning metrics.

Learning, Development and ROI Analytics

Training metrics: Percentage of trained employees – Internal vs external training impact – Training hours per employee – Cost per training hour – Return on Investment (ROI) from training programs – Analytics for optimizing learning investments and outcomes.

HR Analytics Employee Engagement and Career Progression

Employee Engagement Metrics :Talent Retention - Retention index - Voluntary and involuntary turnover- Turnover by department , grades, performance, and service tenure - Internal hired index - Engagement Survey Analysis. Career Progression Metrics : Promotion index - Rotation index - Career path index - Level wise succession readiness index.

Career Progression and Succession Analytics

Career Metrics: Promotion index – Rotation index – Career pathing analysis – Succession planning metrics – Readiness index by leadership levels – High-potential identification using analytics.

Workforce Diversity, Efficiency and Cost Analytics

Diversity metrics: Gender mix – Age profile – Differently-abled diversity index – Employees per manager – Revenue per employee – Operating cost per employee – HR cost and budget variance – Compensation analytics – Profit per employee – Churnover and service profiling.

References:

1. Jac Fitz-enz, The New HR Analytics, AMACOM, 2010 Edition.
2. Edwards, M. R., & Edwards, K., Predictive HR Analytics: Mastering the HR Metric, Kogan Page, 3rd Edition (2024).
3. Dipak Kumar Bhattacharyya, HR Analytics: Understanding Theories and Applications, SAGE Publications India, 2nd Edition.
4. Sesil, J. C., Applying Advanced Analytics to HR Management Decisions, Pearson Education, 1st Edition (2014).
5. Phillips, J., & Phillips, P P., Making Human Capital Analytics Work, McGraw-Hill, 1st Edition (2014).
6. Pease, G., & Beresford, B., Developing Human Capital Using Analytics, Wiley, 1st Edition (2014).
7. Bassi, L., HR Analytics Handbook, McBassi & Company, 1st Edition (2012)

E-Resources:

- ❖ SHRM Learning: www.shrm.org
- ❖ CIPD HR Analytics Hub: www.cipd.co.uk
- ❖ LinkedIn Learning: Courses on People Analytics
- ❖ Coursera: *People Analytics* by University of Pennsylvania

- ❖ Harvard Business Review: Articles on HR Metrics & Analytics
- ❖ McKinsey Insights: *The Role of People Analytics in Talent Strategy*

Course Outcomes

Upon completion of the course, students will be able to:

- **CO1: Demonstrate** conceptual knowledge of the foundations of HR analytics, recruitment metrics, learning and development ROI analytics, employee engagement and career progression, succession analytics, and workforce diversity and efficiency.
- **CO2: Interpret** and **relate** to HR analytics definitions and KPIs, recruitment and workforce planning metrics, training effectiveness and ROI, employee engagement and retention analytics, career progression and succession planning, and workforce diversity and cost analysis.
- **CO3: Apply** the theories and concepts of HR analytics to diagnose issues in HR, calculate recruitment and training ROI metrics, analyze employee engagement and progression data, implement succession planning, and optimize workforce diversity and cost performance.
- **CO4: Analyze** methodologies for defining and measuring HR KPIs, workforce planning, calculating training ROI, assessing employee engagement, evaluating career progression, and optimizing workforce diversity and efficiency in organizational settings.
- **CO5: Evaluate** the theories related to HR analytics foundations, recruitment metrics, learning and development ROI, employee engagement, succession planning, and workforce diversity to build models for enhancing human capital management and decision-making.
- **CO6: Develop** contemporary practices, **adapt** and **modify** HR analytics concepts to all functions of human resource management, from recruitment to diversity and cost performance, to suit organizational strategies and foster data-driven problem-solving.

Internal Assessment Methodology (Total: 100 Marks)

Component	Weightage
Written Test I & II	60%
Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project	40%

CO–PO–PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	2	2	2	1	3	2
CO2	3	3	3	3	2	3	3
CO3	2	2	3	2	3	2	2
CO4	3	3	3	3	2	3	3
CO5	2	3	2	2	2	3	3

CO6	3	2	2	2	3	2	3
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Note: 1 – Low, 2 – Medium, 3 – High

BN25002

Marketing and Social Media Web Analytics

L T P C

3 0 0 3

Course Objectives:

This course enables learners to harness the power of marketing, social media, and web analytics in the digital era. It provides deep insights into strategic marketing metrics, the science of community building, and the use of analytical tools to measure engagement and campaign success. The course highlights ethical considerations, policies, and future trends in web and social media usage. Learners will explore SEO, user behavior, web traffic, and search analytics to design data-driven strategies for digital success.

Foundations of Marketing Analytics

Introduction to marketing analytics – Marketing budgeting and performance metrics – Financial impact of marketing strategies – Application of marketing metrics – Geographical mapping – Market Basket Analysis – Data exploration and segmentation.

Social Media Strategy and Community Management

History and Evolution of Social Media-Understanding Science of Social Media -Goals for using Social Media- Social Media Audience and Influencers-Social theory and social media - technological determinism- Keys to Community Building - Promoting Social Media Pages- Linking Social Media Accounts-The Viral Impact of Social Media- Digital PR-Encourage Positive Chatter in Social Media - Identity in social media:formation of identities, communities, activist movements, and consumer markets -Social Media as business.

Social Media Policies, Ethics and Impact Measurement

Social media policies – Etiquette and privacy considerations – Ethical challenges in emerging media – Social media analytics and tracking tools – Campaign performance reports – Extracting insights – Observations and interpretations of social trends.

Web Analytics Concepts and Techniques

Present and future of web analytics – Data collection strategies – Qualitative analysis overview – KPIs and business analysis – Components of web analytics strategy – Web data visualization – Analytics proposals and dashboard reporting.

Search Engine and User Behavior Analytics

SEO techniques – Web traffic analysis – Navigation flow – Usability and user-centered design – Eye tracking studies – Non-linear media consumption – Engagement through content – Mobile platform integration – Online security and ethics.

Tools, Visualization, and Emerging Trends

Content management systems – Data visualization techniques – RSS feeds and syndicated content – Leveraging mobile-first platforms – Search behavior and clickstream analysis – Emerging web and social tools – Optimization strategies.

References:

1. Rajkumar Venkatesan, Paul W. Farris, Ronald T. Wilcox – Marketing Analytics: Essential Tools for Data-Driven Decisions, University of Virginia Press, 2021.
2. Jerry Rackley – Marketing Analytics Roadmap: Methods, Metrics, and Tools, Apress, 2015.
3. Alex Gonçalves – Social Media Analytics Strategy, Apress, 2017.
4. Christian Fuchs – Social Media: A Critical Introduction, SAGE, 4th Edition (2024).
5. Avinash Kaushik – Web Analytics: An Hour a Day, Wiley, 2007.
6. Eric T. Peterson – Web Analytics Demystified, Celilo Group Media, 2004.
7. Takeshi Moriguchi – Web Analytics Consultant Official Textbook, 9th Edition (2019).
8. K. M. Shrivastava – Social Media in Business and Governance, Sterling, 2013.

