DEPARTMENT OF MANAGEMENT STUDIES

SCHOOL OF MANAGEMENT

PONDICHERRY UNIVERSITY

MBA

(DATA ANALYTICS)

COURSE CURRICULUM

2026 ONWARDS

DEPARTMENT OF MANAGEMENT STUDIES

SCHOOL OF MANAGEMENT

PONDICHERRY UNIVERSITY

MBA (DATA ANALYTICS)

COURSE CURRICULUM

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INDEX

COURSE STRUCTURE OF MBA (Data Analytics) PROGRAMME IN PONDICHERRY UNIVERSITY

SEMESTER - I			SEMESTER – II		
Subject	**Credit**	**Marks**	**Subject**	**Credit**	**Marks**
Management Process and Organisational Behaviour	3	100	Financial Management	3	100
Business Environment	3	100	Marketing Management	3	100
Business Statistics for Analytics	3	100	Operations Management	3	100
Accounting for Managers	3	100	Human Resources Management	3	100
Data Base Management Systems	3	100	Strategic Management	3	100
Research Methodology	3	100	Business Intelligence	3	100
Operations Research	3	100	Machine Learning	3	100
Excel for Business Intelligence	3	100	Introduction to Cloud	3	100
Communication and Negotiation Skills Workshop	2	50	Business Valuation Lab	2	50
R Programming Lab	2	50	Data Visualization Lab	2	50
Python Programming Lab- 1	2	50	Python Programming Lab – 2	2	50
Total	**30**	**950**	**Total**	**30**	**950**

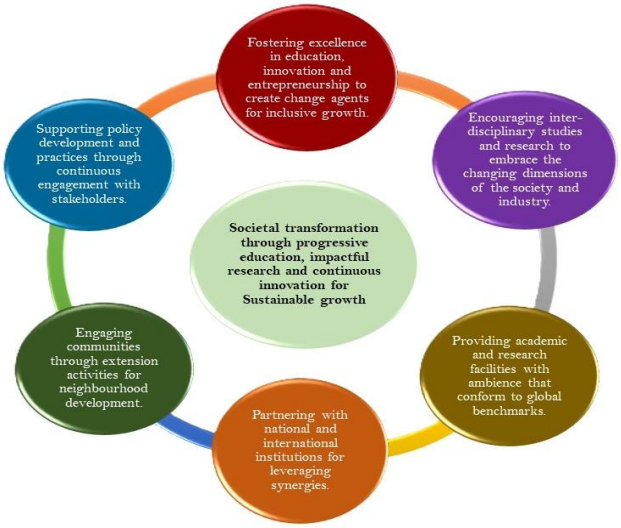
SEMESTER – III			SEMESTER – IV		
Subject	**Credit**	**Marks**	**Subject**	**Credit**	**Marks**
Software Project Management	3	100	Project-2 (12 Weeks) (150 Marks for thesis + 50 Marks for Project Viva)	12	200
Deep Learning	3	100			
Design and Analysis of Algorithms	3	100			
Data Warehouse & Mining	3	100			
SAS Programming Lab	2	50			
Summer Projects (8 Weeks) (80 Marks for Report + 70 Marks for Presentation & Viva)	4	150			
Elective-1	3	100			
Elective-2	3	100			
Elective-3	3	100			
Elective-4	3	100			
Total	**30**	**1000**	**Total**	**12**	**200**
Total Number of Credits	**102**		**Total Marks**		**3100**

PONDICHERRY UNIVERSITY VISION

"Societal transformation through progressive education, impactful research and continuous innovation for Sustainable growth"

PONDICHERRY UNIVERSITY MISSION

1. Fostering excellence in education, innovation and entrepreneurship to create change agents for inclusive growth.
2. Encouraging inter-disciplinary studies and research to embrace the changing dimensions of the society and industry.
3. Providing academic and research facilities with ambience that conform to global benchmarks.
4. Partnering with national and international institutions for leveraging synergies.
5. Engaging communities through extension activities for neighbourhood development.
6. Supporting policy development and practices through continuous engagement with stakeholders.

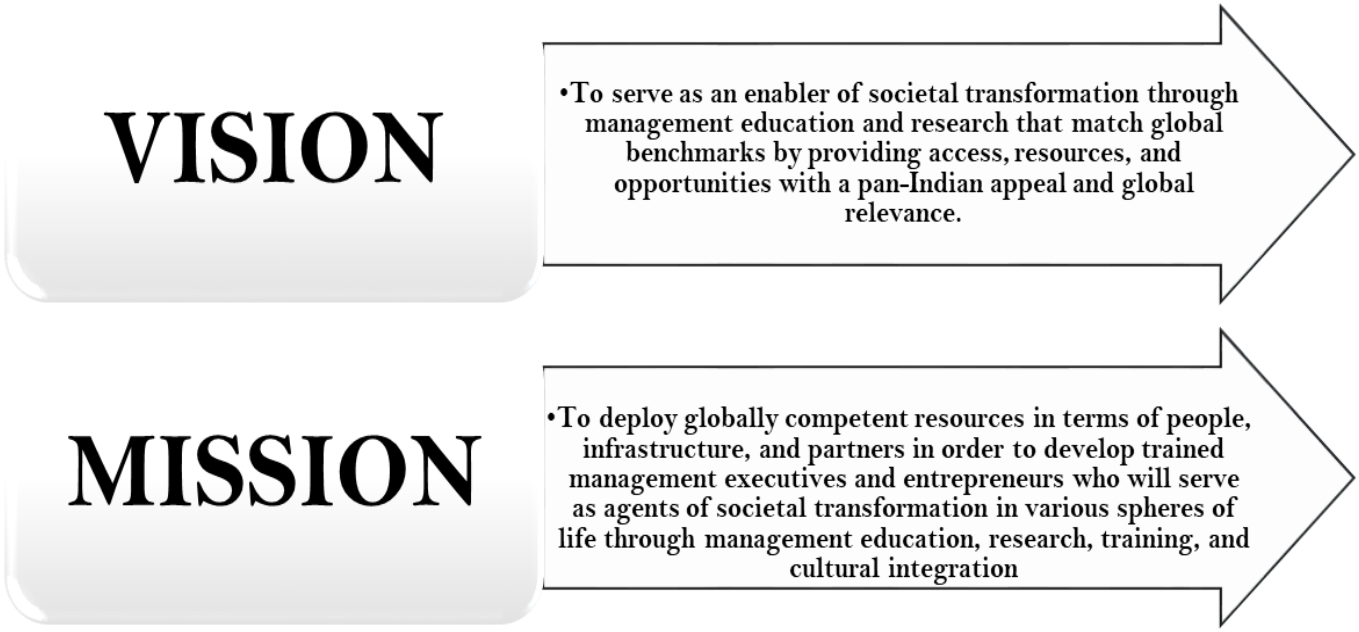


DEPARTMENT OF MANAGEMENT STUDIES VISION

To serve as an enabler of societal transformation through management education and research that match global benchmarks by providing access, resources, and opportunities with a pan-Indian appeal and global relevance.

DEPARTMENT OF MANAGEMENT STUDIES MISSION

To deploy globally competent resources in terms of people, infrastructure, and partners in order to develop trained management executives and entrepreneurs who will serve as agents of societal transformation in various spheres of life through management education, research, training, and cultural integration



PROGRAM OUTCOMES (POs)AND PROGRAM SPECIFIC OUTCOMES (PSOs) OF MBA DATA ANALYTICS PROGRAMME

Program Outcomes (POs)

PO1	***Application of Management Theories and Practices*** Ability to conceptualize, organize and resolve complex business or corporate issues by applying Management Theories and Practices.
PO2	***Critical Thinking and Communication Skills*** Analyze and solve business issues/complexities to make effective decisions and communicate the outcomes with clarity to the stakeholders.
PO3	***Leadership and Ethics*** Nurturing leadership qualities and inculcating ethical behaviour to be socially responsible managers.
PO4	***Environment and Sustainability*** Understand and analyse global, economic, legal and environmental aspects of Business to provide professional management solutions to ensure sustainable development.
PO5	***Contribution in Team Environment*** Ability to lead themselves and contribute in team- Based environment to achieve Organizational goals effectively.

Program Specific Outcomes (PSO)

PSO1	Competency in analysing complex datasets using tools like Python, R, and machine learning frameworks to derive actionable insights for real-world business problems.
PSO2	Graduates will approach data analytics with a strong ethical code of conduct, ensuring privacy, fairness, and compliance with relevant regulations in their analytical practices.

MBA (DATA ANALYTICS) DEGREE PROGRAMME

REGULATIONS FOR THE MBA (DATA ANALYTICS) PROGRAMME OFFERED IN THE UNIVERSITY DEPARTMENT

1. **Eligibility for the Programme:** Bachelor's degree, such as B.Com/ BBA/ BCA/ B.Sc. (Mathematics/Statistics/Computer Science)/ B.E./ B.Tech with 50% marks. All SC/ST candidates who have passed the qualifying examination are eligible to apply for PG admission, irrespective of the percentage of marks obtained in the qualifying examination, except otherwise specified.

2. **Admission Procedure :** Admission will be Based on the Central Universities Entrance Test (CUET) with the CUET Test Paper code COQP12.

3. **Duration of the Course:** 2 Years [4 Semesters / Self Financing Mode]

4. **Examination**: End semester examinations only under the CBCS Scheme by the course teacher for each subject, except for workshop-based courses; in the workshop-based courses, the assessment is continuous and internal. For the revaluation/revaluation, the rules specified by the University, from time to time, will be applicable.

5. Proportion of marks between internal assessment and end-semester evaluation for subjects is 40:60 while it is internal for the workshop and lab courses.

6. Guidelines for awarding marks for project works:

A. Summer Project (8 Weeks)

It will be done during the summer vacation after first Year.

There will be a mid-term review after 4 weeks

Marks for the Project awarded by the Guide **80 Marks**

A single member panel (examiner) will be appointed by the project Co-Ordinator.

Marks for Presentation and Question & Answer Session **70 Marks**

B. IV Semester Project (12 Weeks)

It will be done during the fourth Semester.

There will be a mid-term review after 4 weeks

Marks for the Project Report **150 Marks**

A single member panel (examiner) will be appointed by the project Co-Ordinator.

Marks for Presentation and Question & Answer Session **50 Marks**

7. Passing Requirement: The student should have a minimum of 40% marks in the University Examination and a minimum of 50 % marks in the Internal and University Examinations put together in theory subjects. Wherever there is no internal component, the student should have a minimum of 50% marks in the University Examination.

8. Question paper pattern: Time: 3 Hours Maximum Marks: 60

PART A: 5× 3 = 15 Marks

Answer ALL FIVE Questions
Question 1 to Question 5

PART B: 5 × 7 = 35 Marks

Question 6A or Question 6B
Question 7A or Question 7B
Question 8A or Question 8B
Question 9A or Question 9B
Question 10A or Question 10B

PART C (1 × 10 = 10 Marks)

Question 11: COMPULSORY (Case/Problem depending upon the subject)

Note: For answers, the following are the prescribed word limits.
5 marks – maximum 50 words
8 marks – maximum 200 words
10 marks – maximum 300 words

9. Maximum number of years permitted after completion of Semester IV to write arrear subjects:

a. Two years

10. Guidelines to deal with the attendance shortage of the students:

The students are permitted to proceed to the succeeding semesters without a break. A student who gets FA grade in a course due to insufficient attendance should repeat the course as and when offered.

QUESTION PAPER PATTERN

Course Name		Duration:	:	3 Hours
Course Code		Max. Marks:	:	60

Part A **[Answer All Questions]** **[5 X 3 = 15]**

Q.No	Questions	CO		K-level
1		CO1		K1/K2
2		CO2		K1/K2
3		CO3		K1/K2
4		CO4		K1/K2
5		CO5		K1/K2

Part B **[Answer All Questions]** **[5 X 7 = 35]**

Q.No	Questions	CO	K-level
6A		CO1	K3/K4
	OR		
6B		CO1	K3/K4
7A		CO2	K3/K4
	OR		
7B		CO2	K3/K4
8A		CO3	K3/K4
	OR		
8B		CO3	K3/K4
9A		CO4	K3/K4
	OR		
9B		CO4	K3/K4
10A		CO5	K3/K4
	OR		
10B		CO5	K3/K4

Part C	**Compulsory Questions**	**[1 X 10 = 10]**	
Q.No	**Questions**	**CO**	**K-level**
11			K5/K6

INDEX OF SEMESTER WISE DETAILED SYLLABUS FOR MBA (DATA ANALYTICS) COURSES

SEMESTER - I

LIST OF CORE PAPERS

Title of the Paper	**Code**
Management Process and Organisational Behaviour	DA26H1001
Business Environment	DA26H1002
Business Statistics for Analytics	DA26H1003
Accounting for Managers	DA26H1004
Data Base Management Systems	DA26H1005
Research Methodology	DA26H1006
Operations Research	DA26H1007
Communication and Negotiation Skills Workshop	DA26H1008
R Programming Lab	DA26H1009
Python Programming Lab- 1	DA26H1010
Excel for Business Intelligence	DA26H1011

DA26H1001	Management Process and Organisational Behaviour	L	T	P	C
Core / Elective	Core	3	0	0	3

Course Objectives:

- Providing conceptual understanding of management concepts
- Familiarizing the students with the contemporary issues in management
- Enable them to apply the concepts in the management organization
- Emphasizing behavioural concepts and its practical applications in the organisation

UNIT: 1	**09 Hours**
Nature of Management: Meaning and Definition, Management: Science, Theory and Practice - The Evolution of Management Thought and the Patterns of Management Analysis- Approach to Management – Levels in Management – Managerial Skills - Functions of Management-The Nature and Purpose of Planning - Objectives - Strategies, Policies and Planning Premises, . Management by Objective (MBO)	
UNIT: 2	**09 Hours**
The Nature of Organizing - Organizational Structure: Departmentation - Line/Staff Authority and Decentralization, Co-ordination functions in Organisation, Emerging Trends in corporate Structure- Authority Relationships – Delegation of Authority and Decentralisation- Human Factors and Motivation- Leadership – Meaning, Importance, styles and theories of leadership. Committees and group- Decision Making- Techniques and processes.	
UNIT: 3	**09 Hours**
An overview of staffing function: Elements of staffing- Recruitment sources- Selection process- The System and Process of Controlling- Methods, Tools and Techniques of Control and Information Technology – Design of techniques – Choices in Control. Best Management Practices across the world – Select cases of Domestic & International Corporations.	
UNIT: 4	**09 Hours**
Organisational Behaviour: Meaning & Definition- Management functions and relevance to Organisation Behaviour. Personality - Determinants, structure, behaviour, assessment, theories of personality- Emotions and Emotional Intelligence as a managerial tool. Attitudes - relationship with behaviour, Perception - Process, Managerial implications of perception. Learning - classical, operant and social cognitive approaches. Implications of learning on managerial performance.	
UNIT: 5	**09 Hours**
Foundation of Group Behaviour- Definition of Groups, Reasons for forming Groups- Stages of Group Development-Characteristics of Groups, Group Structure-Understanding Work Teams- Organisational Change-Managing Change In the Organisational Context- Forces for Change In Organization- Managing resistance to change- Organization Development: Meaning & Definition- OD Interventions- Organisational Culture- Characteristics of Organizational Culture- Creating and Sustaining Culture- Successful Organizational Culture- Organizational Behaviour responses to Global and Cultural diversity	
Total Lecture Hours	**45 Hours**