E-Resources:

- ❖ Google Analytics Academy: <https://analytics.google.com>
- ❖ HubSpot Academy: <https://academy.hubspot.com>
- ❖ Hootsuite Blog & Courses: <https://blog.hootsuite.com>
- ❖ Facebook Business Resources: <https://www.facebook.com/business/learn>
- ❖ LinkedIn Learning: *Digital and Web Analytics Courses*
- ❖ Moz SEO Learning Center: <https://moz.com/learn/seo>

Course Outcomes

Upon completion of the course, students will be able to:

- **CO1:** Demonstrate conceptual knowledge of marketing budgeting and performance metrics, social media community building and its impact, ethical policies, data collection strategies for web analytics, SEO techniques, and various content management and visualization tools.
- **CO2:** Interpret and relate marketing metrics to financial impact, social media theories to community formation, ethical considerations in emerging media, web analytics components to business analysis, user behavior and navigation flow, and emerging trends and optimization strategies.
- **CO3:** Apply marketing metrics for data exploration and segmentation, social media strategies for digital PR, social media policies and tracking tools, web analytics techniques for dashboard reporting, and SEO and user-centered design principles for content engagement.
- **CO4:** Analyze marketing budgeting and financial impact, the viral impact of social media and identity formation, campaign performance reports, web data visualization, and user consumption patterns and web traffic to formulate data-driven digital strategies.
- **CO5:** Evaluate the application of marketing metrics, community management practices and their effectiveness, ethical challenges in media usage, web analytics strategies, and usability and mobile platform integration to enhance digital success.
- **CO6:** Develop data-driven strategies by synthesizing marketing analytics, community management, social media policies, web analytics, and search behavior analysis, while leveraging emerging tools and mobile-first platforms to optimize for success.

Internal Assessment Methodology (100 Marks)

Component	Weightage
Written Test I & II	60%
Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project	40%

CO–PO–PSO Mapping Matrix:

CO)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	3	3	2	2	3	3
CO2	2	3	2	3	2	2	3
CO3	3	2	2	2	3	3	3
CO4	2	3	2	3	2	2	2
CO5	3	2	3	3	2	3	3
CO6	3	2	2	2	3	3	3

Note: 1 – Low, 2 – Medium, 3 – High

BN25003

Financial Analytics

**L T P C
3 0 0 3**

Course Objectives:

This course is designed to equip learners with cutting-edge analytical tools and techniques applicable in corporate finance, market behavior, portfolio modeling, technical trading, and risk management. Students will explore how data science tools such as Excel, Python, and R are used to predict financial outcomes, value financial assets, and assess market volatility. It provides a strong foundation for decision-making through modeling, forecasting, and simulation in dynamic financial environments. The course blends traditional financial concepts with modern machine learning-based predictions and time series analysis.

Corporate Finance Modeling and Forecasting

Predictive modeling in corporate finance – Project and cash flow analysis – Cost of capital under sensitivity conditions – Financial break-even and indifference point analysis – Capital budgeting

techniques: Payback, NPV, IRR, MIRR – Bankruptcy prediction models: Beaver t-test, Ohlson logistic regression, Altman Z-score.

Financial Market Analytics and Time Series Modeling

Risk and return estimation for bonds and stocks – Data cleaning and importing from web portals – Adjustments for corporate actions (splits, mergers) – Time series behavior of financial data – EWMA – Value at Risk – ARMA, ARCH, and GARCH models for volatility forecasting.

Portfolio Optimization and Option Pricing

Portfolio performance evaluation – Sharpe Ratio – Capital Asset Pricing Model – Markowitz's mean-variance optimization – Cluster analysis for portfolio categorization – Option pricing models: Binomial and Black-Scholes – Option-implied volatility modeling.

Technical Analysis and Machine Learning Applications

Technical indicators: RSI, ROC, MACD, Moving averages, Candlestick analysis – Simulating and evaluating trading strategies – Predictive analytics for share prices using Artificial Neural Networks (ANN) and Support Vector Machines (SVM).

Credit Risk Analytics and Predictive Models

Credit scoring and risk prediction – Data preprocessing – Logistic regression and decision trees for credit risk modeling – Evaluating the performance of credit scoring models – Real-world application in loan default prediction.

Tools and Technologies for Financial Analytics

Using Excel, Python, and R for financial analysis – Data visualization with Matplotlib/ggplot – Scenario analysis – Financial dashboards – Monte Carlo simulations – Reporting and interpretation of model outcomes – Use of Bloomberg / Quandl APIs for data.

References:

1. Mark J. Bennett & Dirk L. Hugen, Financial Analytics with R, Cambridge University Press, 2016 Edition.
2. Pavel Ryzhov, Haskell Financial Data Modeling and Predictive Analytics, Import Edition, 2013 Edition.
3. Edward E. Williams & John A. Dohelman, Quantitative Financial Analytics: The Path to Investment Profits, 2017 Edition.
4. Yuxing Yan, Python for Finance, Import Edition, 2nd Edition (2018).
5. James Ma Weiming, Mastering Python for Finance, Packt Publishing, 2nd Edition (2019).
6. Yves Hilpisch, Python for Algorithmic Trading, O'Reilly Media, 2020 Edition.
7. Avinash Dixit & Barry Nalebuff, Thinking Strategically: The Competitive Edge in Business, 1993 Edition

E-Resources:

- ❖ Coursera – Financial Engineering & Risk Management by Columbia University
- ❖ Investopedia: <https://www.investopedia.com>
- ❖ QuantInsti: <https://www.quantinsti.com>
- ❖ Python for Finance on GitHub: <https://github.com/yhilpisch>
- ❖ CFA Institute Resources: <https://www.cfainstitute.org>
- ❖ R-bloggers (for financial modeling using R): <https://www.r-bloggers.com>

Course Outcomes

Upon completion of the course, students will be able to:

- **CO1: Demonstrate** conceptual knowledge of corporate finance modeling, financial market analytics and time series modeling, portfolio optimization and option pricing, technical analysis and machine learning applications, credit risk analytics, and tools for financial analytics.
- **CO2: Interpret and relate** to corporate finance models and forecasting, time series behavior and volatility forecasting, portfolio performance and asset pricing models, technical indicators and machine learning algorithms, credit risk prediction models, and the use of Excel, Python, and R for financial analysis.
- **CO3: Apply** the theories and concepts of corporate finance, time series analysis, portfolio optimization, machine learning, credit risk modeling, and financial tools to solve complex business problems and make data-driven financial decisions.
- **CO4: Analyze** methodologies for corporate finance modeling, time series and volatility forecasting, portfolio optimization, technical and machine learning-based trading strategies, credit risk prediction, and the use of various tools for financial analytics.
- **CO5: Evaluate** the theories related to corporate finance, financial market analytics, portfolio optimization, machine learning models, credit risk prediction, and financial tools to build models for enhancing financial performance and strategic decision-making.
- **CO6: Develop** contemporary practices, **adapt** and **modify** financial analytics concepts to all functions of corporate finance, market analysis, portfolio management, risk assessment, and technical analysis to suit dynamic financial environments and make evidence-based predictions.

Internal Assessment Methodology (100 Marks)

Component	Weightage
Written Test I & II	60%
Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project	40%

CO–PO–PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	3	2	2	2	3	3
CO2	2	3	3	3	3	3	3
CO3	3	2	3	3	2	3	2
CO4	3	3	3	3	2	3	3

CO5	2	3	2	2	3	2	2
CO6	3	2	2	2	3	3	3

Note: 1 – Low, 2 – Medium, 3 – High

BN25004

Operation and Supply Chain Analytics

**L T P C
3 0 0 3**

Course Objectives:

This course equips students with advanced analytical and mathematical tools for solving complex problems in logistics and supply chain management. It introduces predictive, prescriptive, and descriptive analytics in the context of warehousing, inventory, transportation, and decision-making. Learners will develop a solid understanding of modeling techniques, risk pooling strategies, and multi-criteria decision-making (MCDM) tools for real-world applications. The course emphasizes digital transformation and optimization of supply chains through data-driven strategies.

Fundamentals of Analytics in Supply Chain

Overview of descriptive, predictive, and prescriptive analytics – Data-driven supply chains – Importance and transformation of supply chains – Roadmap for implementation – Barriers to analytics in supply chains – Digitalization in logistics and procurement.

Warehousing & Facility Location Analytics

Mathematical programming in warehousing – P-Median methods – Guided LP – Balmer-Wolfe method – Greedy Drop Heuristics – Dynamic location models – Layout design models – Space determination models – Role of IoT in warehouse optimization.

Inventory Management & Risk Analysis

Dynamic lot sizing and aggregation models – Multi-echelon inventory systems – LIMIT and aggregate inventory models – Transit, supply, and delivery risks – Risk pooling strategies – Safety stock analytics – ABC analysis and reorder point simulations.

Transportation & Network Optimization

Graphs in logistics – Minimal spanning trees – Shortest path algorithms – Maximal flow models – Multistage transshipment – Set covering/partitioning problems – Traveling Salesman Problem – Advanced vehicle routing heuristics – Scheduling using deficit functions and linking algorithms.

Multi-Criteria Decision-Making Models (MCDM)

AHP – Data Envelopment Analysis (DEA) – Fuzzy logic techniques – Analytical Network Process (ANP) – TOPSIS – Application of MCDM in supply chain vendor selection, logistics evaluation, and risk trade-off decisions.

Tools and Emerging Trends in SCM Analytics

Use of optimization tools (Excel Solver, Python-PuLP, R) – Supply chain dashboards – GIS-based analytics – RFID and sensor integration – Blockchain in SCM – Green and sustainable supply chain analytics – Simulation tools in logistics.

References:

1. Nada R. Sanders, Big Data Driven Supply Chain Management, Pearson Education, 2014 Edition.
2. Michael Watson et al., Supply Chain Network Design, Pearson Education, 2013 Edition.
3. Kurt Y. Liu, Supply Chain Analytics: Concepts, Techniques and Applications, Springer Nature, 2022 Edition.
4. Muthu Mathirajan et al., Analytics in Operations/Supply Chain Management, I.K. International, 2016 Edition.
5. Anna Nagurney et al., Networks Against Time: Supply Chain Analytics for Perishable Products, Springer, 2013 Edition.
6. Sunil Chopra & Peter Meindl, Supply Chain Management: Strategy, Planning, and Operation, Pearson, 6th Edition (2016).
7. B. Mahadevan, Operations Management: Theory and Practice, Pearson, 3rd Edition (2018).

E-Resources:

- ❖ MIT Supply Chain Analytics MicroMasters: <https://micromasters.mit.edu/scm>
- ❖ Coursera – Supply Chain Analytics by Rutgers University
- ❖ SCM Globe Simulation Tool: <https://www.scmglobe.com>
- ❖ INFORMS – Institute for Operations Research: <https://www.informs.org>
- ❖ Harvard Business Review Supply Chain Articles: <https://hbr.org>

Course Outcomes (CO):

Upon completion of the course, students will be able to:

- **CO1: Demonstrate** conceptual knowledge of the fundamentals of analytics in supply chain, warehousing and facility location analytics, inventory management and risk analysis, transportation and network optimization, Multi-Criteria Decision-Making models (MCDM), and tools and emerging trends in SCM analytics.
- **CO2: Interpret and relate** to the fundamentals of analytics in supply chain, warehousing and facility location models, inventory management and risk analysis, transportation and network optimization, Multi-Criteria Decision-Making models (MCDM), and tools and emerging trends in SCM analytics.
- **CO3: Apply** the theories and concepts of analytics in supply chain, warehousing and facility location, inventory management and risk analysis, transportation and network optimization, Multi-Criteria Decision-Making models (MCDM), and SCM analytics tools to solve complex problems in logistics and supply chain management.
- **CO4: Analyze** methodologies for analytics in supply chain, warehousing and facility location models, inventory management and risk analysis, transportation and network optimization, Multi-Criteria Decision-Making models (MCDM), and SCM analytics tools and emerging trends in the context of data-driven supply chains.

- **CO5: Evaluate** the theories related to analytics in supply chain, warehousing and facility location, inventory management and risk analysis, transportation and network optimization, Multi-Criteria Decision-Making models (MCDM), and SCM analytics tools to build models for enhancing supply chain performance.
- **CO6: Develop** contemporary practices, **adapt** and **modify** concepts related to analytics in supply chain, warehousing and facility location, inventory management, transportation, Multi-Criteria Decision-Making models, and SCM analytics tools to suit modern, data-driven supply chain strategies.

Internal Assessment Methodology (Total: 100 Marks)

Component	Weightage
Written Test I & II	60%
Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project	40%

CO–PO–PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	2	3	3	2	3	3
CO2	3	3	3	2	2	3	2
CO3	2	3	2	2	3	2	3
CO4	3	2	3	3	3	3	3
CO5	2	3	2	3	3	2	3
CO6	3	2	3	2	2	3	3

Note: 1 – Low, 2 – Medium, 3 – High

Course Objectives:

This course equips learners with foundational and advanced techniques to analyze time-dependent data using statistical and econometric models. It introduces stochastic processes, stationary and non-stationary models, volatility modeling, multivariate relationships, and cointegration techniques. Emphasis is placed on understanding the theoretical constructs and applying practical forecasting methods using tools such as R and Python. The course supports real-time business decision-making, particularly in finance, economics, marketing, and operations.

Fundamentals of Univariate Stationary Time Series

Introduction to stochastic processes – Stationary and weakly stationary processes – Wold decomposition – Autocovariance, autocorrelation, and partial autocorrelation functions – AR and MA processes – Conditions for stationarity and invertibility – Box-Jenkins methodology – Short-term forecasting techniques.

Non-Stationary and ARIMA Modeling

Trends in time series: deterministic vs stochastic – Random walk, random walk with drift – Unit root processes – Dickey-Fuller and Augmented Dickey-Fuller tests – ARIMA models – Seasonal ARIMA – Forecast evaluation and model diagnostics – Fractionally integrated processes.

Volatility Modeling

Volatility and heteroskedasticity – Volatility clustering in financial time series – ARCH and GARCH models – Extensions: GARCH-M, EGARCH, TGARCH – Testing for ARCH effects – Practical modeling using financial datasets.

Multivariate Stationary Time Series Models

Vector autoregression (VAR) – Model specification and lag selection – Granger causality tests – Impulse response function (IRF) – Variance decomposition – Stationary multivariate modeling using real data.

Multivariate Non-Stationary Time Series and Cointegration

Introduction to cointegration – Single-equation methods: Engle-Granger – System methods: Johansen test – Long-run equilibrium modeling – Vector Error Correction Models (VECM) – Application in finance and macroeconomic data.

Tools, Techniques, and Applications

Time series analysis using R and Python – Time series packages (statsmodels, forecast, tseries, arch) – Real-world applications in business, finance, retail, and forecasting – Case studies – Data visualization and communication of results – Rolling forecasts and backtesting.

References:

1. Brooks, C., *Introductory Econometrics for Finance*, 4th Edition, Cambridge University Press.
2. Enders, W., *Applied Econometric Time Series*, 4th Edition, Wiley.
3. Hamilton, J. D., *Time Series Analysis*, (1994 Edition).

4. Maddala, G. S., & In-Moo Kim, Unit Roots, Cointegration, and Structural Change, (1998 Edition).
5. Shumway, R. H., & Stoffer, D. S., Time Series Analysis and Its Applications, 5th Edition, Springer.
6. Hyndman, R. J., & Athanasopoulos, G., Forecasting: Principles and Practice, 3rd Edition (2021).
7. Tsay, R. S., Analysis of Financial Time Series, 3rd Edition (2010).