Text Book(s)

1.	Koontz & Weirich, “Essentials of Management: An International perspective”, 8th Edn. Tata McGraw-Hill, New Delhi, 2009.
2.	Stephen P. Robbins, Mary A. Coulter and David A. De Cenzo, “Fundamentals of Management

3.	- 10th edition Pearson Education, New Delhi, 2017.
4.	Peter F. Drucker, "The Practice of Management", Harper Business; Reissue edition, 2006.
Reference Book(s)	
1.	Sarah cook, Practical Bench Marking: A manager's guide to creating competitive advantage, London, Kogan Page 1995
2.	Heracleous.L and Devoge, S., "Bridging the gap the of relevance: strategic management and organizational development, Long Range planning 31(5), 1998
3.	Bateman Snell, "Management: Competing in the new era", McGraw Hill Irwin, 2002.
4.	Peter Eichhorn & Ian Towers, Principles of Management: Efficiency and Effectiveness in the Private and Public Sector, Springer International Publishing. 2018.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1.	https://open.umn.edu/opentextbooks/textbooks/principles-of-management
2.	https://bdpad.files.wordpress.com/2015/05/fred-luthans-organizational-behavior-_-an-evidence- Based-approach-twelfth-edition-mcgraw-hill_irwin-2010.pdf
3.	https://libguides.library.curtin.edu.au/fundamentals-of-management
4.	www.bretlsimmons.com

COURSE OUTCOMES:

Cos	Course Outcome	K Level
CO1	Understand management's evolution, approaches, and functions.	K2
CO2	Analyse organisational structures, authority relationships, and leadership theories to design effective coordination and decision-making strategies in diverse corporate settings.	K4/K6
CO3	Demonstrate understanding of staffing and control systems by applying recruitment, selection, and control tools, and evaluate global best practices in management control.	K3/K5
CO4	Assess the impact of personality, perception, emotions, and learning theories on managerial behaviour and performance within organisational contexts	K5
CO5	Evaluate group dynamics, organizational culture, and change management strategies, and design effective interventions to manage resistance and foster cultural diversity.	K5/K6

CO- PO Mapping

POs Cos	PO1	PO2	PO3	PO4	PO5	PSO	PSO
CO1	3	2	1	2	1	**1**	**2**
CO2	3	2	3	2	2	1	2
CO3	3	2	2	3	2	2	2
CO4	2	3	2	2	2	2	3
CO5	2	3	3	3	3	2	3
Average Alignment Score	**2.6**	**2.4**	**2.2**	**2.4**	**2.0**	**1.6**	**2.4**
3 – Strong, 2 – Medium, 1- Low							

DA26H1002	BUSINESS ENVIRONMENT	L	T	P	C
Core / Elective	Core	3	0	0	3

Course Objectives:

- To enable students, understand the opportunities and challenges of prevailing and desirable global business environment in which business has to operate.
- Provide an understanding of the role of business in society.
- To enable students read, research and discuss the issues through written papers, presentations, industrial visits and role plays in class seminars.

UNIT: 1	Micro Economic Environment	09 Hours
Relevance of demand analysis in Business Decision-making: Law of Demand; Elasticity of Demand; Determinants of Demand; Individual, firm and Market demand; Demand Curve and its nature; Demand Forecasting Techniques; Different Market Structures and Pricing under each structure; Cost concepts: Types of cost; Relationship between Average and Marginal Cost in Short run and long run; Production functions in short and long run; Wages and wage differentials.		
UNIT: 2	**Macro Economic Environment**	**09 Hours**
Inflation, poverty, unemployment and GDP3. Role of government in business-Fiscal and Monetary Policies; Liberalization, Privatization and Globalization of Economy and its consequences; MNCs; World Trade Organization; FDI, FPI, Special Economic Zone - Environmental Issues Outsourcing and Collaboration - Inclusive and Sustainable Development		
UNIT: 3	**Political and Legal Environment**	**09 Hours**
Bureaucracy, Corruption Level, Societal Outlook and Orientation; Introduction to Companies Act, 1956: Definition, Characteristics and types of Companies; Formation and winding-up of Company; Appointment, powers and duties of Directors; Introduction to Consumer Protection Act, 1986: Rights of Consumers; Redressal Machinery under the Act. Introduction to CompetitionAct 2002: Anti-Competitive Agreements, Regulation of Combinations, Competition Commissionof India. Introduction to Goods and Service Tax (GST): Registration under GST; Supply under GST and Valuation of Supply; Input Tax Credit under GST & Returns.		
UNIT: 4	**Socio-Cultural Environment**	**09 Hours**
Population & its Growth Rate, Education Levels, Age Distribution and Life Expectancy Rates Family Size and Structures, Gender Distribution, Religion, Nationality and Beliefs and Minorities Social classes and Lifestyle, Average Disposable Income - Attitude towards Product Quality and Customer Service, Buying Habits, Environmental Consciousness, Work and Leisure, Health Consciousness, Risk Taking Ability.		
UNIT: 5	**Technological Environment**	**09 Hours**
Basic Infrastructure Level - Energy, Transport, Communication, Science and Technology. Research and Development, Product and Process Innovation, Rate of Technological Change and Penetration Levels, Protection of Intellectual Property Rights - Technological Leadership and Followers, Technology and Competitive Advantage, Time Lags in Technology Introduction, Adaptation, Transfer of Technology - Internet Infrastructure		
	Total Lecture Hours	**45 Hours**

Text Book(s)

1.	Francis Cherunilam: Business Environment – Text and Cases, Himalaya Publishing House, New Delhi.
2.	A.C. Fernando, Business Environment, Pearson.
3.	Ian Worthington and Chris Britton: The Business Environment, Prentice Hall

4.	Shaikh Saleem, Business Environment, Pearson
Reference Book(s)	
1.	Rudder Dutt and Sundharam, K.P.M.: Indian Economy, S. Chand & Company Limited, New Delhi.
2.	Managerial Economics and Business Strategy by Michael R Baye and Jeff Prince (2017); McGraw Hill Education, Eighth Edition
3.	Managerial Economics: Principles and Worldwide Applications by Dominick Salvatore and Siddartha k rastogi (2016); Oxford Higher Education
4.	Managerial Economics by D N Dwivedi (2015); Vikas Publishing House
Magazines & Other References	
1.	Survey of Indian Industry – published every year
2.	Magazines & Journals – The Economist, The Week, Harvard Business Review, Indian Management, Economic and Political Weekly, India Today, Business Today, Business World, Outlook, Computers Today, Daily Business and General News Papers, Etc.
3.	TV Programs on Business and Environment
4.	Others: Various publications such as reports, surveys, studies on business and management.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1.	http://www.wikipedia.org
2.	http://www.allbusiness.com
3.	http://www.ehow.com
4.	ww.wareseeker.com/free-managerial-economics-tutorials
5.	www.managementstudyguide.com

COURSE OUTCOMES:

CO	Course Outcome	K Level
CO1	Understand the relevance of demand, cost and production theories in various market structures	K2
CO2	Analyse the impact of macroeconomic indicators, government policies and sustainable development initiatives on business operations	K4
CO3	Interpret key provisions of corporate, consumer and competition laws and assess their influence on ethical and legal business conduct	K2 / K5
CO4	Examine the socio-cultural variables influencing consumer behaviour and apply this understanding to devise business strategies	K3/K4
CO5	Assess the role of technological infrastructure, innovation and intellectual capital	K5

CO- PO Mapping

POs Cos	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO 2
CO1	3	1	0	2	0	1	2
CO2	3	2	3	2	0	2	2
CO3	2	1	2	3	1	1	3
CO4	1	2	3	2	1	2	2
CO5	3	3	3	2	2	2	2
Average	**2.4**	**1.8**	**2.2**	**2.2**	**0.8**	**1.6**	**2.2**

DA26H1003	BUSINESS STATISTICS FOR ANALYTICS	L	T	P	C		
Core / Elective	Core	3	0	0	3		

Course Objectives:

1. Understand the foundational concepts and significance of statistics in business decision-making.
2. Develop the ability to compute and interpret key descriptive statistics using both conceptual and practical approaches.
3. Gain proficiency in probability theory and probability distributions to real-world problems.
4. Acquire skills in inferential statistical methods, with a focus on understanding the assumptions, procedures, and interpretation of results in various testing scenarios.
5. Analyze relationships between variables using correlation and regression techniques to support data-driven decision-making in business contexts.

UNIT: 1	Foundations to Descriptive statistics	**09 Hours**
Meaning & Definition; Significance of statistics in business, Limitations & Misuse of statistics; Descriptive Statistics: **Measures of central tendency** – Meaning, Purpose & Characteristics of Arithmetic Mean, Median, Mode, Geometric Mean, Harmonic Mean, Quadratic Mean. Difference between Mean, Median, Mode, Requisites of Good Average, Which Average to Use; **Measures of dispersion -** Meaning, Purpose. Properties of Good measure of Variation, Methods of Studying variation. Mean Deviation: Merits & Limitations. Standard Deviation: Meaning, Difference between Mean Deviation & Standard Deviation, Mathematical properties of Standard deviation, Merits & limitations of Standard deviation, Lorenz Curve: Meaning & Process. Variance: Meaning. & Standard Error, Which measure of dispersion to use. **Skewness & Kurtosis:** Meaning, Purpose. Tests of Skewness, Requisites of Good Measure of Skewness. Types of Kurtosis. – Practice.		
UNIT: 2	Probability And Probability Distributions	**09 Hours**
Probability: Probability: Meaning - Fundamental Concepts - Approaches to measurement of Probability -Classical, Relative frequency, subjective and axiomatic approaches - Addition theorem - Multiplication theorems- Bayesian theorem and its applications - Mathematical expectation. – Practice. Concepts of Probability-Additive and Multiplicative Laws-Baye's Decision Rule- Probability Distributions: Binomial, Poisson and Normal Distribution. Properties and uses - fitting Binomial, Poisson and Normal, Distributions. – Practice.		
UNIT: 3	**Sampling Theory & Inferential Statistics Between Groups - I**	**09 Hours**
Sampling: Concept of Sampling, Reasons for Sampling, Types of Samples. **Hypothesis Testing**: Hypothesis Testing Procedure. **Types of Errors:** Type I, Type-II Errors. **Types of Sample Tests: Large Sample Tests:** Mean Test, Difference between Two Means, Difference between Two Standard Deviations**. Small Sample Tests** - Mean Test, Difference between Means of Two Independent Samples, Difference between Two Dependent Samples or Paired Observations.		
UNIT: 4	**Inferential Statistics Between Groups - II**	**09 Hours**
Why ANOVA is Preferred Instead T-test. **ANOVA**: Meaning, Assumptions, Procedure for Analysis of Variance, General form of ANOVA, One- way Classification, Two-Way Classification. – Practice. **Chi Square Test**: Definition, Uses and limitations of Chi square test. Chi square test for goodness of fit, Chi square test for testing the independence of Attributes, Chi- Square test of Homogeneity		
UNIT: 5	Association & Causation	**09 Hours**
Correlation: Meaning, Purpose, Assumptions & Application of correlation. **Regression:** Linear regression: Meaning, Purpose, Assumptions & Application. – Practice.		
	Total Lecture Hours	**45 Hours**

Text Book(s)	
1.	Business Statistics, G.C. Beri, Tata McGraw Hill publications.
2.	Statistics for Management, R. I. Levin and D. S. Rubin, 7th Edition, Pearson Education.
3.	Statistical Methods, S. P. Gupta.
4.	Discovering statistics Using SPSS (2009), Andy Field, Sage Publications.

COURSE OUTCOMES:

CO	Course Outcome	K Level
CO1	Explain and compare the measures of central tendency, dispersion, skewness and kurtosis to support business analysis	K2
CO2	Understand and apply probability theories	K2 & K3
CO3	Conduct hypothesis testing using appropriate parametric tests for large and small samples	K4
CO4	Evaluate group differences and attribute associations using ANOVA and Chi-square tests	K5
CO5	Analyse the strength and nature of relationships between variables using correlation and regression analysis	K4

CO- PO Mapping

POs Cos	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO 2
CO1	2	3	1	2	1	3	2
CO2	3	2	1	2	1	3	2
CO3	3	3	1	2	1	3	2
CO4	3	3	1	2	1	2	2
CO5	3	3	1	2	1	3	2
Average Alignment Score	**2.8**	**2.8**	**1.0**	**2.0**	**1.0**	**2.8**	**2.0**
3 – Strong, 2 – Medium, 1- Low							

DA26H1004	ACCOUNTING FOR MANAGERS	L	T	P	C
Core / Elective	Core	3	0	0	3

Course Objectives:

- To provide a comprehensive understanding of the fundamental principles and practices of financial, cost, and management accounting.
- To develop the ability to prepare, analyse, and interpret financial statements for assessing business performance.
- To equip students with analytical skills to apply management accounting tools for planning, control, and decision-making.
- To enable students to evaluate cost structures and apply costing techniques for managerial efficiency and cost optimization.
- To enhance practical competence through case studies, accounting software (Tally) training, and assignments on small business accounting.