E-Resources:

- ❖ <https://otexts.com/fpp3/> – Forecasting Principles & Practice by Hyndman (Open Source)
- ❖ Coursera – *Practical Time Series Analysis* (Johns Hopkins)
- ❖ Udemy – *Time Series Analysis and Forecasting with Python/R*
- ❖ YouTube – StatQuest: Time Series tutorials
- ❖ <https://arch.readthedocs.io> – ARCH package for Python
- ❖ R CRAN – Packages: forecast, tseries, urca, vars, zoo, xts

Course Outcomes (COs):

Upon completion of the course, students will be able to:

- **CO1: Demonstrate** conceptual knowledge of univariate stationary time series, non-stationary and ARIMA modeling, volatility modeling, multivariate stationary time series, multivariate non-stationary time series and cointegration, and tools and applications for time series analysis.
- **CO2: Interpret and relate** to stochastic processes, ARIMA and seasonal models, volatility clustering, VAR and VECM, cointegration and long-run equilibrium, and the use of R/Python for time series problems.
- **CO3: Apply** the theories and concepts of univariate and multivariate time series analysis, ARIMA and GARCH models, cointegration, and various tools to forecast future values and make data-driven business decisions.
- **CO4: Analyze** methodologies for stationary and non-stationary time series, ARIMA modeling, volatility modeling with ARCH/GARCH, VAR/VECM, cointegration testing, and the application of R/Python tools in real-world scenarios.
- **CO5: Evaluate** the theories and performance of various time series models, including ARIMA, GARCH, VAR, and VECM, to build predictive and analytical models for enhancing forecasting accuracy in financial, economic, and business contexts.
- **CO6: Develop** contemporary practices, **adapt** and **modify** time series analysis concepts related to stationary and non-stationary processes, volatility modeling, multivariate relationships, and cointegration to suit real-world data and address emerging trends in business, finance, and economics.

Internal Assessment Methodology (100 Marks)

Component	Weightage
Written Test I & II	60%
Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project	40%

CO–PO–PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	3	2	2	2	3	3
CO2	3	2	3	2	3	3	3
CO3	2	3	3	3	2	2	3
CO4	3	2	3	3	3	3	3
CO5	3	3	2	2	3	3	3
CO6	3	2	3	3	3	3	3

Note: 1 – Low, 2 – Medium, 3 – High

BN25006

Blockchain Technology

**LT P C
3 0 0 3**

Course Objectives:

This course aims to develop a comprehensive understanding of blockchain technology, its architecture, protocols, consensus mechanisms, and real-world applications. Students will gain exposure to key blockchain platforms such as Ethereum and Hyperledger, and understand the role of smart contracts, distributed ledgers, and cryptocurrencies. The course emphasizes hands-on exposure, legal frameworks, and enterprise integration of blockchain in various industries. Learners will be equipped to analyze, design, and apply blockchain-based solutions in business contexts.

Foundations of Distributed Systems and Cryptography

Introduction to Distributed Databases – Byzantine Generals Problem – Fault Tolerance – Hadoop DFS – Distributed Hash Tables – Cryptography Fundamentals – Hash Functions – ECDSA – Memory Hard Algorithms – Zero Knowledge Proofs – Turing Completeness and ASIC Resistance.

Blockchain Principles and Use Cases

Introduction to Blockchain, Gartner's Hype Curve and Evolution of Blockchain Technology, Blockchain Need & Genesis, Key Characteristics of Blockchain, Blockchain Structure, Blockchain types and Network, Mining and Consensus, How Blockchain Works, Bitcoin Whitepaper, Understanding Bitcoin, Components of a Block, Forks: soft& hard forks, Ummerr blocks, Different forks from Bitcoin, Wallets, Transactions, Public& Private keys, Blockchain Applications : Internet of Things, Medical Record Management System, Do-main Name Service and future of Blockchain.

Cryptocurrency and Financial Systems

Origin of Cryptocurrency – Bitcoin Protocols – Mining Strategies and Rewards – Ethereum Introduction – Smart Contracts and DAOs – Sidechains – GHOST Protocol – Attacks and Vulnerabilities – Regulatory Aspects – Exchanges – Black Market and Legal Frameworks – Impact on the Global Economy.

Ethereum Ecosystem and Smart Contracts

Need for Ethereum – Ethereum Foundation and Whitepaper – Ethereum Virtual Machine (EVM) – Types of Transactions – Mining and Consensus – Ethereum Architecture – Development and Execution of Smart Contracts – Introduction to Solidity.

Hyperledger Fabric for Enterprise Blockchain

Overview of Hyperledger – Fabric Architecture and Components – Consensus in Fabric vs Other Platforms – Chaincode – Fabric Network Setup – Features and Advantages – Business Applications in Supply Chain, Banking, and Identity Management.

Capstone Projects, Security & Ethical Issues

Blockchain Security Concepts – Blockchain forensics – Privacy Preservation – Ethical and Societal Challenges – Decentralized Identity – Capstone Project on Blockchain Solution Design – Case Studies of Blockchain Adoption in Business.

References:

1. Imran Bashir, Mastering Blockchain, Packt Publishing, 3rd Edition (2020).
2. Andreas M. Antonopoulos & Gavin Wood, Mastering Ethereum: Building Smart Contracts and DApps, O'Reilly, 1st Edition (2018).
3. Debajani Mohanty, Blockchain: From Concept to Execution, BPB Publications, 2018 Edition.
4. Nitin Gaur et al., Hands-on Blockchain with Hyperledger, Packt Publishing, 2018 Edition.
5. Arvind Narayanan et al., Bitcoin and Cryptocurrency Technologies, Princeton University Press, 2016 Edition.
6. Melanie Swan, Blockchain: Blueprint for a New Economy, O'Reilly Media, 2015 Edition.
7. Joseph J. Bambara & Paul R. Allen, Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, McGraw Hill, 2018 Edition

E-Resources:

- ❖ Ethereum Foundation – <https://ethereum.org>
- ❖ IBM Hyperledger Project – <https://www.hyperledger.org>
- ❖ Solidity Documentation – <https://docs.soliditylang.org>
- ❖ Coursera: Blockchain Specialization – <https://www.coursera.org/specializations/blockchain>
- ❖ Blockchain Council Certifications – <https://www.blockchain-council.org>
- ❖ YouTube Channels: Dapp University, Simply Explained – Blockchain Playlist

Course Outcomes

Upon completion of the course, students will be able to:

- **CO1: Demonstrate** conceptual knowledge of the foundations of distributed systems and cryptography, blockchain principles and use cases, cryptocurrency and financial systems, the Ethereum ecosystem, Hyperledger Fabric, and security and ethical issues related to blockchain.
- **CO2: Interpret** and **relate** to distributed systems and cryptographic fundamentals, blockchain structure and consensus mechanisms, cryptocurrency protocols and legal frameworks, Ethereum's architecture and smart contracts, Hyperledger Fabric's components and features, and the security, privacy, and ethical implications of blockchain technology.
- **CO3: Apply** the theories and concepts of distributed systems, blockchain technology, cryptocurrencies, Ethereum and Hyperledger Fabric to design, develop, and implement blockchain-based solutions for real-world business problems.
- **CO4: Analyze** methodologies for understanding distributed systems, evaluating blockchain principles and use cases, assessing cryptocurrency protocols and attacks, developing smart contracts on Ethereum, configuring Hyperledger Fabric, and addressing security and ethical challenges in blockchain technology.
- **CO5: Evaluate** the theories and performance of various blockchain technologies, including Bitcoin, Ethereum, and Hyperledger Fabric, to build models for enhancing business processes and developing new applications in a decentralized environment.
- **CO6: Develop** contemporary practices, **adapt** and **modify** blockchain concepts related to cryptography, consensus mechanisms, smart contracts, and enterprise platforms to suit emerging business needs and address the security, privacy, and ethical challenges of decentralized systems.

Internal Assessment Methodology (100 Marks):

Component	Weightage
Written Test I & II	60%
Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project	40%

CO–PO–PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	3	2	2	-	3	2
CO2	3	3	3	3	-	3	3

CO3	3	2	3	2	2	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3
CO6	3	3	2	3	3	3	3

Note: 1 – Low, 2 – Medium, 3 – High

BN25007

Cloud Computing Tools and Techniques

**L T P C
3 0 0 3**

Course Objectives:

This course provides learners with a comprehensive understanding of cloud computing principles, virtualization techniques, and emerging platforms. It introduces foundational concepts of cloud architecture, deployment models, and service models including IaaS, PaaS, and SaaS. Students will explore simulation tools such as CloudSim, GreenCloud, and VMware, along with hands-on exposure to AWS infrastructure and services. The course fosters awareness of the benefits, risks, and real-world applications of cloud computing in digital business environments.