METHODOLOGY:

- Class Room teaching of each of the UNIT followed by regular exercises and surprise tests.
- One practical assignment on 'Accounting for SBEs" and its presentation by students.
- Case Study - Analysis of Company Annual Report & application of marginal costing
- Training on Tally Package

UNIT: 1	12 Hours
Book-keeping and Accounting – Meaning – Definition – Objectives of Financial Accounting – Branches of Accounting: Financial, Cost and Management Accounting – Accounting Concepts and conventions – journal – Ledger – Trial Balance – Preparation of Final Accounts: Trading, Profit and Loss Account and Balance Sheet (problems) – Accounting Standards – Groups interested in Accounting Information – An Introduction to Tally Package – salient features – types of vouchers – reports generated by Tally.	
UNIT: 2	**12 Hours**
Capital and Revenue Expenditure – Deferred Revenue Expenditure – Capital and Revenue Receipts – Depreciation – Definition – Causes – Necessity of providing for depreciation – Methods of Calculating Depreciation: Straight Line Method and Written Down Value Method – Problems.	
UNIT: 3	**12 Hours**
Financial Statements – Meaning – Types of financial Analysis – Techniques of Financial Analysis – Ratio Analysis – Profitability Ratios – Coverage Ratios – Turnover Ratios – Financial Ratios – Ratios to Financial Statement (problems) – uses and limitations of Ratio Analysis – Funds Flow Analysis (simple problems) – uses and limitations – Cash Flow Analysis (simple problems) – uses and limitations – Difference between funds flow and cash flow analysis.	
UNIT: 4	**12 Hours**
Marginal costing – assumptions – Cost Volume Profit Analysis – Breakeven Analysis – Key Factor – Profit Planning (problem) – Decisions involving Alternative Choices: Determination of sales mix, exploring new markets and Make or Buy decisions (Problem for case study)	
UNIT: 5	**12 Hours**
Concept of cost – Elements of Cost – Cost Accounting – Objectives – Cost Sheet (Problems) – classification of cost – Cost UNIT and Cost Centre – Methods of Costing – Techniques of Costing.	
Total Lecture Hours	**60 Hours**

Text Book(s)	
1	Vinayakam, N., & Charumathi, B. (2004). Financial accounting. S. Chand, Limited
2	S.N. Maheswari: Management Accounting. Maheshwari, S. N. (2021). Principles of management accounting (18th rev. ed.). Sultan Chand & Sons
Reference Book(s)	
1	Hingorani, N. L., Ramanathan, A. R., & Grewal, T. S. (1983). Management accounting (4th ed.). Sultan Chand & Sons.
2	Anthony, R. N. (1970). Management accounting: Text and cases. Richard D. Irwin, Inc.
3	Bhar, B. K. (1982). Cost accounting: Methods and problems (5th ed.). Academic Publishers.
4	Guthmann, H. G. (1953). Analysis of financial statements (4th ed.). Prentice-Hall.
5	Narayanaswamy, R. (2022). Financial accounting: A managerial perspective (7th ed.). PHI Learning Private Limited.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	www.accountingformanagement.com
2	http://www.business.com/directory/accounting/software/
3	www.icai.org
4	www.icsi.edu
5	www.icwai.org

COURSE OUTCOMES On Completion of the course, the students will be able to	
CO1	Recall the accounting principles and prepare and interpret Final accounts of a Business Concern.
CO2	Classify various categories of expenditure and analyze problems concerning different methods of Depreciation.
CO3	Describe the various Techniques of Financial Analysis, classify different types of ratios and distinguish Fund Flow Analysis from Cash Flow.
CO4	Analyze the problems related to Marginal Costing and Break-Even Analysis and choose the decisions from alternative choices pertaining to determination of sales mix, exploring new markets and analyze the cases related to make or buy decisions
CO5	Classify in detail about the various elements of cost and define different methods and techniques of Costing and analyze the Cost Sheet of any firm.

CO- PO Mapping

POs **Cos**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO 1**	**PSO 2**
CO1	3	2	1	2	1	2	2
CO2	3	2	1	2	1	2	2
CO3	3	3	1	2	1	2	2
CO4	3	3	2	2	2	3	2
CO5	3	3	1	2	1	2	2
Average Alignment	**3.0**	**2.6**	**1.2**	**2.0**	**1.2**	**2.2**	**2.0**

Score							
DA26H1005	**DATA BASE MANAGEMENT SYSTEMS**	**L**	**T**	**P**	**C**		
Core / Elective	**Core**	**3**	**0**	**0**	**3**		

Course Objectives:

- The objective of the subject is to introduce the concepts of data modelling, data Base design, DBMS products and Data base administration

UNIT: 1	Introduction to DBMS	**09 Hours**
DBMS vs File Systems – Database Architecture – Data Models (Relational, ER, Object-oriented) – Database Users and Roles. Applications: Centralized business data management, analytics-ready data storage.		
UNIT: 2	Relational Model & SQL	**09 Hours**
Relational model concepts – Tables, Keys, Relationships – Structured Query Language (SQL): SELECT, INSERT, UPDATE, DELETE – Joins, Views, Aggregations. Applications: Business reporting, sales analytics, customer segmentation, inventory management.		
UNIT: 3	Database Design & Normalization	**09 Hours**
Entity-Relationship (ER) modeling – Relational schema design – Functional dependencies – Normal forms (1NF to 3NF, BCNF) – Denormalization for analytics. Applications: Optimized database design for CRM, ERP, and decision support systems.		
UNIT: 4	Transaction Management & Concurrency	**09 Hours**
Transactions, ACID properties – Concurrency control – Locking, Deadlock handling – Recovery techniques – Database security fundamentals. Applications: Ensuring data integrity in financial transactions, multi-user business environments, audit compliance.		
UNIT: 5	Advanced DBMS Concepts & Business Applications	**09 Hours**
Data warehousing – OLAP & OLTP – Indexing and Query Optimization – Big Data integration – NoSQL databases overview – Real-time analytics. Applications: Business intelligence dashboards, predictive analytics, real-time operational insights, customer analytics.		
	Total Lecture Hours	**45 Hours**

Text Book(s)	
1.	Panneerselvam, R., Data Base Management Systems PHI Learning Pvt. Ltd., New Delhi, 2011.
Reference Book(s)	
1.	James martin, Principles of Data Base Management, Prentice-Hall of India, 1998.
2.	Silberschatz., A., et.al., Data Base Management Concepts, McGraw Hill International Edition, New York, 1997.
3.	Date, C.J., An Introduction to Data Base Systems, Narosa Publishing House, New Delhi, 1987.
4.	Everest, Gorden, C., Data Base Management, McGraw-Hill, New York, 1986.
5.	Dan Sullivan, NoSQL for Mere Mortals.
6.	Gaurav Vaish, Getting Started with NoSQL.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1.	www.sciencedirect.com
2.	www.ebsco.com

3.	www.googlescholar.com
4.	www.scirp.org

COURSE OUTCOMES:

CO	Course Outcome	K Level
CO1	Explain the evolution of Data Base systems and describe key components and data structures	K2
CO2	Interpret different data models and apply normalization techniques to design efficient conceptual Data Base schemas.	K3
CO3	Develop Basic Data Base schemas and queries using DDL and DML operations	K4
CO4	Differentiate between relational and Nosql Data Bases and evaluate their applicability	K4
CO5	Examine the roles of a DBA and implement techniques for security, concurrency control and recovery in Data Base systems	K4

CO- PO Mapping

POs Cos	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO 2
CO1	2	2	1	2	1	2	2
CO2	3	3	1	2	1	3	2
CO3	3	2	1	2	1	3	2
CO4	3	3	1	2	1	3	2
CO5	3	2	2	2	2	2	3
Average Alignment Score	**2.8**	**2.4**	**1.2**	**2.0**	**1.2**	**2.6**	**2.2**
3 – Strong, 2 – Medium, 1- Low							

DA26H1006	Research Methodology	L	T	P	C
Core / Elective	Core	3	0	0	3

Course Objectives:

- To enable the students to know about the information needs of Management.
- To introduce the concept of Scientific Research and the methods of conducting Scientific Enquiry.
- To enable them to conduct a Business Research Study and prepare the report.

UNIT: 1		**09 Hours**
Research – Meaning – importance and definition, Research in business, manager's role revisited, role of research, measures of a good research. Research process – the manager-researcher relationship, defining research problem and formulation of hypothesis, feasibility study and research proposal		
UNIT: 2		**09 Hours**
Research Design – types of research design-exploratory, descriptive and experimental studies. The sources and collection of data – primary and secondary data sources-Sampling design – sampling procedures, types of sampling plans, sample size determination, common sources of error in sampling and data collection		
UNIT: 3		**09 Hours**
Attitudinal measurements and scales - Basic methods of collecting data – survey methods, personal interviewing, telephone interviewing and self-administered surveys, instruments for respondent communication – Questionnaire design.		
UNIT: 4		**09 Hours**
Analysis and interpretation of data: editing, coding and analysis of collected data- an Introduction-Univariate [T-tests Z-Tests] / Bivariate [Correlation-Regression-Chi Square, ANOVA]/ Multivariate Data analysis [Factor Analysis- Cluster Analysis-Multiple Regression-Discriminate Analysis, - Conjoint Analysis]		
UNIT: 5		**09 Hours**
Presenting results, – written and oral reports – technical report, survey Based report research report Criteria-Application of research in functional areas of business- Guidelines for reviewing draft, Report format – Typing instructions, oral presentation		
	Total Lecture Hours	**45 Hours**

Text Book(s)	
1.	Panneerselvam, R., RESEARCH METHODOLOGY, PHI Learning Pvt. Ltd., New Delhi, 2004
2.	Donald R, Cooper and Pamela S. Schindler, Business Research Methods, 6th edition, Irwin/ McGraw Hill, 1998, New Delhi.
Reference Book(s)	
1.	Harper W. Boyd Jr., Ralph Westfall & Stanley F. Stasch, Marketing Research, Text and Cases, 7th edition (AITBS, 1998), New Delhi.
2.	Paul E.Green, Donald S. Tull, Gerald Albaum,, Research for Marketing Decisions, 5th edition, PHI, 1998, New Delhi.
3.	Kothari C.R., Research Methodology, Methods & Techniques, New Delhi.
4.	Aaker, David A Marketing research / David A Aaker, V Kumar and George S Day - 6th ed - New York: Wiley, 1998.

5.	Malhotra, Naresh K Marketing research: an applied orientation - Englewood Cliffs: Prentice Hall
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1.	www.stattutorials.com *(**Statistics tutorials** including worked examples using softwares like SPSS)*
2.	www.analyzemath.com/statistics.html (***Statistics tutorials)***
3.	www.burns-stat.com/pages/tutorials.html (***Statistics tutorials)***
4.	www.spss.com
5.	www.search.ebscohost.com

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Understand the meaning, importance, and definition of research in business, and explain the manager's role in the research process.	K2
CO2	Define and formulate a research problem, create a hypothesis, and prepare a feasibility study and research proposal.	K3
CO3	Compare and contrast different types of research designs, including exploratory, descriptive, and experimental studies, and evaluate sampling methods and procedures.	K4
CO4	Apply various data collection techniques, including survey methods and questionnaire design, to gather and organize primary and secondary data.	K3
CO5	Analyze and interpret data using appropriate statistical techniques and present research findings in both written and oral formats.	K5

CO- PO Mapping

POs / Cos	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO 2
CO1	2	3	1	2	1	2	2
CO2	3	3	1	2	1	2	2
CO3	3	3	1	2	2	2	2
CO4	3	3	1	2	2	2	2
CO5	3	3	2	2	2	3	2
Average Alignment Score	**2.8**	**3.0**	**1.2**	**2.0**	**1.6**	**2.2**	**2.0**
3 – Strong, 2 – Medium, 1- Low							

DA26H1007	Operations Research	L	T	P	C
Core / Elective	Core	3	0	0	3

Course Objectives:

- To introduce various optimization techniques of operations research
- To apply Optimization Techniques and interpret solutions using software
- To facilitate the use of Quantitative Technique in various functional areas

UNIT: 1	**09 Hours**
Stages of Development of Operations Research, Applications of Operations Research, Limitations of Operations, Introduction to Linear Programming, Graphical Method, Simplex Method, Duality and Sensitivity Analysis	
UNIT: 2	**09 Hours**
Transportation Problem, Assignment Problem- Project Management- CPM/PERT, Crashing of a Project network.	
UNIT: 3	**09 Hours**
Inventory Control – Introduction to Inventory Management, Basic Deterministic Models, Purchase Models, Manufacturing Models without Shortages and with Shortages. Dynamic Programming, Capital Budgeting Problem, Shortest Path Problem, Reliability Problem, Optimal subdividing Problems-Markov Analysis	
Unit 4	**09 Hours**
Game Theory: Two Person Zero-sum Games, Graphical Solution of (2 × n) and (m × 2) Games Introduction to Queuing Theory,	
Unit 5	**09 Hours**
Basic Waiting Line Models:(M/M/1) :(GD/α/α), (M/M/1):(GD/N/α), (M/M/C):(GD/α/α), (M/M/C):(GD/N/α), Introduction to queuing system simulation – Introduction to Basic Replacement Analysis: Economic Life of an Asset.	
Total Lecture Hours	**45 Hours**

Text Book(s)	
1.	Panneerselvam, R., OPERATIONS RESEARCH, PHI Learning Pvt. Ltd., New Delhi, 2006.
2.	Hillier and Lieberman, Introduction to Operations Research, Tata McGraw Hill, New Delhi, 2021 (Eighth Edition).
Reference Book(s)	
1.	J.K. Sharma. Operations Research – Theory and Applications. Trinity Press, New Delhi, 2017.
2.	Hamdy A. Taha, OPERATIONS RESEARCH – AN INTRODUCTION, Prentice Hall of India, New Delhi, 2004.
3.	Frank S. Budrick, Dennis McLeay & Richard Mojena, PRINCIPLES OF OPERATIONS RESEARCH FOR MANAGEMETN; II Ed., Richard D. Irwin Inc., 1988.
4.	Kanti Swarup, et al, Operations Research, Sultan Chand and Sons, New Delhi.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1.	www.universalteacherpublications.com ***(a website for OR Tutorial help)***
2.	http://www.mhhe.com/engcs/industrial/hillier/iortutorial/install/iordownload.html
3.	www.rosemaryroad.org/brady/oss_ieor.html ***(Open source softwares for Operations Research)***

4.	http://ocw.mit.edu/courses/sloan-school-of-management/ ***(Open source courseware for OR, From MIT).***

COURSE OUTCOMES:

CO	Course Outcome	K Level
CO1	Understand the stages of development and applications of Operations Research, and explain the key concepts such as Linear Programming, Simplex Method, and Project Management techniques like CPM/PERT.	K2
CO2	Apply linear programming techniques to solve optimization problems, and evaluate the results using Duality and Sensitivity Analysis.	K3
CO3	Analyze inventory control models, including Basic deterministic models and purchase/manufacturing models, and solve dynamic programming and capital budgeting problems.	K4
CO4	Solve game theory problems (two-person zero-sum games) and apply Basic queuing models and simulation techniques to solve waiting line and replacement analysis problems.	K4
CO5	Evaluate and apply queuing theory and replacement analysis techniques to solve real-life operational problems, such as determining the economic life of an asset and optimizing service systems.	K5

CO- PO Mapping

POs Cos	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO 2
CO1	3	2	1	2	1	3	2
CO2	3	3	1	2	1	3	2
CO3	3	3	1	2	1	3	2
CO4	3	3	1	2	2	3	2
CO5	3	3	2	2	2	3	2
Average Alignment Score	**3.0**	**2.8**	**1.2**	**2.0**	**1.4**	**3.0**	**2.0**
3 – Strong, 2 – Medium, 1- Low							

DA26H1008	COMMUNICATION AND NEGOTIATION SKILLS WORKSHOP	L	T	P	C
Core / Elective	Core	1	0	2	2

Course Objectives:

- To provide an understanding of the communication process in an organisation
- To sharpen the communication skills by simulating real-world business communication contexts
- To provide an understanding of the phases in negotiation and options in conflict resolution
- To facilitate experiential learning through the use of role plays and presentations simulating real-world communication and negotiation scenarios

METHODOLOGY:

Lectures, case discussions, story-telling, role-plays, seminar presentations, position papers, firm/issue analysis, mini-projects, social media content development and sharing

UNIT: 1	COMMUNICATION FOUNDATIONS	15 Hours
Communication model – relevance and types of managerial communication – communication barriers – ethical communication Professionalism in communication – team communication, meetings, listening, nonverbal communication		
UNIT: 2	**WORKPLACE COMMUNICATION**	**15 Hours**
Electronic messages and digital media – Use of audiovisuals Positive Messages - Negative Messages: Structure and Patterns in Communicating News. Persuasive messages – Developing a sales pitch Presentation skills – overcoming stage fright – gaining and retaining the attention		
UNIT: 3	**NEGOTIATION**	**15 Hours**
Negotiation and conflict resolution - Phases of Negotiation: Pre-negotiation – opening – information sharing – problem solving – agreement Breakdown in negotiation – barriers that create impasse – overcoming barriers – conflict-resolution skills		
	Total Lecture Hours	**45 Hours**

Reference Book(s)

1	Guffey, M. E., & Loewy, D. (2025). *Business Communication: Process & Product* (11th ed.). Cengage Learning.
2	Rentz, P., Lentz, K., & Das A.. (2020). *Business Communication: A Problem-Solving Approach* (1st ed.). McGraw-Hill Education.
3	Lewicki, R. J., Barry, B., & Saunders, D. M. (2025). *Essentials of negotiation* (8th ed.). McGraw-Hill Education.
4	Fells, R. (2016). *Effective negotiation*. Cambridge University Press.

COURSE OUTCOMES On Completion of the course, the students will be able to	
CO1	To understand the communication process in an organization
CO2	To sharpen the communication skills – both oral and written - of the learner
CO3	To simulate real-world business communication contexts and communicate effectively and to facilitate experiential learning through use of role plays, presentations and so on.

Mapping of COs with Pos							
POs COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	3	2	2	3	3	2
CO2	2	3	2	1	3	3	2
CO3	3	3	2	1	3	3	2
	2.7	**3**	**2**	**1.3**	**3**	**3**	**2**

DA26H1009	R Programming Lab	L	T	P	C
Core / Elective	Core	1	0	2	2

Course Objectives:

- To enable the students to know about the information needs of Management
- To introduce the concepts of data analysis methods
- To have hands-on training of Statistical Data Analysis through R Programming

UNIT: 1	INTRODUCTION	09 Hours
Introducing to R – R Data Structures – Help functions in R – Vectors – Scalars – Declarations – recycling – Common Vector operations – Using all and any – Vectorised operations – NA and NULL values – Filtering – Vectorised if-then else – Vector Equality – Vector Element names		
UNIT: 2	**MATRICES, ARRAYS AND LISTS**	**09 Hours**
Creating matrices – Matrix operations – Applying Functions to Matrix Rows and Columns – Adding and deleting rows and columns – Vector/Matrix Distinction – Avoiding Dimension Reduction – Higher Dimensional arrays – lists – Creating lists – General list operations – Accessing list components and values – applying functions to lists – recursive lists		
UNIT: 3	**DATA FRAMES**	**09 Hours**
Creating Data Frames – Matrix-like operations in frames – Merging Data Frames – Applying functions to Data frames – Factors and Tables – factors and levels – Common functions used with factors – Working with tables - Other factors and table related functions - Control statements – Arithmetic and Boolean operators and values – Default values for arguments - Returning Boolean values – functions are objects – Environment and Scope issues – Writing Upstairs - Recursion – Replacement functions – Tools for composing function code – Math and Simulations in R		
	Total Lecture Hours	**45 Hours**

Text Book(s)	
1.	"R Cookbook", Paul Teetor
2.	"R for Data Science", Garrett Grolemund and Hadley Wickham
3.	"Hands-On Programming with R", Garrett Grolemund
4.	"An Introduction to Statistical Learning: With Applications in R", Daniela Witten, Gareth James Robert Tibshirani, and Trevor Hastie
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1.	https://www.rstudio.com/online-learning/
2.	https://hackr.io/tutorials/learn-r
3.	https://www.statmethods.net/r-tutorial/index.html
4.	https://www.tutorialspoint.com/r/index.htm

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Understand and apply core R data structures to perform basic data manipulation	K2 & K3
CO2	Analyse structured data using matrices, arrays and lists	K4
CO3	Develop and test R functions to manage data frames, implement control statements and perform simulations	K5

CO- PO Mapping

POs / Cos	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO 2
CO1	2	3	1	1	1	3	2
CO2	3	3	1	1	1	3	2
CO3	3	3	1	2	1	3	2
Average Alignment Score	**2.7**	**3.0**	**1.0**	**1.3**	**1.0**	**3.0**	**2.0**
3 – Strong, 2 – Medium, 1- Low							

DA26H1010	Python Programming Lab- 1	L	T	P	C
Core / Elective	Core	1	0	2	2

Course Objectives:

- To enable the students to know about the information needs of Management
- To introduce the concepts of data analysis methods
- To have hands-on training of Statistical Data Analysis through Python Programming

UNIT: 1	**09 Hours**
Introducing to Python – Installing Python and Anaconda – Introduction to Jupyter(IPython) notebook - Environment setup – Datatypes – Variables and Types – Installing libraries – Strings – Lists – Tuples – Dictionaries – List Comprehensions – Dictionary Comprehensions – Regular Expressions.	
UNIT: 2	**09 Hours**
Control Flow (if-then statements, looping) – Organizing code (functions, modules, packages) – Reading and writing data from local files (.txt,.csv,.xls,.json, etc) – Scraping tables from webpages (.html) – read_table method – Introduction to Numpy and 2D plotting – Understanding the N- dimensional data structure – Creating arrays – Indexing arrays by slicing or more generally with indices or masks –Basic Basci operations and manipulations on N-dimensional arrays.	
UNIT: 3	**09 Hours**
Plotting with matplotlib (scatter plots, line plots, box plots, bar charts and histograms) – Working with Pandas data structures: Series and DataFrames – Accessing your data: indexing, slicing, fancy indexing, Boolean indexing – Data wrangling, including dealing with dates and times and missing data – Adding, dropping, selecting, creating and combining rows and columns – Pandas powerful groupby method – Reshaping, pivoting, and transforming your data – Simple and rolling statistics.	
Total Lecture Hours	**45 Hours**

Text Book(s)	
1.	Learning Python", David Ascher and Mark Lutz
2.	"Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", Wes McKinney
3.	"Introduction to Machine Learning with Python: A Guide for Data Scientists", Andreas C. Muller and Sarah Guido
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1.	https://www.learnpython.org/
2.	https://www.tutorialspoint.com/python/

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Demonstrate understanding of Basic Python syntax, data types and data structures.	K2
CO2	Apply control structures, modular programming concepts	K3
CO3	Analyze and manipulate datasets using Pandas and visualise data using matplotlib	K4

CO- PO Mapping

POs / Cos	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO 2
CO1	2	3	1	1	1	3	2
CO2	3	3	1	1	1	3	2
CO3	3	3	1	2	1	3	2
Average	**2.7**	**3.0**	**1.0**	**1.3**	**1.0**	**3.0**	**2.0**

DA26H1011	Excel for Business Intelligence	L	T	P	C		
Core / Elective	Core	3	0	0	4		

Course Objectives:

i. ***Identify and interpret managerial information needs***
Enable students to differentiate between strategic and operational data requirements, ensuring that Excel-based solutions align with real-world managerial decision contexts.

ii. ***Apply Excel-driven analytical techniques for business problem-solving***
Use formulas, functions, and structured analytical workflows to evaluate business scenarios and support evidence-based decision-making.

iii. ***Develop proficiency in Excel's core tools and visualization capabilities***
Build hands-on expertise in data formatting, structuring, chart creation, and dashboard design to communicate insights with clarity and impact.

iv. ***Innovate using scenario modeling and automation***
Leverage advanced Excel features—such as What-If Analysis, PivotTables, Power Query, and VBA—to build dynamic models and automate repetitive processes for enhanced managerial efficiency.

v. ***Incorporate AI-powered intelligence into Excel workflows***
Explore emerging AI-enabled Excel tools (e.g., Microsoft Copilot, predictive insights, automated reporting) to elevate business intelligence and drive innovation in managerial decisions.

Course Methodology

1) **Dual Approach to Excel Proficiency**
Every task is completed using both traditional manual methods (formulas, Power Query, PivotTables, etc.) and AI-assisted methods (Copilot, Analyze Data in Excel, and similar features).
2) **Direct Comparison in Exercises**
All exercises require a comparison of speed, accuracy, and outcomes between manual and AI-assisted approaches.
3) **Prompt Engineering Practice**
Prompt engineering for Copilot and other AI tools is practiced and evaluated throughout the course.
4) **AI Audit in Assignments**
Each assignment includes a brief AI Audit section addressing accuracy, limitations, risks or biases, and areas where human judgment remains essential.
5) **Mini-Project with Integrated Dashboard**
Participants produce a professional business dashboard and report that integrates traditional Excel techniques with at least three distinct AI features, with all AI-generated elements clearly identified and justified.

The final examination is completed without access to any AI tools to verify independent mastery of core Excel skills.

- Understand the strategic and operational information needs of managers.
- Apply Excel- Based data analysis to solve business problems and support decision-making.
- Gain hands-on proficiency in Excel's interface, formatting, formulas, data tools, and visualization.
- Develop skills in scenario modeling, dashboard creation, and data-driven storytelling.

UNIT: 1	EXCEL FOUNDATIONS FOR BUSINESS APPLICATIONS	9 Hours

Excel Interface & Navigation

- Tabs, Ribbons, Document Windows
- Save Options
- Navigation Tips and Keyboard Shortcuts
- Introduction to Excel Templates for Business Use

Data Entry & Presentation Formatting

- Fonts, Fills, Alignment
- Cut, Copy, Paste, Paste Special
- Undo, Redo, Find & Replace
- Cell Styles and Clean Layout Design
- Formatting Numbers: Currency, Dates, Custom Formats
- Format Painter and Special Formats

Worksheet Management

- Naming, Moving, Copying Worksheets
- Adding, Deleting, Hiding Worksheets
- Grouping Worksheets and Batch Operations

Getting Help & Smart Tools

- Excel Help and Smart Lookup
- Quick Analysis Tool
- Flash Fill Introduction

UNIT: 2	CORE DATA ANALYSIS & VISUALIZATION TECHNIQUES	9 Hours

Formula Design & Automation

- Creating Formulas and Using Operations
- AutoSum and Common Formulas
- Relative vs. Absolute References
- AutoFill Series and Custom Lists
- Formula Copying and Auditing basics

Data Structuring & Annotation

- Modifying Rows, Columns, Cells
- Cell Width, Height, Hiding/Unhiding
- Adding Comments and Notes for Review

UNIT: 3	ADVANCED MANAGERIAL TOOLS & DECISION SUPPORT	9 Hours

Conditional Formatting & Visual Insights

- Highlight Cell Rules, Top/Bottom Rules
- Data Bars, Color Scales
- Custom Formatting Rules

Charts & Graphs for Managers

- Column, Line, Pie, Bar, Combo Charts
- Sparklines for Trend Analysis
- Chart Formatting and Best Practices

Data Cleaning & Error Handling

- TRIM, CLEAN, TEXT Functions
- IFERROR, ISERROR
- Auditing Tools and Formula Tracing

UNIT - 4	Strategic Data Management and Decision-Making in Excel	9 Hours

Tables & Pivot Tables

- Creating and Styling Tables
- Adding Rows/Columns and Table Functions
- Summarizing Data with Pivot Tables
- Using Slicers and Pivot Charts

Data Tools for Decision Making

- Data Validation and Drop-Down Lists
- Removing Duplicates and Text to Columns
- Goal Seek and Scenario Manager
- What-If Analysis Techniques

Advanced Referencing & Named Ranges

- Multiple Sheet References
- Consolidating Data (with/without links)
- Trace Precedents and Dependents
- Watch Window for Monitoring
- Named Ranges and Date Formulas

UNIT 5	Data Intelligence for Managerial Decision-Making	9 Hours

Lookup Functions & Business Applications

- VLOOKUP and HLOOKUP
- XLOOKUP
- INDEX-MATCH
- Lookup Use Cases: HR, Finance, Inventory

Dashboards & Automation

- Designing Interactive Dashboards
- Linking Tables, Charts, and Slicers
- Introduction to Macros and VBA Recording

Power Query Basics for Data Import

Total Lecture Hours	**45 Hours**

Text Book(s)

1. Microsoft Excel 365 Bible (2nd Edition) – Michael Alexander, Dick Kusleika, John Walkenbach, Publisher: Wiley https://www.wiley.com/go/excel365bible2e](https://www.wiley.com/go/excel365bible2e
2. Microsoft Excel Data Analysis and Business Modeling (7th Edition, Office 2021 & Microsoft 365) – Wayne L. Winston, Publisher: Microsoft Press / PHI Learning, https://www.phindia.com/Books/BookDetail/9788119364947/MICROSOFT-EXCEL-DATA-ANALYSIS-AND-BUSINESS-MODELING-OFFICE-2021-AND-MICROSOFT-365-WINSTON)
3. Storytelling with Data: A Data Visualization Guide for Business Professionals – Cole Nussbaumer Knaflic, Publisher: Wiley, https://www.amazon.in/Storytelling-Data-Visualization-Business-Professionals/dp/1119002257
4. Excel Power Pivot & Power Query For Dummies (2nd Edition) – Michael Alexander, Publisher: Wiley, https://www.oreilly.com/library/view/excel-power-pivot/9781119844488/
5. Business Analytics: Data Analysis & Decision Making (8th Edition) – S. Christian Albright & Wayne L. Winston, Publisher: Cengage, https://faculty.cengage.com/titles/9780357984581)

Online References (with URLs)

a. Microsoft Learn – Excel Training https://learn.microsoft.com/en-us/training/

b. Coursera – Excel Skills for Business Specialization (Macquarie University) https://www.coursera.org/specializations/excel

c. ONLC – Best Excel Data Analysis Courses (2025) https://www.onlc.com/blog/best-excel-data-analysis-courses/

d. SpreadsheetPoint – Best Excel Courses Online (2025) https://spreadsheetpoint.com/excel/best-excel-courses/

e. Corporate Finance Institute (CFI) – Excel Guide https://corporatefinanceinstitute.com/topic/excel/

MODE OF EVALUATION

1. Continuous assessment through dual-path exercises (traditional Excel + AI-assisted) and hands-on AI labs.
2. Mini-project evaluation based on the AI-enhanced business dashboard, report, AI Audit, and justification of AI use.