Fundamentals of Cloud Computing

Origins of Cloud Computing – Key Components and Characteristics – On-demand Self-Service – Broad Network Access – Rapid Elasticity – Measured Service – Cloud Providers vs Traditional IT – Architectural Influences – Benefits and Limitations – Government and Regulatory Concerns – Security Implications in Third-Party Cloud Environments - Regularity issues: Government policies.

Cloud Architecture and Service Models

Cloud Architecture Layers – Software as a Service (SaaS): Features and Use Cases – Platform as a Service (PaaS): Features and Benefits – Infrastructure as a Service (IaaS): Features and Flexibility – Public, Private, Hybrid, and Community Clouds – Advantages and Challenges in Cloud Adoption.

Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing.

Cloud Simulation Tools – Cloud Sim and Green Cloud

Concept of Simulation in Cloud Environments – Introduction to CloudSim – Architecture of CloudSim (User Code, GridSim, SimJava) – Modeling Cloud Workloads – Energy-Aware Computing with GreenCloud – Research and Analysis Applications.

VMware and Virtualization Techniques

Overview of VMware Platform – Benefits of Virtualization – Installing and Using VMware Workstation – Creating and Managing Virtual Machines – Cloning and Migrating VMs – Virtualizing Physical Machines – Use Cases in Business IT.

AWS Cloud Infrastructure and Services

AWS Global Infrastructure – Core AWS Services: Compute, Storage, Database, Networking – AWS Well- Architected Framework – Shared Responsibility Model – AWS Security Essentials – Cloud Migration Basics – Real-Time Case Examples.

Capstone Project, Cloud Trends & Ethics

Latest Trends in Cloud (Serverless, Edge, Multi-cloud, DevOps Integration) – Cloud Cost Optimization – Legal, Ethical, and Environmental Considerations – Cloud-based Business Models – Capstone Mini Project with Any Cloud Platform – Team Presentations.

References:

1. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, McGraw-Hill, 2010 Edition.
2. Judith Hurwitz et al., Cloud Computing for Dummies, Wiley Publishing, 2nd Edition.
3. Rajkumar Buyya et al., Cloud Computing: Principles and Paradigms, Wiley, 2011 Edition.
4. Michael Miller, Cloud Computing: Web-Based Applications, Que Publishing, 2008 Edition.
5. Thomas Erl, Cloud Computing: Concepts, Technology & Architecture, Pearson, 2nd Edition (2024).
6. Amazon Web Services, AWS Documentation and Whitepapers – aws.amazon.com.

E-Resources:

- ❖ AWS Cloud Training – <https://aws.amazon.com/training>
- ❖ CloudSim Toolkit – <https://www.cloudbus.org/cloudsim/>
- ❖ VMware Learning – <https://www.vmware.com/learn.html>
- ❖ Coursera: Cloud Computing Specialization – <https://www.coursera.org/specializations/cloud-computing>
- ❖ edX: AWS Cloud Practitioner Essentials – <https://www.edx.org>
- ❖ YouTube Channels: Simplilearn, GCP, AWS Tutorials, VMware Labs

Course Outcomes

Upon completion of the course, students will be able to:

- **CO1: Demonstrate** conceptual knowledge of the fundamentals of cloud computing, cloud architecture and service models, cloud simulation tools, virtualization techniques with VMware, AWS cloud infrastructure and services, and cloud trends and ethical considerations.
- **CO2: Interpret and relate** to cloud computing fundamentals, cloud architecture and service models, cloud simulation tools like CloudSim, virtualization concepts with VMware, core AWS services, and the latest cloud trends and their ethical implications.
- **CO3: Apply** the theories and concepts of cloud computing fundamentals, service and deployment models, simulation, virtualization with VMware, AWS services, and modern cloud trends to design and manage cloud-based solutions.
- **CO4: Analyze** methodologies for understanding cloud computing fundamentals, evaluating cloud service and deployment models, simulating cloud environments, using VMware for virtualization, utilizing AWS services, and addressing the legal, ethical, and environmental considerations of cloud adoption.

- **CO5: Evaluate** the theories and performance of cloud computing fundamentals, service and deployment models, simulation tools, virtualization techniques, AWS services, and cloud trends to build models for optimizing business scalability and performance in digital environments.
- **CO6: Develop** contemporary practices, **adapt** and **modify** cloud computing concepts related to architecture, service models, simulation, virtualization, AWS services, and emerging trends to suit various digital business environments and address ethical and security challenges.

Internal Assessment Methodology (100 Marks):

Component	Weightage
Written Test I & II	60%
Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project	40%

CO–PO–PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	3	2	2	-	3	2
CO2	3	3	3	3	2	3	2
CO3	3	3	3	3	3	3	3
CO4	3	3	3	2	2	3	3
CO5	3	3	3	3	3	3	3
CO6	3	2	3	3	3	3	3

Note: 1 – Low, 2 – Medium, 3 – High

BN25008

Enterprise Information System

**L T P C
3 0 0 3**

Course Objectives:

This course aims to provide a comprehensive understanding of enterprise information systems and ERP technologies in modern business. It covers system analysis and design, database management, information security, and integration of business functions. Learners will explore ERP architecture, project planning, implementation methodologies, and real-world application scenarios. The course prepares students to evaluate, implement, and manage enterprise systems for business efficiency and digital transformation.

System Analysis and Business Process Design

Data, Information, and Information Systems – Evolution and Types – Enterprise and Functional IS – System Development Life Cycle – Methodologies – Data Flow Diagrams (DFD) – Decision Tables – Entity Relationship (ER) Diagrams – Object-Oriented Analysis and Design (OOAD) – UML Diagrams – Business Process Design.

Database Management and Data Intelligence

Introduction to DBMS – Types and Evolution: RDBMS, OODBMS, RODBMS – Data Warehousing Models: Star, Snowflake, Fact Constellation – Data Mart – Data Mining Techniques – Open Source DBMS Tools – Integration with Scripting Languages – JDBC & ODBC Concepts – Role of Data in Enterprise Systems.

Enterprise Systems and Digital Integration

Overview of Enterprise Systems – Evolution – Benefits and Risks – Functional Modules and Data Flow – Business Process Reengineering (BPR) – Project Management in ERP – Use of Organizational and Master Data – Integration of Social Media, Mobile Applications – Knowledge-based Decision Systems.

ERP Architecture and Applications

ERP Software Solutions – Core Functional Areas – Procurement, Sales, Production, Inventory, HR – ERP Architecture and Technology Stack – Data Migration – ERP Platforms Comparison – SAP, Oracle, Microsoft Dynamics – Document Management – Reporting and BI Integration in ERP.

ERP Implementation Lifecycle

ERP Evaluation and Selection – Implementation Lifecycle – Methodologies and Frameworks – Change Management – Role of Consultants, Vendors, and Employees – Training Strategies – Organizational and Industrial Impact – Success and Failure Factors of ERP Implementation – Post-Implementation Maintenance.

Security, Ethics, and Case Applications

Security in Information Systems – IS Vulnerabilities – Computer Crimes – Disaster Recovery Planning – Securing Web and Cloud-Based ERP – Regulatory Compliance – Ethical and Legal Issues – Capstone Project on ERP Adoption in Industry – ERP Case Study Analysis.