3. Peer review of projects and live presentation with dashboard walkthrough and on-the-spot Copilot demonstration.
4. Evaluation of class participation, case discussions, and the AI Failure Log.
5. Final no-AI examination to confirm independent mastery of core Excel skills.

COURSE OUTCOMES: On Completion of the course, the students will be able to	
CO1	Use Excel's interface, navigation tools, formatting features, and worksheet management techniques to create clean, well-structured spreadsheets, comparing manual and AI-assisted formatting approaches.
CO2	Apply formulas, references, autofill tools, and data-structuring techniques to design automated and accurate business calculations, evaluating efficiency gains from AI-driven formula suggestions.
CO3	Analyze and visualize data using conditional formatting, charts, graphs, and data-cleaning functions, integrating AI-powered recommendations to enhance managerial insights.
CO4	Manage and summarize large datasets using Excel Tables, PivotTables, data-validation tools, what-if analysis, and advanced referencing techniques, while leveraging AI features such as automated scenario modeling and anomaly detection.
CO5	Implement lookup functions, dashboards, macros, and Power Query tools to build interactive and efficient business reports, incorporating AI-driven forecasting, automated reporting, and critical evaluation of AI outputs for ethical and reliable decision-making.

Mapping of COs with Pos

POs COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	2	1	1	2	3	1
CO2	3	3	1	1	2	3	2
CO3	3	3	2	2	3	3	3
CO4	3	2	2	2	3	3	3
CO5	3	3	3	3	3	3	3
	3	**2.6**	**1.8**	**2.4**	**2.6**	**3**	**2.4**

SEMESTER - II

LIST OF CORE PAPERS

Title of the Paper	Code
Financial Management	DA26H2001
Marketing Management	DA26H2002
Operations Management	DA26H2003
Human Resources Management	DA26H2004
Strategic Management	DA26H2005
Business Intelligence	DA26H2006
Machine Learning	DA26H2007
Business Valuation Lab	DA26H2008
Introduction to Cloud	DA26H2009
Data Visualization Lab	DA26H2010
Python Programming Lab – 2	DA26H2011

DA26H2001	Financial Management	L	T	P	C
Core / Elective	Core	3	0	0	3

Course Objectives:

- To know the various concept and sources of finance.
- To understand the various uses of finance.
- To familiarize oneself with the techniques used in financial management.

UNIT: 1	FINANCIAL MANAGEMENT	09 Hours
Importance of Finance; Meaning of Business Finance; Meaning of Financial Management; Objectives of Financial Management; Scope of Financial management, Role of Financial Manager in the Changing Scenario; Method of Financial Management; Organisation of the Finance Function; Importance of Financial Management. Tools of Financial Management and Financial Forecasting, Financial Statement, Analysis and Interpretation; Practical Problems		
UNIT: 2	**FINANCIAL PLANNING**	**09 Hours**
Meaning of Financial Planning; Pattern of Financing; Source of Finance; Security Financing; Convertible Debentures; Internal Financing; Loan Financing; Public Deposits; Bridge Financing; Loan Syndication, & Finance Decision, Leverage; Types of Leverage; Significance of Operating Leverage, Financial Leverage and Composite Leverage; Practical Problems		
UNIT: 3	**CAPITAL STRUCTURE**	**09 Hours**
Meaning of Capital Structure; Capital Structure and Financial Structure; Pattern of Capital Structure; Optimum Capital Structure; Capital Structure Theories, Determination of Capital Structure; Financial Break Even Point and EPS Analysis, Capital Gearing and Trading on Equity, Cost of Capital, Importance of Cost of Capital; Classification of Cost of Capital; Determination of Cost of Capital, Capital Assets Pricing Model (CAPM) and Weighted Average Cost of Capital (WACC), Practical Problems.		
UNIT: 4	**WORKING CAPITAL MANAGEMENT**	**09 Hours**
Concept of Working Capital Management; Need for Working Capital; Types of Working Capital; Management of Working Capital, Projection of Working Capital, Conservative Asset Policy, Aggressive Asset Policy, Risk Return Trade Off, Source of Working Capital; Management of Cash, Tools of Cash Management, Cash budget, Playing on Float, Lock Box System; Management of Inventory, Tools of Inventory Management, ABC Analysis, VED Analysis, EOQ Analysis, Perpetual Inventory System, Different Stock Level and Management of Receivable and Factoring Management; Practical Problems		
UNIT: 5	**CAPITAL BUDGETING**	**09 Hours**
Concept of Capital Budgeting, Importance of Capital Budgeting, Characteristic of Capital Budgeting Decisions; Limitations of Capital Budgeting Decisions; Capital Budgeting Process; Capital Rationing. Capital Budgeting Techniques- Accounting Rate of Return- ARR Method of Evaluation & Its Analysis; Payback Method of Evaluation & Its Analysis; Internal Rate of Return- IRR Method of Evaluation & Its Analysis; Net Present Value- NPV Method of Evaluation & Its Analysis; Profitability Index- PI Method of Evaluation & Its Analysis, Dividend, Bonus, Right Shares, Theories of Dividend, Types of Dividend, Determination of Dividend, Inflation; Inflation Accounting; Capital Market and Money Market, Practical Problems.		
	Total Lecture Hours	**45 Hours**

Text Book(s)

1.	Kapil Sheeba and Kapil Kanwal Nayan, FINANCIAL MANAGEMENT, STRATEGY, IMPLEMENTATION & CONTROL, Pragati Prakashan Publishers, Meeruti.
2.	Khan MN. and Jain P.K: FINANCIAL MANAGEMENT, Tata McGraw-Hill co. Ltd, New Delhi.
3.	Pandey I.M.: FINANCIAL MANAGEMENT, Vikas Publishing House Pvt. Ltd, New Delhi.

4.	Prasanna Chandra: FINANCIAL MANAGEMENT, The McGraw-Hill Education Ltd., New Delhi.
Reference Book(s)	
1.	1. Abdelsamad, M.: A GUIDE TO CAPITAL EXPENDITURE ANALYSIS, New York,
2.	American Management Association, 1973
3.	2. Beranack, W.: WORKING CAPITAL MANAGEMENT, Belmont, Wadsworth, 1968.
4.	3. Bolten, S.E.: MANAGERIAL FINANCE, Boston, Houghton Mifflin co., 1976.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1.	www.reoprtiunction.ocm
2.	www.investorindia.com
3.	www.fms.org
4.	www.fmsfindia.org
5.	www.financialmanagement.in

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Define Finance and Business Finance, and explain the objectives, scope, importance, and methods of Financial Management, along with the organization of finance function and the role of financial manager in the changing business environment.	K1/K2/K3/K4
CO2	Understand financial planning, identify financing patterns and sources, and apply concepts such as security financing, convertible debentures, internal and loan financing, public deposits, bridge financing, loan syndication, and financial decisions while computing operating, financial, and combined leverage.	K2/K3/K4
CO3	Describe capital structure, differentiate it from financial structure, and apply capital structure theories to determine the optimal capital structure of a firm.	K2/K3/K4
CO4	Define inventory management and use its tools and techniques such as EOQ, ABC, and VED analysis to determine average and required inventory levels.	K1/K3
CO5	Understand capital budgeting and apply various evaluation techniques such as Payback Period, NPV, ARR, and IRR for investment decisions.	K2/K3/K4

CO- PO Mapping

POs Cos	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO 2
CO1	3	2	1	1	2	2	2
CO2	3	3	1	1	2	2	2
CO3	3	2	1	1	1	2	2
CO4	3	2	1	1	2	2	2
CO5	3	3	1	1	2	2	2
Average Alignment Score	**3.0**	**2.4**	**1.0**	**1.0**	**1.8**	**2.0**	**2.0**

DA26H2002	Marketing Management	L	T	P	C		
Core / Elective	Core	3	0	0	3		

Course Objectives:

- Explain the foundational principles of marketing, the evolution of marketing concepts
- Develop marketing plans and strategies through market research
- Apply marketing mix strategies related to product and price decisions
- Design and implement place and promotion strategies

UNIT: 1	Understanding marketing and the marketing process	09 Hours
The importance and scope of marketing Evolution of marketing: From transaction- Based to relationship marketing Fundamental marketing concepts Marketing and customer value The marketing environment (macro and micro), ethics and social responsibility Marketing management process		
UNIT: 2	**Marketing planning, information and strategy**	**09 Hours**
Strategic planning and the marketing process; Developing marketing plans Marketing research and Decision support systems Understanding consumer behaviour – marketing implications Market Segmentation, Targeting and Positioning Competitive strategies.		
UNIT: 3	**Developing the marketing mix: Product and Price**	**09 Hours**
Product classifications, Product Mix Product management decisions, Product Life Cycle Strategies New Product Development Pricing considerations and approaches (cost- Based, buyer Based and competition- Based), pricing strategies.		
UNIT: 4	**Developing the marketing mix: Place and Promotion**	**09 Hours**
Distribution channels and physical distribution – channel design decisions, channel management decisions Retailing and wholesaling – Retail classification, retailer marketing decisions, wholesaler marketing decisions Integrated marketing communication and promotion strategy, Promotion mix.		
UNIT: 5	**Marketing applied**	**09 Hours**
Introduction to and the basic concepts of Industrial marketing, Services marketing, Rural marketing, International marketing, marketing for non-profit organizations, marketing in a connected world		
	Total Lecture Hours	**45 Hours**
Text Book(s)		
1.	Kotler and Keller: Marketing Management 15th Edition (2017) Pearson Education ISBN:9789332587403	
2.	Ramaswamy and Namakumari: Marketing Management: Global Perspective Indian Context 5th Edition (2013) McGraw-Hill Education India Pvt. Ltd.	
Reference Book(s)		
1.	1. Cravens, Hills and Woodruff: MARKETING MANEGEMENT	
2.	2. Pride and Ferrell: Marketing – Concepts and strategies (Indian adaptation) (Wiley-DreamTech)	
3.	3. Stanton: Fundamentals of Marketing (McGraw-Hill)	
4.	4. Ramesh Kumar: MARKETING NUGGETS	

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Define market opportunities by analyzing customers, competitors, collaborators, context and the strength and weakness of a company	K1/K4
CO2	To develop effective marketing strategies to achieve organizational objectives	K3/K5
CO3	To design, create and to maintain the Product and pricing strategy for developing the business competencies.	K6/K3
CO4	To learn and decide place and promotion of Marketing practices	K2/K5
CO5	To apply marketing practices in varied corporate and geographic Scenarios.	K3

CO- PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO 2
CO1	3	3	2	3	0	2	2
CO2	3	3	2	1	3	2	2
CO3	0	2	0	3	0	2	2
CO4	3	3	0	0	0	2	2
CO5	3	3	2	2	0	2	2
Average Alignment Score	**2.4**	**2.8**	**1.2**	**1.8**	**0.6**	**2.0**	**2.0**
3 – Strong, 2 – Medium, 1- Low							

DA26H2003	Operations Management	L	T	P	C
Core / Elective	Core	3	0	0	3

Course Objectives:

- To understand the concepts and techniques of Operations Management.
- To use the above for improving the Operational Productivity of Organizations.

UNIT: 1	**09 Hours**
Systems Concept of Production, Types of Production System, Productivity, World Class Manufacturing. Process Planning & Design, Value Analysis/ Value Engineering, Make or Buy Decision. Capacity Planning, Forecasting: Demand Patterns, Measures of forecasting, Forecasting Models: Simple Moving Average Method, Weighted Moving Average, Simple(single) Exponential Smoothing, Linear Regression, Delphi Method.	
UNIT: 2	**09 Hours**
Facility Location: Factors influencing Plant Location, Break Even Analysis. Plant Layout & Materials Handling: Classification of Layout, Advantages and Limitations of Process Layout, Advantages and Limitations of Product Layout, Advantages and Limitations of Group Technology Layout. Layout Design Procedures: Introduction to CRAFT, ALDEP & CORELAP, Material Handling System, Unit Load Concept, Material Handling Principles, Classification of Materials Handling Equipment's. Line Balancing: Concept of Mass Production system, Objective of Assembly Line Balancing, Rank Positional Weight Method. Inventory Control: Review of basic Models of Inventory, Quantity Discount Model, Implementation of Inventory Systems, Introduction to P & Q system of Inventory	
UNIT: 3	**09 Hours**
Nature of Aggregate Planning Decisions, Aggregate Planning Strategies, Aggregate Planning Methods: Heuristic Method, Transportation Model for Aggregate Planning. Material Requirement Planning: Product Structure/Bill of Materials(BOM), MRP Concept Single Machine Scheduling: Types of Scheduling, Concept of Single Machine Scheduling, SPT Rule to Minimize Mean Flow Time, Minimizing Weighted Mean Flow Time, EDD Rule to Minimize Maximum Lateness, Flow Shop Scheduling: Introduction, Johnson's Problem, Extension of Johnson's Rule.	
UNIT: 4	**09 Hours**
Work Study: Method Study – Recording Techniques, Steps in Method Study, Principles of Motion Economy, Time Study. Quality Control: Introduction, need for Controlling Quality, Definition of a Quality System, Classification of Quality Control Techniques, Control Charts, Control Charts for Variable, Control Charts for Attributes, C-Chart, Acceptance Sampling: Operating Characteristic Curve (O.C. Curve), Single Sampling Plan.	
UNIT: 5	**09 Hours**
Maintenance Planning and Control: Maintenance Objectives, Types of Maintenance, basic Reasons for Replacement (Need for Replacement), Group Replacement Vs Individual Replacement – Trade-off.	
Total Lecture Hours	**45 Hours**

Text Book(s)	
1.	Panneerselvam. R, PRODUCTION AND OPERATIONS MANAGEMENT, 3rd Edition, PHI Learning, Delhi, 2013
Reference Book(s)	
1.	Joseph G. Monks: OPERATIONS MANAGEMENT - THEORY AND PROBLEMS, (McGraw Hill).
2.	Everett E. Adam & Ronald J. Ebert: PRODUCTION AND OPERATIONS MANAGEMENT, (Prentice Hall, 1994).

3.	William J. Stevenson: PRODUCTION/OPERATIONS MANAGEMENT, Richard Irwin.
4.	Norman Gaither: PRODUCTION AND OPERATIONS MANAGEMENT, (The Dryden Press).

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	To prepare the students for leadership positions in the productions and service industries.	K3
CO2	To develops skills in problem solving, project management, communication, and managing effectively in team- Based work environments.	K3
CO3	To understand the importance of an effective production and operations strategy to an organization.	K2
CO4	To gain an understanding and appreciation of the principles and applications relevant to the planning, design, and operations of manufacturing/service firms.	K2
CO5	To gain some ability to recognize situations in a production system environment that suggests the use of certain quantitative methods to assist in decision making on operations management and strategy.	K3

CO- PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO 2
CO1	3	2	3	2	3	2	2
CO2	3	3	3	2	3	2	2
CO3	3	2	2	3	2	2	2
CO4	3	2	2	3	2	2	2
CO5	3	3	2	3	3	2	2
Average Alignment Score	**2.8**	**2.4**	**2.4**	**2.6**	**2.6**	**2.0**	**2.0**
3 – Strong, 2 – Medium, 1- Low							

DA26H2004	Human Resources Management	L	T	P	C
Core / Elective	Core	3	0	0	3

Course Objectives:

- This subject provides the platform to the students of management to appreciate the critical managerial functions, processes and tasks of HRM in an organization.
- To become sensitive to the HR Management Processes and to adopt conceptual learning to real-life situations.
- To appreciate the methods and mechanics to bring out the best in people directing their energies towards corporate goals with personal satisfaction.
- The Class-room interaction is supplemented by Feel HRM Visits, Case Study presentation & Discussion and team-oriented sharing of knowledge inputs via c- group.

METHODOLOGY:

- Consultative and participative involving role modeling and fieldwork, case studies, role-plays, simulation exercises, group discussions and structured and unstructured group work. Eminent competent professionals from HR and other industrial realms will interact with the students besides the faculty.

UNIT: 1	INTRODUCTION TO HUMAN RESOURCES MANAGEMENT	9 Hours
Context and Concept of People Management– Organisation and Functions of the HR– HR Structure and Strategy; Role of Government and Personnel Environment including that of MNCs		
UNIT: 2	**HR PLANNING AND SELECTION**	**9 Hours**
Human Resource Information System (HRIS), Manpower Planning – Selection System including Induction – Performance and Potential Appraisal; Coaching and Mentoring; HRM issues and practices in the context of Outsourcing as a strategy and MNCs.		
UNIT: 3	**PERSONNEL DEVELOPMENT AND RETIREMENT**	**9 Hours**
Training and Development – Methods, Design & Evaluation of T & D Programmes; Career Development – Promotions and Transfers – Retirement and Other Separation Processes.		
UNIT: 4	**FINANCIAL COMPENSATION, PRODUCTIVITY AND MORALE**	**9 Hours**
Principal Compensation Issues & Management – Job Evaluation – Productivity, Employee Morale and Motivation; Stress Management and Quality of Work Life.		
UNIT: 5	**CURRENT ISSUES AND TRENDS IN HRM**	**9 Hours**
Creating Safer Workplaces, Diversity Management, Management of Multi-Generational workforce, Understanding International Human Resource Management, Hybrid workplace management, E-HRM, Green HRM, Workforce Analytics to improve business outcomes.		
	Total Lecture Hours	**45 Hours**

Text Book(s)

1	Aswathappa, K. E. M. A. L. (2013). Human resource management: Text and cases. Tata McGraw-Hill Education.
2	Mondy, R. W., & Noe, R. M. (2005). Human resource management. Pearson Educación.
3	Soundararajan, R., & Singh, K. (2016). Winning on HR analytics: Leveraging data for competitive advantage. SAGE Publications India.
4	Subba Rao, P. (2006). Essentials of human resource management and industrial relations. Text Cases and Games)., Himalaya Publishing House, (265-267).

Reference Book(s)	
1	Agrawal, S., & Puri, R. (2020). Green HRM: A Climate Conscious Route to Triple Bottom Line. Sage Publications Pvt. Limited.
2	Boroughs, A., & Palmer, L. (2016). HR transformation technology: Delivering systems to support the new HR model. Routledge.
3	Gratton, L. (2022). Redesigning Work: How to Transform Your Organization and Make Hybrid Work for Everyone. MIT Press.
4	Renwick, D. W. (Ed.). (2018). Contemporary developments in green human resource management research: towards sustainability in action? Routledge.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	http://forum.hrdiscussion.com/
2	http://network.hrmtoday.com/forum
3	http://www.citeman.com/11853-evolution-of-the-concept-of-hrm/
4	www.citeHR.com

COURSE OUTCOMES On Completion of the course, the students will be able to	
CO1	Define the meaning and definition of Human resource management context and concept of people management in system perspective and classify the functions of HR and personnel department- HR structure and strategy and by finding the role of Government and personnel environment including that of MNC's
CO2	Demonstrate the Human resource information system HRIS, manpower planning- Selection systems including induction system Explain performance appraisal and potential appraisal, coaching and mentoring. Illustrate the HRM issues and practices in the context of outsourcing as a strategy and MNC's
CO3	Describe the training and development- methods, Design and evaluation of training and development Programmes Summarize career development- Promotions and transfers- Personnel empowerment including delegation- Classify the Retirement and other separation processes.
CO4	Measure principal Compensation issues and management - Job evaluation- Productivity_ Identify employee morale and motivation, Stress management and develop the strategies Quality of work life.
CO5	Recognize and describe the concepts of trade unions- Managing conflicts- disciplinary process- Collective bargaining - Measure the workers and management decision making- A discussion on Concept, Mechanics and experience.

Mapping of COs with POs							
POs COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	1	3	1	0	3	3
CO2	3	1	0	2	2	3	2
CO3	2	0	3	0	2	3	3
CO4	2	1	2	0	2	2	3
CO5	2	3	2	0	2	3	3
	2.4	**1.2**	**2**	**0.6**	**1.6**	**2.8**	**2.8**

DA26H2005	Strategic Management	L	T	P	C
Core / Elective	Core	3	0	0	3

Course Objectives:

- To enable the students to apply the strategies studied in the foundation and fundamental courses, its specific strategic knowledge in different functional areas. This paper will enable the students
- To create, execute and evaluate different strategies in their everyday life as managers.

UNIT: 1		**09 Hours**
Strategic management – definition, need, dimensions – strategic planning – strategic decision making process – benefit and risks of strategic management – ethics and social responsibility.		
UNIT: 2		**09 Hours**
Strategic management process – vision of the company – business vision models – objectives and goals. Business policies and strategies.		
UNIT: 3		**09 Hours**
Environmental scanning and analysis – types: international, external, internal – characteristics – SWOT – approaches of the environmental scanning.		
UNIT: 4		**09 Hours**
Generic competitive strategies – integration strategies – outsourcing strategies – offensive and defensive strategies – strategic alliances and collaborative partnerships – merger and acquisition – diversifications – tailoring strategies to fit specific industry and company situations.		
UNIT: 5		**09 Hours**
Building resource strengths and organizational capabilities – frame work for executing strategy – strategy execution process – organizational structure – managing internal operations corporate culture of leadership – designing strategic control system, key success factors – monitoring success and evaluating deviation.		
	Total Lecture Hours	**45 Hours**
Text Book(s)		
1.	Arthur A.Thomson, A.J. Strick land III, John E. Cambel, Crafting and Executing Strategy, Pearson Education, New Delhi.	
2.	Charles W.L..Hill, Gareth R.Jones. Strategic Management An integrated approach, Cengage Learning New Delhi	
Reference Book(s)		
1.	Vipin Gupta, Kamala Gollakota, R. Srinivasan, Business policy and strategic management concept and application, Oxford University Press, Chennai.	
2.	Sukul Lomesh, P.K.P.K. Mishra, Business policy and Strategic Management, Tata Mc Graw Hill, New Delhi.	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1.	www.businessweek.com	
2.	www.foxnews.com	
3.	www.atimes.com	
4.	www.brandweek.com	
5.	www.thenewstribune.com	

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Describe about Strategic Planning, Strategic Decision Making & Corporate Social Responsibility of Business with the thorough understanding in the Basic concepts, need, dimensions and benefits of Strategy.	K2
CO2	Describe the Strategic Management Process steps and elements of Strategic Intent. Illustrate Business vision models, distinguish between objectives & goals and interpret Business Policies &Strategies.	K2
CO3	Point out the international, external & internal characteristics of business, critically scan and analyze the environment factors affecting business by using various scanning approaches and appropriate Tools and Techniques.	K3
CO4	Demonstrate their proficiency by critically assessing a wide range of strategic concepts including generic competitive strategies, integration strategies, offensive and defensive maneuvers, strategic alliances, mergers and acquisitions and diversification strategies. Appraise how the strategies can be tailored to suit specific industry and company circumstances.	K4
CO5	Formulate the framework for executing the chosen strategy and implementing it effectively using behavioral and structural dimensions with leadership qualities. Design a suitable strategic control system with key success factors; monitor success; evaluate it and take corrective action in case of deviation occurs.	K5

CO- PO Mapping

POs COs	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO 2
CO1	3	1	2	2	1	2	2
CO2	3	3	3	2	1	2	2
CO3	2	2	2	3	1	2	2
CO4	2	3	3	3	2	2	2
CO5	3	2	3	3	3	2	2
Average Alignment Score	**2.6**	**2.2**	**2.6**	**2.6**	**1.6**	**2.0**	**2.0**
3 – Strong, 2 – Medium, 1- Low							

DA26H2006	Business Intelligence	L	T	P	C
Core / Elective	Core	3	0	0	3

Course Objectives:

- This subject aims to presents the importance of data and data warehouse
- It also gives different methods perform data mining to find useful patterns if any
- It focuses on Business performance measures

UNIT: 1	**09 Hours**
Business Intelligence – Introduction, Framework of Business Intelligence- Definition, History, Architecture of BI, benefits of BI, Intelligence creation and use of BI governance, Transaction processing versus analytic processing, BI implementation – Developing or acquiring BI, Justification and Cost-benefit analysis, Security and protection of privacy, Integration of systems and applications, BI tools and techniques, Major vendors.	
UNIT: 2	**09 Hours**
Data Warehousing – Definition, and concepts, Characteristics, Data marts, Operational data stores, Enterprise data warehouse, metadata, Architectures. Data warehouse process overview. Data integration, ELT. Data warehouse development – Vendors, Development approaches, Representation of data in data warehouse, OLAP Vs OLTP, OLAP operations Implementation issues of data warehouse, Administration, security and future trends of data warehouse.	
UNIT: 3	**09 Hours**
Business performance management (BPM) – Overview, Definition, BPM Vs BI, Strategize, Plan, Monitor, Act and Adjust of BPM, Performance management, BPM methodologies, technologies and applications, Performance dashboards and scoreboards.	
UNIT: 4	**09 Hours**
Data mining for business intelligence – concepts, definitions, applications, process, methods, Clustering methods, meta heuristics, Artificial neural networks for data mining, data mining software tools.	
UNIT: 5	**09 Hours**
Text mining – concepts and definitions, Natural language processing, Applications, Process, Tools. Web mining – overview, web content mining, Web structure mining, Web usage mining. BI Implementation – Overview (BI implementation factors, managerial issues), BI and integration implementation, Connecting BI systems to Data Bases and other systems, On demand BI, Issues of legality, privacy and ethics, Social networks and BI for collaborative decision making, RFID and new BI application opportunities.	
Total Lecture Hours	**45 Hours**

Text Book(s)	
1.	Turban, E., Sharda, R., Delen, D. and King, D., Business Intelligence- A Managerial Approach, Pearson Education, New Delhi, 2012.
Reference Book(s)	
1.	Sonar, R.M., Next generation Business Intelligence – A Knowledge Based Approach, VIKAS Publications, New Delhi, 2011

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Understand the framework, components, and implementation of Business Intelligence systems.	K2
CO2	Analyze differences between OLAP and OLTP systems and identify implementation challenges.	K4
CO3	Evaluate methodologies, technologies, and applications of BPM including dashboards and scorecards.	K5
CO4	Understand data mining concepts, methods, and processes applied in business contexts.	K2
CO5	Analyze ethical, legal, and managerial issues in BI implementation.	K4

CO- PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO 2
CO1	3	2	1	2	2	3	2
CO2	2	3	1	2	2	3	2
CO3	3	2	1	2	3	3	2
CO4	3	3	1	2	2	3	2
CO5	2	3	3	2	2	2	3
Average Alignment Score	**2.6**	**2.6**	**1.4**	**2**	**2.2**	**2.8**	**2.2**
3 – Strong, 2 – Medium, 1- Low							

DA26H2007	Machine Learning	L	T	P	C
Core / Elective	Core	3	0	0	3

Course Objectives:

- Understand a set of well-known supervised, unsupervised and semi-supervised learning algorithms
- Use a tool to implement typical clustering algorithms for different types of applications
- Identify applications suitable for different types of machine learning with suitable justification
- Implement probabilistic discriminative and generative algorithms for an application of your choice and analyse the results

UNIT: 1	Foundations of Machine Learning	**09 Hours**
Introduction to ML – Supervised & Unsupervised Learning – Probability basics for analytics – Discrete & Continuous distributions – Joint probability – Monte Carlo approximation – Information theory basics – Generative models (Bayesian concept learning, Beta-binomial, Dirichlet-multinomial, Naïve Bayes) – Gaussian models overview – Bayesian vs Frequentist thinking.		
UNIT: 2	Predictive Modelling & Graphical Models	**09 Hours**
Linear Regression – Logistic Regression – MLE & Ridge Regression – Bayesian regression – Online learning basics – GLMs & Exponential family – Probit regression – Multi-task learning – Directed graphical models – Naïve Bayes – Bayesian Networks – HMMs – Mixture models – EM algorithm – Handling missing data.		
UNIT: 3	Dimensionality Reduction & Kernel-Based Methods	**09 Hours**
PCA – Factor Analysis – ICA – PCA for categorical/multi-view data – Sparse models (L1 regularization, ARD/SBL, sparse coding) – Kernel functions – Support Vector Machines – Kernel-based discriminative and generative methods – Gaussian Processes – CART – GAMs – Boosting – Neural networks – Ensemble methods.		
UNIT: 4	Probabilistic Models & Inference Techniques	**09 Hours**
State-space models – Inference in linear Gaussian SSMs – Hybrid models – Markov Random Fields – Conditional Random Fields – Structural SVMs – Belief propagation – Variable elimination – Junction tree algorithm – Variational inference (mean field, structured mean field, VB-EM) – Monte Carlo methods – Gibbs sampling – Metropolis–Hastings – Particle filtering.		
UNIT: 5	Clustering, Structure Learning & Deep Models	**09 Hours**
Clustering (spectral, hierarchical, affinity propagation, Dirichlet process mixtures) – Structure learning in graphical models – Tree & DAG structures – Causal discovery – Gaussian/discrete graphical models – Latent variable models (LDA, extensions, relational/graph-based LVMs, RBMs) – Deep generative models – Neural architectures – Applications in marketing analytics, NLP, customer behaviour & BI.		
	Total Lecture Hours	**45 Hours**
Text Book(s)		
1.	Pattern Recognition and Machine Learning, Christopher Bishop, Springer, 2007	
2.	Machine Learning: A Probabilistic Perspective, Kevin P. Murphy, MIT Press,2012	
3.	Introduction to Machine Learning, Ethem Alpaydin, MIT Press, 2014	
Reference Book(s)		
1.	"Hands-On Machine Learning with Scikit-Learn and Tensor Flow", AurElien Geron, O'Reilly	