References:

1. Alexis Leon, ERP Demystified, 3rd Ed., Tata McGraw-Hill, 2014.
2. Simha R. Magal & Jeffrey Word, Integrated Business Processes with ERP Systems, Wiley, 2011.
3. Jagan Nathan Vaman, ERP in Practice, Tata McGraw-Hill,
4. Mahadeo Jaiswal & Ganesh Vanapalli, ERP, Macmillan India,
5. Vinod Kumar Garg & N.K. Venkitakrishnan, ERP – Concepts and Practice, PHI.
6. Laudon & Laudon, Management Information Systems, 17th Ed., Pearson Education, 2021.
7. Monk & Wagner, Concepts in Enterprise Resource Planning, Cengage Learning,

E-Resources:

- ❖ SAP Learning Hub – <https://learning.sap.com>

- ❖ Oracle ERP Cloud Resources – <https://www.oracle.com/erp>
- ❖ Moodle ERP Sandboxes – <https://erpnext.com>
- ❖ Coursera: ERP and Information Systems Courses – <https://www.coursera.org>
- ❖ YouTube: ERPNext, SAP Tutorials, Odoo Implementation Demos

Course Outcomes

Upon completion of the course, students will be able to:

- **CO1: Demonstrate** conceptual knowledge of system analysis and business process design, database management and data intelligence, enterprise systems and digital integration, ERP architecture and applications, ERP implementation lifecycle, and security, ethics, and case applications.
- **CO2: Interpret and relate** to system development lifecycle methodologies, various database management models, the evolution and benefits of enterprise systems, ERP architecture and core functional areas, the ERP implementation lifecycle, and security and ethical issues in enterprise systems.
- **CO3: Apply** the theories and concepts of system analysis and design, database management, enterprise system integration, ERP architecture and applications, implementation methodologies, and security principles to evaluate and manage enterprise systems for business efficiency.
- **CO4: Analyze** methodologies for system analysis and business process design, data warehousing and data mining, enterprise systems and digital integration, ERP architecture and technology stacks, the ERP implementation lifecycle, and security vulnerabilities and ethical challenges.
- **CO5: Evaluate** the theories related to system analysis and design, database management, enterprise systems, ERP implementation, and security to build models for digital transformation and make data-driven decisions.
- **CO6: Develop** contemporary practices, **adapt** and **modify** concepts related to system analysis, database management, enterprise systems, ERP implementation, and security to suit modern business environments and address ethical and legal challenges.

Internal Assessment Methodology (100 Marks):

Component	Weightage
Written Test I & II	60%
Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project	40%

CO–PO–PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	3	3	2	-	3	2

CO2	3	3	3	2	2	3	2
CO3	3	3	3	3	3	3	3
CO4	3	2	3	3	2	3	3
CO5	3	3	3	3	3	3	3
CO6	3	3	3	3	3	3	3

Note: 1 – Low, 2 – Medium, 3 – High

BN25009

Big Data Analytics

**L T P C
3 0 0 3**

Course Objectives:

This course enables students to understand the computational frameworks and methodologies essential for handling big data in modern enterprises. It imparts skills in real-time stream data processing, Hadoop ecosystem, and predictive modeling techniques. The course also covers practical tools such as Pig, Hive, and HDFS, and includes applications of MapReduce and visualization for deriving actionable insights. Emphasis is laid on real-world analytics, security considerations, and scalable data architectures for business decision-making.

Introduction to Big Data Analytics

Introduction to Big Data – Characteristics of Big Data – Challenges of Conventional Systems – Analytic Processes vs Reporting – Data Analysis Life cycle – Intelligent Data Analysis – Business Applications of Big Data.

Real-Time Stream Analytics

Stream Data Models and Architecture – Stream Computing and RTAP – Data Sampling and Filtering – Distinct Element Counting – Estimating Moments and Oneness – Decaying Windows – Case Studies on Real-Time Sentiment Analysis and Stock Market Prediction.

Hadoop Ecosystem and MapReduce

History and Evolution of Hadoop – Hadoop Distributed File System (HDFS) – Java Interfaces to HDFS – Developing MapReduce Applications – Job Execution Flow – Failures, Scheduling, Shuffle, Sort – Types, Formats, and Features – Hadoop Streaming.

Data Processing Frameworks – Pig, Hive & HBase

Data Manipulation with Pig – Operators and Scripts – Hive Services and HiveQL – Querying in Hive – HBase Fundamentals – ZooKeeper Basics – IBM Infosphere Big Insights – Stream Data Processing with Apache Storm & Spark (Introductory View).

Predictive Analytics and Visualization

Introduction to Predictive Modeling – Simple and Multiple Linear Regression – Model Evaluation – Data Visualization Techniques – Visual Analysis Systems – Interaction and Dashboard Design – Application in Business Analytics.

Security, Ethics & Capstone Project

Big Data Security Concepts – Cryptographic Practices – Case Studies on Data Privacy – Ethical Implications in Big Data Use – Project Presentation using Real-Time Datasets – Industry Tools for Final Analytics Report.

References:

1. Frank J. Ohlhorst, Big Data Analytics: Turning Big Data into Big Money, Wiley, 2013.
2. Anand Rajaraman & Jeffrey David Ullman, Mining of Massive Datasets, Cambridge Univ. Press, 3rd Ed., 2020.
3. Tom White, Hadoop: The Definitive Guide, O'Reilly Media, 2012.
4. Bill Franks, Taming the Big Data Tidal Wave, Wiley & SAS Business Series, 2012.
5. Michael Berthold & David J. Hand, Intelligent Data Analysis, Springer, 2007.
6. Paul Zikopoulos et al., Harness the Power of Big Data, McGraw-Hill, 2012.
7. Jiawei Han & Micheline Kamber, Data Mining: Concepts and Techniques, Elsevier, 2011.
8. Glenn J. Myatt, Making Sense of Data I, John Wiley & Sons, 2014.
9. Colleen McCue, Data Mining and Predictive Analysis, Elsevier, 2015.
10. Mark Talabis et al., Information Security Analytics, Syngress, 2014.

E-Resources:

- ❖ IBM Big Data University – <https://cognitiveclass.ai>
- ❖ Coursera: Big Data Specialization – <https://www.coursera.org/specializations/big-data>
- ❖ Hadoop Apache Project – <https://hadoop.apache.org/>
- ❖ Spark Apache Project – <https://spark.apache.org/>
- ❖ Kaggle Datasets for Big Data Projects – <https://www.kaggle.com>
- ❖ YouTube: Big Data Analytics Tutorials – IBM, Edureka, Simplilearn channels

Course Outcomes

Upon completion of the course, students will be able to:

- **CO1: Demonstrate** conceptual knowledge of the introduction to big data analytics, real-time stream analytics, the Hadoop ecosystem and MapReduce, data processing frameworks like Pig and Hive, predictive analytics and visualization, and big data security and ethics.
- **CO2: Interpret and relate** to the characteristics of big data, real-time stream analytics models and techniques, the Hadoop ecosystem and MapReduce application development, data processing frameworks like Pig and Hive, predictive modeling techniques and data visualization, and big data security and ethical considerations.
- **CO3: Apply** the theories and concepts of big data analytics, real-time stream processing, Hadoop and MapReduce, data manipulation frameworks, predictive modeling, and security practices to solve real-world business problems and derive actionable insights.
- **CO4: Analyze** methodologies for handling big data, real-time stream analytics, developing MapReduce applications, using data processing frameworks, performing predictive analytics and visualization, and addressing security and ethical challenges in big data environments.
- **CO5: Evaluate** the theories and performance of big data analytic processes, real-time stream data models, MapReduce applications, data processing frameworks, predictive models, and security practices to build models for business decision-making and digital transformation.

- **CO6: Develop** contemporary practices, **adapt** and **modify** big data analytics concepts related to data processing, stream analytics, Hadoop and its ecosystem, predictive modeling, and visualization to suit enterprise environments and address the security and ethical challenges of big data.

Internal Assessment Methodology (100 Marks):

Component	Weightage
Written Test I & II	60%
Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project	40%

CO–PO–PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	3	2	2	-	3	2
CO2	3	3	3	3	-	3	2
CO3	3	3	3	3	2	3	3
CO4	3	2	3	2	3	3	3
CO5	3	3	3	2	3	3	3
CO6	3	2	3	3	3	3	3

Note: 1 – Low, 2 – Medium, 3 – High

**BN25010 Disruptive Technologies for Digital Transformation in Business L T P C
3 0 0 3**

Course Objectives:

This course aims to develop a strategic understanding of disruptive digital technologies and their transformative impact on modern businesses. Students will explore core concepts of Artificial Intelligence, Extended Reality, Blockchain, IoT, and Robotic Process Automation in practical business contexts. The course integrates hands-on tools and case-driven approaches to equip learners with the skills to evaluate, implement, and manage digital transformation initiatives ethically and effectively. Emphasis is laid on Industry 4.0 innovations and emerging trends shaping the future of work and business operations.