2.	"Introduction to Machine Learning with Python", Andreas Muller, O'Reilly
3.	"Learning from Data", Yaser S. Abu-Mostafa
4.	"Learning from Data: Artificial Intelligence and Statistics", Doug Fisher
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1.	https://www.kaggle.com/kanncaa1/machine-learning-tutorial-for-beginners
2.	https://www.youtube.com/watch?v=mbyG85GZ0PI&list=PLD63A284B7615313A
3.	https://www.python-course.eu/machine_learning.php
4.	https://www.youtube.com/watch?v=OGxgnH8y2NM&list=PLQVvvaa0QuDfKTOs3Keq _kaG2P55YRn5v
5.	https://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010/
6.	https://www.youtube.com/playlist?list=PLZHQObOWTQDMsr9K- rj53DwVRMYO3t5Yr
7.	https://www.coursera.org/courses?languages=en&query=Algorithm%20design%20and% 20analysis

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Understand the foundations of machine learning	K2
CO2	Analyze advanced statistical models and apply the EM algorithm	K4
CO3	Perform dimensionality reduction and feature extraction	K3
CO4	Assess different inference algorithms for their computational efficiency and inference quality	K5
CO5	Design latent variable models for structured and unstructured data	K6

CO- PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO 2
CO1	2	3	1	2	2	3	2
CO2	2	3	1	2	2	3	2
CO3	3	3	1	2	2	3	2
CO4	3	3	1	2	2	3	2
CO5	3	3	1	2	2	3	2
Average Alignment Score	**2.6**	**3.0**	**1.0**	**2.0**	**2.0**	**3.0**	**2.0**
3 – Strong, 2 – Medium, 1- Low							

DA26H2008	Business Valuation Lab	L	T	P	C
Core / Elective	Core	3	0	0	3

Course Objectives:

- An easy introduction to the concept of business valuation
- A complete overview of the existing business valuation models
- An understanding of the importance of various assumptions underlying the valuation models
- An easy-to-understand explanation of various business valuation techniques, with their pros and cons
- A discussion on valuation of assets and liabilities, whether tangible or intangible, apparent or contingent.

UNIT: 1		**09 Hours**
Mergers- types of merger – theories of mergers- operating, financial and managerial synergy of mergers – value creation in horizontal, vertical and conglomerate mergers – internal and external change forces contributing to M & A activities - Impact of M & A on stakeholders. M&A – A strategic perspective- industry life cycle and product life cycle analysis in M&A decision, strategic approaches to M&A- SWOT analysis, BCG matrix, Porter's five forces model		
UNIT: 2		**09 Hours**
Corporate restructuring – significance - forms of restructuring – joint ventures – sell off and spin off – divestitures – equity carve out – leveraged buy outs (LBO) – management buy outs –master limited partnerships – Limited Liability Partnership (LLP) in India: Nature and incorporation of LLP-De merger-strategic alliance- buyback of shares-employee stockownership plans (ESOP)		
UNIT: 3		**09 Hours**
Merger Process: Dynamics of M&A process - identification of targets – negotiation – closing the deal. Five-stage model – Due diligence – Types - due diligence strategy and process – due diligence challenges. Process of merger integration – organizational and human aspects – managerial challenges of M & A Takeovers, types, takeover strategies, - Takeover defenses – financial defensive measures – methods of resistance – anti-takeover amendments – poison pills		
UNIT: 4		**09 Hours**
Methods of financing mergers – cash offer, share exchange ratio – mergers as a capital budgeting decision Synergies from M&A: Operating and Financial Synergy Accounting for amalgamation – amalgamation in the nature of merger and amalgamation in the nature of purchase- pooling of interest method, purchase method – procedure laid down under Indian companies act of 1956		
UNIT: 5		**09 Hours**
Legal aspects of Mergers/amalgamations and acquisitions/takeovers- Combination and Competition Act- Competition Commission of India (CCI)- CCI Procedure in Regard to the transactions of Business Relating to combination of Regulations 2011- Scheme of Merger/Amalgamation-essential features of the scheme of Amalgamation-Approvals for the Scheme-Step wise procedure- Acquisitions/Takeovers-Listing agreement-The SEBI Substantial Acquisition of Shares and Takeover code.		
	Total Lecture Hours	**45 Hours**
Text Book(s)		
1.	Business Analysis and Valuation, Krishna G. Palepu, Paul M. Healy, Cengage Publications	

Reference Book(s)	
1.	Business Valuation: An Integrated Theory, Z. Christopher Mercer, Travis W. Harms, Wiley Publications
2.	Business Valuation Management, The Institute of Cost and Works Accountants of India
3.	Mergers and Acquisitions: Strategy, Valuation and Integration, Kamal Ghosh Ray, PHI Publications

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Analyze the balance sheet of the firm using excel formats	K4
CO2	Analyze beta value of the Firm to determine Fluctuations	K4
CO3	Perform valuation using financial comparable with excel formula	K3

CO- PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO 2
CO1	3	3	2	1	3	3	2
CO2	2	3	2	1	0	3	2
CO3	3	2	3	2	1	3	2
Average Alignment Score	**2.7**	**2.7**	**2.3**	**1.3**	**1.3**	3	2
3 – Strong, 2 – Medium, 1- Low							

DA26H2009	Introduction to Cloud	L	T	P	C
Core / Elective	Core	3	0	0	3

Course Objectives:

- To enable the students to know about the information needs of cloud
- To introduce the usage of various clouds
- To have hands-on training of Statistical Data Analysis through Google Cloud/ Amazon AWS/ Microsoft AZURE

UNIT: 1		**09 Hours**
Introduction to Cloud Computing – Linux Basics – Getting Started with Google Cloud Platform – Virtual Machines in the Cloud – Storage in the Cloud – Containers in the Cloud – Applications in the Cloud – Developing, Deploying and Monitoring in the Cloud – Big Data and Machine Learning in the Cloud		
UNIT: 2		**09 Hours**
Introduction to AWS Services – Introduction to AWS – Elastic Compute Cloud (EC2) Essentials – EC2 Instances – Elastic Block Store (EBS) – Elastic Load Balancer (ELB) – Auto Scaling – Simple Storage Service (S3) – Glacier Storage – Identity and Access Management (IAM) –		
UNIT: 3		**09 Hours**
Virtual Private Cloud (VPS) – Route 53 – Cloud Watch – Simple Notification Services (SNS) – Simple Queue Service (SQS) – Simple Email Services (SES) – Elastic Beanstalk – Relational Data Base Service (RDS) – Cloud Front – ElasticAche – Cloud Formation – Use Cases		
UNIT 4		**09 Hours**
Getting Started with Microsoft Azure – Microsoft Azure Management Tools – Virtual Machines in Microsoft Azure –		
UNIT 5		**09 Hours**
Web Apps and Cloud Services – Creating and Configuring Virtual Networks – Cloud Storage – Microsoft Azure Data Bases – Creating and Managing Azure AD		
	Total Lecture Hours	**45 Hours**
Text Book(s)		
1.	Cloud Computing: Concepts, Technology & Architecture, Erl	
2.	Data Science on the Google Cloud Platform: The Definitive Reference, Valliappa Lakshmanan	
3.	Google Cloud Platform for Developers: Build highly scalable cloud solutions with the power of Google Cloud Platform	
4.	Learning AWS: Design, build and deploy responsive applications using AWS Cloud components, Aurobindo Sarkar and Amit Shah	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1.	https://cloud.google.com/	
2.	https://cloud.google.com/docs/tutorials	
3.	https://aws.amazon.com/	
4.	https://aws.amazon.com/getting-started/tutorials/	
5.	https://azure.microsoft.com/en-in/	

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Explain the fundamentals of cloud computing and demonstrate the use of core cloud services such as virtual machines, storage, containers, and cloud-based applications.	K2
CO2	Deploy, configure, and manage compute, storage, networking, and security services on **Amazon Web Services (AWS)**, including EC2, S3, EBS, IAM, ELB, and Auto Sca	K2 & K5
CO3	Utilize advanced AWS services such as VPC, Route 53, CloudWatch, SNS, SQS, SES, Elastic Beanstalk, RDS, CloudFront, and CloudFormation to build scalable and secure cloud solutions.	K3
CO4	Work with **Microsoft Azure** by creating and managing virtual machines, using Azure management tools, and configuring cloud networks and storage	K3
CO5	Develop, deploy, and manage cloud applications using Azure services such as Web Apps, Cloud Services, Storage, Azure Databases, and Azure Active Directory.	K4

CO- PO Mapping

POs COs	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO 2
CO1	2	3	1	2	2	3	2
CO2	2	3	1	2	2	3	2
CO3	2	3	1	2	2	3	2
CO4	3	2	3	3	2	2	2
CO5	2	3	3	2	3	2	2
Average Alignment Score	**2.2**	**2.8**	**1.8**	**2.2**	**2.4**	**2.6**	**2.0**
3 – Strong, 2 – Medium, 1- Low							

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DA26H2010	Data Visualization Lab	L	T	P	C
Core / Elective	Core	3	0	0	3

Course Objectives:

- To recognize the importance of Visualization tools
- To have comprehensive knowledge of various graphs, charts and plots
- To be familiar in various data visualization tools such as tableau, powerbi and plotly

UNIT: 1	TABLEAU	09 Hours
Introduction to Tableau – Installation – Tableau Interface – Data Importing (live vs extract) – Continuous and discrete data – Different kinds of plots and their usage (bar chart, line chart, scatter plot, histogram, dual axis) – Parameters – Functions and calculated field – Row and aggregate calculations – Time series analysis – Bin & group – Forecast & clusters – Joins and blends – Dashboard and interactive plots – Data interpretation – Connecting to real time Data Base		
UNIT: 2	**POWERBI**	**09 Hours**
Introduction to PowerBI – Working with data – Importing from flat files, excel files, other sources – PowerPivot data types – Column operations - Table relationship – PowerPivot data analysis – PivotTable and PivotChart – Slicers – Dashboard Implementation – Dates, hierarchies, and perspectives – 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		
UNIT: 3	**WEB VISUALIZATION**	**09 Hours**
Introduction to Plotly – Using Plotly with R, Python and Javascript - Introduction to Chart.js, d3.js, ggplot – Building web apps in Python – Introduction to Shiny		
	Total Lecture Hours	**45 Hours**
Text Book(s)		
1.	"Learning Tableau", Joshua N. Milligan	
2.	"Practical Tableau", Ryan Sleeper	
3.	"Mastering Microsoft Power BI", Brett Powell	
4.	"Microsoft Power BI Cookbook", Brett Powell	
5.	"R Graphics Cookbook", Winston Chang, O'Reilly	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1.	https://www.tableau.com/learn/training	
2.	https://docs.microsoft.com/en-us/power-bi/guided-learning/	
3.	https://help.plot.ly/tutorials/	
4.	https://code.tutsplus.com/tutorials/getting-started-with-chartjs-introduction--cms-28278	

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Apply various visualization techniques using plots, filters, parameters and dashboards in Tableau	K3
CO2	Create and publish interactive dashboards using PowerBI tools	K6
CO3	Design simple web—Based visual apps and integrate visualisations for user interaction.	K6

CO- PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO 2
CO1	2	3	1	2	2	3	2
CO2	2	3	1	2	2	3	2
CO3	2	3	1	2	2	2	2
Average Alignment Score	**2**	**3**	**1**	**2**	**2**	**2.7**	**2.0**
3 – Strong, 2 – Medium, 1- Low							

DA26H2011	Python Programming Lab – 2	L	T	P	C
Core / Elective	Core	3	0	0	2

Course Objectives:

- To enable the students to know about the information needs of Management
- To introduce the concepts of data analysis methods
- To have hands-on training of Statistical Data Analysis through Python Programming
- Understand and apply the design principles of HTML to create static and dynamic web pages.
- To able to create simple web pages using HTML and CSS

UNIT: 1		**09 Hours**
Introduction to Machine Learning & AI – ML Concepts – Learning algorithms – Supervised learning – Linear Regression – Logistic Regression – Decision Trees – Ensemble Learning – KNN – Bayesian Techniques – Support Vector Machines – Time Series Analysis – Neural Networks – Unsupervised learning – Cluster analysis		
UNIT: 2		**09 Hours**
Introduction to Text Mining – Text Processing using Base Python and Pandas, Regular Expressions – Text Processing with specialized modules like NLTK, sklearn, etc – Sentiment Analysis – Word cloud analysis – Segmentation using K-Means/Hierarchical Clustering – Classification (Span/Not spam)		
UNIT: 3		**09 Hours**
Basics of deep learning and neural networks – Optimizing a neural network with backward propagation – Building deep learning models with keras – Fine-tuning keras models – Introduction to TensorFlow – Convolutional Neural Networks(CNN) – Recurrent Neural Networks(RNN) – Unsupervised Learning - Autoencoders		
	Total Lecture Hours	**45 Hours**

Text Book(s)	
1.	"Learning Python", David Ascher and Mark Lutz
2.	"Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", Wes McKinney
3.	"Introduction to Machine Learning with Python: A Guide for Data Scientists", Andreas C. Muller and Sarah Guido
4.	"Natural Language Processing with Python", Edward Loper, Ewan Klein, and Steven Bird
5.	"Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems", Aurelien Geron
6.	"Learning from Data: A Short Course", Yaser S. Abu-Mostafa, Malik Magdon-Ismail, Hsuan-Tien Lin
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1.	https://www.learnpython.org/
2.	https://www.tutorialspoint.com/python/
3.	https://www.codecademy.com/learn/learn-python-3
4.	https://work.caltech.edu/telecourse.html
5.	https://angularfire Base.com/lessons/tensorflow-js-quick-start/
6.	https://www.kaggle.com/

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Understand core concepts and algorithms of supervised and unsupervised machine learning	K2
CO2	Analyse and visualize patterns in textual data	K4
CO3	Create and fine tune deep learning models	K6

CO- PO Mapping

POs COs	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO 2
CO1	3	2	1	2	2	3	2
CO2	2	3	1	2	2	3	2
CO3	3	2	1	2	2	3	2
Average Alignment Score	**2.67**	**2.33**	**1**	**2**	**2**	**3.0**	**2.0**
3 – Strong, 2 – Medium, 1- Low							

SEMESTER III

LIST OF CORE PAPERS

Title of the Paper	**Code**
Software Project Management	DA26H3001
Deep Learning	DA26H3002
Design and Analysis of Algorithms	DA26H3003
Datawarehouse and Mining	DA26H3004
SAS Programming Lab	DA26H3006
Project-1 (8 Weeks) (80 Marks for Report + 70 Marks for Project Presentation & Viva)	DA26H3007

DA26H3001	Software Project Management	L	T	P	C
Core / Elective	Core	3	0	0	3

Course Objectives:

- To understand the concept of software projects and steps in software project management.
- To enable the students to prepare business proposals for software management.
- To enable the students to evaluate the technical feasibility, financial viability, market acceptability and social desirability of software projects.