Digital Transformation Landscape

Introduction to Digital Transformation – Business and Technology Drivers – Goals, Benefits, and Risks – Data Intelligence and Decision-Making – Industry 4.0 and Service 4.0 – Identifying Digital Threats and Opportunities – Gartner Hype Cycle – Principles of Disruptive Innovation in Business.

Artificial Intelligence and Cognitive Technologies

Overview of Artificial Intelligence and Cognitive Computing – Applications in Business – Computer Vision – Natural Language Interfaces and Conversational Platforms – Industry Use Cases – Current Developments and Trends.

Immersive Technologies and Blockchain

Virtual, Augmented, Mixed, and Immersive Realities – Experiential Marketing and Training Applications – Blockchain Fundamentals – Components: Hashing, Encryption, Distributed Ledger – Use of Ethereum, Metamask, and Solidity – Hands-on Blockchain Business Application Development.

Internet of Things (IoT) in Business Ecosystems

IoT Components and Architecture – Value Proposition in Business Models – IoT Implementation Strategies – IoT Security and Privacy Challenges – Integration with Cloud, Edge, and Big Data.

Robotic Process Automation and Hybrid Cloud Trends

Introduction to RPA – Automation Anywhere Hands-on – RPA in HR, Finance, and Supply Chain – Edge Computing – Microservices – Big Data Platforms – Societal and Ethical Considerations.

Capstone Projects and Future Technologies

Technology Trend Mapping – Evaluating Emerging Tech for Competitive Advantage – Group Presentations on Disruptive Tech Use Cases – Debates on Societal Impact and Ethical AI – Strategic Planning for Digital Transformation Initiatives.

References:

1. Thomas Erl & Roger Stoffers, A Field Guide to Digital Transformation, Pearson Education, 2021.
2. Klaus Schwab, The Fourth Industrial Revolution, Penguin Books, 2017.
3. Christensen, C.M., The Innovator's Dilemma, Harvard Business Review Press, 2013.
4. Christensen, C.M., & Raynor, M.E., The Innovator's Solution, Harvard Business Press, 2013.
5. Fingar, P., Cognitive Computing: A Brief Guide for Game Changers, Meghan-Kiffer Press, 2015.
6. Frankish, K., & Ramsey, W. (Eds.), The Cambridge Handbook of Artificial Intelligence, Cambridge University Press,
7. Bernard Marr, Tech Trends in Practice, Wiley, 2020.

E-Resources:

- ❖ Coursera: Digital Transformation – www.coursera.org/specializations/digital-transformation
- ❖ T Sloan: Leading Digital Business Transformation – executive.mit.edu
- ❖ IBM AI & Blockchain Academy – <https://www.ibm.com/skills>
- ❖ World Economic Forum – <https://www.weforum.org/focus/fourth-industrial-revolution>
- ❖ YouTube: Disruptive Tech Explained – TEDx and McKinsey Digital

Course Outcomes:

Upon completion of the course, students will be able to:

- **CO1: Demonstrate** conceptual knowledge of the digital transformation landscape, AI and cognitive technologies, immersive technologies and blockchain, the Internet of Things (IoT), Robotic Process Automation (RPA) and hybrid cloud trends, and capstone projects and future technologies.
- **CO2: Interpret and relate** to the drivers and risks of digital transformation, the application of AI and cognitive technologies, the fundamentals of blockchain and extended realities, the components and security of IoT, the use of RPA tools and hybrid cloud trends, and the strategic and ethical implications of disruptive technologies.
- **CO3: Apply** the theories and concepts of digital transformation, AI, blockchain, IoT, RPA, and hybrid cloud trends to evaluate, implement, and manage digital transformation initiatives in a business context.
- **CO4: Analyze** methodologies for identifying digital threats and opportunities, developing AI and cognitive solutions, creating blockchain and immersive reality use cases, implementing IoT, using RPA tools, and evaluating the societal impact and ethical implications of disruptive technologies.
- **CO5: Evaluate** the theories and performance of disruptive technologies, including AI, XR, blockchain, IoT, and RPA, to build models for competitive advantage and strategic planning in business.
- **CO6: Develop** contemporary practices, **adapt** and **modify** concepts related to digital transformation, AI, XR, blockchain, IoT, and RPA to suit emerging trends and address ethical and societal challenges in the future of work and business.

Internal Assessment Methodology (100 Marks):

Component	Weightage
Written Test I & II	60%
Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project	40%

CO–PO–PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	3	2	2	2	3	2
CO2	3	3	3	2	2	3	3
CO3	3	3	3	3	2	3	3
CO4	3	3	3	2	2	3	3
CO5	2	3	3	2	2	3	3
CO6	3	3	3	3	3	3	3

Note: 1 – Low, 2 – Medium, 3 – High

BN25011

Multivariate Data Analysis

L T P C
3 0 0 3

Course Objectives:

This course equips students with the knowledge and analytical skills to apply multivariate statistical techniques for solving complex business problems. It focuses on the identification, interpretation, and modeling of data using advanced tools such as regression, factor analysis, SEM, and clustering. The course also prepares learners to deal with real-world data issues, including missing data, model assumptions, and latent variables. Through practical application, learners will be able to draw meaningful business insights from multidimensional data.

Fundamentals of Multivariate Analysis

Introduction to multivariate data – Uni-variate, Bi-variate, and Multi-variate techniques – Types and classification of multivariate methods – Applications in business research – Guidelines for multivariate analysis – Interpretation and model-building strategies.

Data Preparation and Preprocessing

Research problem conceptualization – Selection of appropriate techniques – Data screening and cleaning – Handling missing data – Dealing with measurement errors – Testing multivariate assumptions – Use of dummy variables for non-metric data.

Regression and Factor Analytical Models

Multiple Linear Regression Analysis – Introduction – Basic concepts – Multiple linear regression model – Least square estimation – Inferences from the estimated regression function – Validation of the model. Factor Analysis: Definition – OBJECTIVE – Approaches to factor analysis – methods of estimation – Factor rotation – Factor scores - Sum of variance explained – interpretation of results

Latent Variable Models and SEM

Confirmatory Factor Analysis (CFA) – Structural Equation Modeling (SEM) – Mediation and Moderation models – Latent growth models – Conditional process modeling – Longitudinal designs – Introduction to Bayesian inference.

Advanced Classification and Reduction Techniques

Discriminant Analysis – Logistic Regression – Conjoint Analysis – Cluster Analysis – Multidimensional Scaling – Applications in marketing and HR analytics.

Software Applications and Case Studies

Hands-on application using tools such as R/SPSS/SAS – Business use cases across domains – Interpretation of real-life data sets – Report writing and business decision-making – Ethical considerations in multivariate research.

References:

1. Hair, J.F., Black, W.C., Babin, B.J., & Anderson, R.E. (2022). *Multivariate Data Analysis* (8th ed.). Pearson Education.
2. Tabachnick, B.G., & Fidell, L.S. (2019). *Using Multivariate Statistics* (7th ed.). Pearson.
3. Johnson, R.A., & Wichern, D.W. (2018). *Applied Multivariate Statistical Analysis* (6th ed.). Pearson.
4. Andy Field. (2024). *Discovering Statistics Using IBM SPSS Statistics* (6th ed.). Sage Publications.
5. Sharma, S. (1996). *Applied Multivariate Techniques*. John Wiley & Sons.
6. Kothari, C.R. (2023). *Research Methodology: Methods and Techniques* (5th ed.). New Age International.

E-Resources:

- ❖ IBM SPSS Tutorials – <https://www.ibm.com/analytics/spss-statistics-software>
- ❖ Coursera: Multivariate Data Analysis (University of Illinois) – <https://www.coursera.org>
- ❖ R Documentation and CRAN Tutorials – <https://cran.r-project.org/>
- ❖ edX: Data Science and Machine Learning Essentials – <https://www.edx.org>
- ❖ YouTube: Quantitative Specialists Channel – <https://www.youtube.com/user/StatInfer>

Course Outcomes:

Upon completion of the course, students will be able to:

- **CO1: Demonstrate** conceptual knowledge of the fundamentals of multivariate analysis, data preparation and preprocessing, regression and factor analytical models, latent variable models and SEM, advanced classification and reduction techniques, and software applications and case studies.
- **CO2: Interpret** and **relate** to the different types of multivariate techniques, data preprocessing steps and assumptions, regression and factor analysis results, latent variable models and SEM, various classification and reduction techniques, and the outputs of statistical software.
- **CO3: Apply** the theories and concepts of multivariate analysis, data preparation, regression, factor analysis, SEM, and advanced classification techniques to analyze complex relationships and solve business problems.

- **CO4: Analyze** methodologies for multivariate data analysis, data preprocessing and handling missing data, multiple linear regression and factor analysis, latent variable models and SEM, advanced classification and reduction techniques, and using statistical software for case studies.
- **CO5: Evaluate** the theories related to multivariate techniques, data preparation, regression and factor analysis, SEM, and classification to build models for drawing meaningful business insights from multidimensional data.
- **CO6: Develop** contemporary practices, **adapt** and **modify** multivariate analysis concepts related to data preparation, regression and factor analysis, SEM, classification, and software applications to suit real-world data and address ethical considerations in research.

Internal Assessment Methodology (100 Marks):

Component	Weightage
Written Test I & II	60%
Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project	40%

CO–PO–PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	3	2	2	-	3	2
CO2	3	3	3	3	-	3	2
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	2	3	3
CO5	3	2	3	2	3	3	3
CO6	3	3	3	3	3	3	3

Note: 1 – Low, 2 – Medium, 3 – High

Course Objectives:

This course introduces students to the principles and practices of Natural Language Processing (NLP) with a strong emphasis on business applications. It enables learners to process and analyze unstructured textual data using Python, apply text mining techniques, build sentiment analysis models, and use word embeddings for semantic interpretation. The course also explores real-world NLP applications such as chatbots, named entity recognition, and text generation. Students gain hands-on exposure to popular NLP libraries including NLTK, SpaCy, and Scikit-learn, preparing them for data-driven decision-making in analytics-driven organizations.

Introduction to Text Mining and NLP Fundamentals

Overview of NLP – Importance of text analytics in business – NLP vs. Text Mining – Syntax and semantics – Language modeling – NLP pipeline and workflow – Applications: sentiment mining, search engines, chatbots – Common challenges in NLP (ambiguity, sarcasm, slang) – Case examples from Indian digital economy and customer experience.

Text Preprocessing and Feature Engineering

Raw data extraction – Pre-processing pipeline: tokenization, stopword removal, case normalization, HTML tag removal, emoji cleansing – Stemming and Lemmatization – Text vectorization: Bag of Words, TF-IDF – Term frequency matrix – Topic modeling (LDA) – Word clouds and text visualization.

Word Embeddings and Semantic Representation

Limitations of one-hot and TF-IDF encoding – Word2Vec, GloVe, FastText – Co-occurrence matrix – Cosine similarity – Vector space models – Pre-trained embeddings – Use cases: sentiment clustering, document similarity – Manipulating semantic meaning in vector spaces – Visualization using t-SNE and PCA.

Sentiment Analysis and Supervised Modeling

Text classification tasks – Sentiment analysis using labeled datasets – Vocabulary creation – Feature extraction from frequency counts – Logistic regression for classification – Evaluation metrics (accuracy, precision, recall, F1-score) – Text classification workflow with tweets and reviews – Business use case: social listening and brand analysis.

Python for NLP and Named Entity Recognition

Python packages: NLTK, SpaCy, TextBlob, Gensim – Reading text from .txt/.pdf – Regular expressions – Tokenization and POS tagging – Named Entity Recognition (NER) – Text classification pipeline – Chatbot architecture – Introduction to language generation – Indian language NLP initiatives (AI4Bharat, IndicNLP).

Advanced Applications and Trends in NLP

Text summarization (extractive and abstractive) – Transformer architecture overview – Introduction to BERT, GPT, T5 – Use of Hugging Face models – Multilingual NLP – Ethics in NLP (bias,

privacy) – Real-time NLP in customer support, HR, finance – Capstone discussion: build a mini NLP solution for a business problem.

References:

1. Steven Bird, Ewan Klein, Edward Loper, Natural Language Processing with Python, O'Reilly, 2009.
2. Dipanjan Sarkar, Text Analytics with Python, Apress, 2019.
3. Dan Jurafsky & James H. Martin, Speech and Language Processing, Pearson, 3rd Ed. (draft, 2024).
4. Palash Goyal et al., Deep Learning for NLP, Apress, 2018.
5. Aurélien Géron, Hands-On ML with Scikit-Learn, Keras, TensorFlow, O'Reilly, 2nd Ed., 2019.
6. Charu C. Aggarwal, Machine Learning for Text, Springer, 2023.
7. Sowmya Vajjala et al., Practical Natural Language Processing, O'Reilly, 2020.
8. Christopher D. Manning et al., Introduction to Information Retrieval, Cambridge, 2008.

E-Resources:

- ❖ <https://www.nltk.org/> – NLTK Documentation
- ❖ <https://spacy.io/> – SpaCy Docs
- ❖ <https://huggingface.co/> – Transformers & Pretrained Models
- ❖ <https://towardsdatascience.com/tagged/nlp> – NLP Tutorials
- ❖ <https://ai4bharat.org/> – NLP for Indian languages
- ❖ <https://scikit-learn.org/> – Scikit-learn Resources
- ❖ <https://github.com/> – Open-source NLP Projects

Course Outcomes

Upon completion of the course, students will be able to:

- **CO1: Demonstrate** conceptual knowledge of the fundamentals of NLP, text preprocessing and feature engineering, word embeddings and semantic representation, sentiment analysis and supervised modeling, Python for NLP and named entity recognition, and advanced applications and trends in NLP.
- **CO2: Interpret and relate** to NLP fundamentals and text mining, text preprocessing pipelines and feature engineering, word embedding techniques for semantic representation, supervised modeling for sentiment analysis, the use of Python NLP libraries, and modern NLP trends and their ethical implications.
- **CO3: Apply** the theories and concepts of text mining, preprocessing, word embeddings, supervised modeling, named entity recognition, and advanced NLP applications to solve real-world business problems and analyze unstructured textual data.
- **CO4: Analyze** methodologies for text mining and NLP, feature engineering and topic modeling, word embeddings and semantic representation, sentiment analysis and text classification, using Python for NER and chatbots, and evaluating advanced NLP models and their impact.
- **CO5: Evaluate** the theories and performance of various NLP techniques, including text preprocessing, word embeddings, supervised models for sentiment analysis, and advanced architectures like transformers, to build data-driven solutions for business.
- **CO6: Develop** contemporary practices, **adapt** and **modify** NLP concepts related to text mining, preprocessing, word embeddings, sentiment analysis, named entity recognition, and advanced applications to suit business challenges and address ethical considerations in data-driven organizations.

Internal Assessment Methodology – 100 Marks

Component	Weightage
Written Test I & II	60%
Assignment, Presentation, Case Study, Quiz, Simulation, Online Certification, Seminar, Mini project	40%

CO–PO–PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	3	3	2	2	3	3
CO2	3	2	3	3	3	3	3
CO3	3	3	2	2	2	2	2
CO4	3	3	3	3	3	3	3
CO5	3	2	3	3	2	3	2
CO6	3	3	3	2	3	3	3

Note: 1 – Low, 2 – Medium, 3 – High