UNIT: 1	Software projects and metrics	09 Hours
Software Project Management – Concepts and 3 P's (People, problem and process) Metrics in the process and project domains, Software measurement – size-oriented metrics, function- oriented metrics and extended function point metrics, Integrating metrics within the software process.		
UNIT: 2	**Software project planning**	**09 Hours**
Software Project planning – objectives, scoping, Resources – human resources, reusable software resources and environmental resources Software project estimation – Popular decomposition techniques – problem- Based, process- Based and empirical estimation (COCOMO model).		
UNIT: 3	**Software outsourcing and project scheduling**	**09 Hours**
The Make-Buy decision – creating a decision tree, Software outsourcing – issues involved Project Scheduling and tracking – relationship between people and effort – defining a task set for the software project.		
UNIT: 4	**Software risk management and configuration management**	**09 Hours**
Risk Management – Reactive and Proactive risk strategies, Risk identification, projection, mitigation and monitoring – RMMM Plan Software configuration management – process and standards		
UNIT: 5	Object-oriented software projects and CASE tools	**09 Hours**
Management of Object-oriented software projects – process framework, metrics, estimation and scheduling approach, Computer-aided Software Engineering (CASE) – CASE tools – their building blocks and taxonomy.		
	Total Lecture Hours	**45 Hours**

Text Book(s)	
1.	Roger Pressman, Software Engineering: A Practitioner's Approach, Tata McGraw-Hill, 2005
2.	Robert T. Futrell, Donald F. Shafer, and Linda I. Safer, Quality Software Project Management, Pearson Education, 2002
Reference Book(s)	
1.	Ian Sommerville, Software Engineering, Pearson Education, 2010
2.	Bob Hughes and Mike Cotterell, Software Project Management,McGraw-Hill, 2009
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1.	http://softwareprojectmanager.org/
2.	http://www.softwareprojects.org/
3.	http://www.rspa.com/spi/project-mgmt.html

COURSE OUTCOMES:

CO No.	**Course Outcome**	**K Level**
CO1	Explain core concepts of software project management and various software metrics	K2
CO2	Describe project planning objectives and apply estimation techniques for software project estimation	K2
CO3	Evaluate the make-buy decision process and explain the implications of software outsourcing	K5
CO4	Identify and assess software project risk	K5
CO5	Classify CASE tools and manage object-oriented software projects	K3

CO- PO Mapping

POs **COs**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**
CO1	3	2	1	2	2	2	1
CO2	3	3	2	2	2	3	1
CO3	2	3	2	3	2	1	2
CO4	3	3	2	2	2	2	2
CO5	3	2	2	2	3	2	1
Average Alignment Score	**2.8**	**2.6**	**1.8**	**2.2**	**2.2**	**2.0**	**1.4**
3 – Strong, 2 – Medium, 1- Low							

DA26H3002	Deep Learning	L	T	P	C
Core / Elective	Core	3	0	0	3

Course Objectives:

- To acquire knowledge on the Basics of neural networks.
- To implement neural networks using computational tools for variety of problems.
- To explore various deep learning algorithms.

UNIT: 1	Introduction to Deep Learning	**09 Hours**
Overview of AI, ML, and Deep Learning – Perceptron, Neurons, Activation Functions – Feedforward Neural Networks – Gradient Descent and Backpropagation. Applications: Customer segmentation, risk scoring, data preprocessing.		
UNIT: 2	Convolutional Neural Networks (CNNs)	**09 Hours**
Convolution operation, kernels/filters, pooling layers, CNN architectures – Image classification, feature extraction, transfer learning. Applications: Product image classification, marketing analytics, sales prediction, image-based operational analytics.		
UNIT: 3	Recurrent Neural Networks (RNNs) and LSTMs	**09 Hours**
RNN architecture, vanishing gradient problem – LSTM and GRU networks – Sequence modeling and prediction. Applications: Time-series forecasting (sales/revenue), customer churn prediction, financial risk modeling, NLP for marketing insights.		
UNIT: 4	Autoencoders and Generative Models	**09 Hours**
Autoencoders, Variational Autoencoders (VAE), Generative Adversarial Networks (GANs) – Feature learning and dimensionality reduction. Applications: Customer behavior modeling, anomaly detection (fraud), dimensionality reduction for analytics dashboards.		
UNIT: 5	Advanced Topics & Deployment	**09 Hours**
Deep reinforcement learning – Model optimization, regularization, and hyperparameter tuning – Deployment considerations, ethical AI, explainability. Applications: Synthetic data generation, scenario simulation, recommendation systems, predictive analytics.		
	Total Lecture Hours	**45 Hours**

Text Book(s)	
1.	Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning (Adaptive Computation and Machine Learning series", MIT Press, 2017.
2.	Josh Patterson and Adam Gibson, "Deep Learning: A Practitioner's Approach"
Reference Book(s)	
1.	Nikhil Buduma, Nicholas Locascio, "Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms", O'Reilly Media, 2017.
2.	Reza Zadeh and Bharath Ramsundar, "TensorFlow for Deep Learning", O'Reilly
3.	Nikhil Buduma and Nichola Locascio, "Fundamentals of Deep Learning: Designing Next-Generation Machine Learning Algorithms", O'Reilly
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1.	https://www.kaggle.com/kanncaa1/machine-learning-tutorial-for-beginners
2.	https://www.youtube.com/watch?v=mbyG85GZ0PI&list=PLD63A284B7615313A
3.	https://www.python-course.eu/machine_learning.php
4.	https://www.youtube.com/watch?v=OGxgnH8y2NM&list=PLQVvvaa0QuDfKTOs3Keq

	_kaG2P55YRn5v
5.	https://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010/
6.	https://www.youtube.com/playlist?list=PLZHQObOWTQDMsr9K- rj53DwVRMYO3t5Yr
7.	https://www.coursera.org/courses?languages=en&query=Algorithm%20design%20and%20analysis
8.	http://course.fast.ai/

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Understand fundamental concepts in linear algebra, probability and numerical computation for deep learning	K2
CO2	Understand machine learning Basics and evaluate optimization and regularisation strategies for training deep models	K2 & K5
CO3	Analyse deep learning methodologies in real-world applications like vision, speech and NLP	K4
CO4	Evaluate unsupervised learning approaches	K5
CO5	Design and evaluate generative models for complex data using deep learning frameworks	K5 & K6

CO- PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	2	3	1	2	2	3	1
CO2	3	3	1	2	2	3	1
CO3	3	3	1	2	3	3	2
CO4	3	3	1	2	2	2	2
CO5	3	3	1	2	2	3	2
Average Alignment Score	**2.8**	**3**	**1**	**2**	**2.2**	**2.8**	**1.6**
3 – Strong, 2 – Medium, 1- Low							

DA26H3003	Data Structures and Algorithms	L	T	P	C
Core / Elective	Core	3	0	0	3

Course Objectives:

- To understand and apply the algorithm analysis techniques.
- To critically analyse the efficiency of alternative algorithmic solutions for the same problem
- To understand different algorithm design techniques.
- To understand the limitations of Algorithmic power.

UNIT: 1	Introduction to Algorithms and Analysis	**09 Hours**
Notion of algorithm – Algorithmic problem solving – Types of problems – Analysis of algorithmic efficiency – Asymptotic notations – Recursive and iterative algorithms – Amortized analysis.		
UNIT: 2	Data Structures and Fundamental Algorithms	**09 Hours**
Stack, Queue, Linked List, Binary Tree, Balanced Tree – Basic operations – Matrix operations – Tower of Hanoi, String Matching, Hashing – Network algorithms: Dijkstra, Floyd, Minimum Spanning Tree, Maximum Flow.		
UNIT: 3	Sorting, Searching, and Heuristic Methods	**09 Hours**
Sorting algorithms: Bubble, Insertion, Selection, Merge, Quick, Heap, Radix – Searching: Linear, Binary, Fibonacci – Backtracking: N-Queen, Hamiltonian Circuit – Branch & Bound: Travelling Salesman, Scheduling heuristics – Huffman coding.		
UNIT: 4	Dynamic Programming and Advanced Techniques	**09 Hours**
Dynamic Programming: Knapsack, Shortest Path, Scheduling, Matrix Chain Multiplication – Metaheuristics: Genetic Algorithm, Simulated Annealing, Tabu Search, Ant Colony Optimization – Cryptography basics – Probabilistic algorithms: Random number generation, simulation.		
UNIT: 5	Algorithm Performance, Complexity, and Scheduling	**09 Hours**
Benchmarking of algorithms – Single and parallel processor scheduling – Complexity analysis: Polynomial, Exponential – Computational intractability: P, NP, NP-Complete, NP-Hard – Implications for practical business analytics.		
	Total Lecture Hours	**45 Hours**
Text Book(s)		
1.	R. Panneerselvam, Design and Analysis of Algorithms, PHI Learning Private Limited	
Reference Book(s)		
1.	Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein,	
2.	―Introduction to Algorithms, Third Edition, PHI Learning Private Limited, 2012.	
3.	Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2007.	
4.	Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, ―Data Structures and Algorithms, Pearson Education, Reprint 2006.	
5.	Harsh Bhasin, ―Algorithms Design and Analysis, Oxford university press, 2016.	

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Understand the fundamentals of algorithmic problem solving, including the analysis of algorithmic efficiency using asymptotic notations, and develop the ability to apply amortized analysis for recursive and non-recursive algorithms.	K2
CO2	Apply graph algorithms, such as Dijkstra's algorithm, Floyd's algorithm, and Minimum Spanning Tree, to solve network and tree-related problems, including real-world applications like the Maximal Flow Problem and string matching.	K3
CO3	Analyze and compare sorting algorithms (like Quick Sort, Merge Sort, and Heap Sort) and their respective time complexities. Additionally, solve backtracking problems such as the n-Queen Problem, Hamiltonian Circuit, and Subset Sum Problem.	K4
CO4	Design dynamic programming solutions for problems like the Knapsack Problem, Shortest Path Problem, and Travelling Salesman Problem, and evaluate the effectiveness of different meta-heuristic algorithms, including Simulated Annealing and Genetic Algorithms.	K5
CO5	Evaluate and compare the performance of various algorithms, including GA- Based heuristics, using benchmarking techniques, and understand the complexity classes like P, NP, NP-Complete, NP-Hard problems.	K6

CO- PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	2	3	1	1	1	3	1
CO2	3	2	1	1	2	3	1
CO3	2	3	1	1	2	2	1
CO4	3	3	1	1	2	3	2
CO5	2	3	1	1	1	3	1
Average Alignment Score	**2.4**	**2.8**	**1**	**1**	**1.6**	**2.8**	**1.2**
3 – Strong, 2 – Medium, 1- Low							

DA26S3004	DATA WAREHOUSE & MINING	L	T	P	C
Core / Elective	Elective	3	0	0	3

Course Objectives:

- Pre-process the data for mining applications
- Understand supervised and unsupervised mining
- Apply various frequent pattern mining techniques on market Basket data
- Understand the importance of Attribute Selection (Curse of Dimensionality)
- Differentiate problems related to classification or clustering

UNIT: 1	Introduction	09 Hours
Introduction to Data Mining, Importance of Data Mining, Data Mining functionalities, Classification of Data mining systems, Data mining architecture, Major Issues in Data Mining, Data mining metrics, Applications of Data Mining, Social impacts of data, Data Mining from a Data Base Perspective		
UNIT: 2	**Data Pre-processing**	**09 Hours**
Introduction, Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization		
UNIT: 3	**Classification and Prediction**	**09 Hours**
Basic issues regarding classification and predication, Classification by Decision Tree, Bayesian classification, classification by back propagation, Associative classification, Prediction, Statistical-Based Algorithms, Decision Tree - Based Algorithms, Neural Network - Based Algorithms, Rule-Based Algorithms, Other Classification Methods, Combining Techniques, Classifier Accuracy and Error Measures.		
UNIT: 4	**Clustering**	**09 Hours**
Similarity and Distance Measures, Hierarchical Algorithms, Partitioned Algorithms, Clustering Large Data Bases, Clustering with Categorical Attributes		
UNIT: 5	**Association Rules**	**09 Hours**
Basic Algorithms, Advanced Association Rule Techniques, Measuring the Quality of Rules		
	Total Lecture Hours	**45 Hours**
Text Book(s)		
1.	"Data Mining: Concepts and Techniques", J. Han and M. Kambar, Morgan Kaufman	
2.	"Data Warehousing, Data Mining", Alex Berson and Stephen J. Smith	
Reference Book(s)		
1.	"Data Mining and Predictive Analytics", Daniel T. Larose and Chantal D. Larose	
2.	"The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling", Ralph Kimball and Margy Ross	

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Explain the fundamental concepts, architecture, and functionalities of data mining systems	K2
CO2	Apply data pre-processing techniques	K3
CO3	Analyze and implement classification and prediction algorithms	K4
CO4	Use clustering algorithms to group data	K3
CO5	Evaluate the effectiveness of association rule mining techniques using Basic and advanced algorithms	K5

CO- PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	2	1	2	1	3	2
CO2	3	3	1	2	1	3	2
CO3	3	3	1	2	1	3	2
CO4	3	3	1	2	1	3	1
CO5	3	3	1	2	1	3	1
Average Alignment Score	**3.0**	**2.8**	**1.0**	**2.0**	**1.0**	**3.0**	**1.6**
3 – Strong, 2 – Medium, 1- Low							

DA26H3006	SAS Programming Lab	L	T	P	C
Core / Elective	Core	3	0	0	3

Course Objectives:

- To enable the students to know about the information needs of Management
- To introduce the concepts of data analysis methods
- To have hands-on training of Statistical Data Analysis through SAS and Hadoop Programming

UNIT: 1	Introduction to SAS and Data Handling	**09 Hours**
Overview of SAS environment – SAS windows, libraries, datasets – Data input and output methods: importing and exporting data (Excel, CSV, databases) – Data step processing: reading raw data files, creating SAS datasets – Data types and variable attributes – Data manipulation techniques: SET, MERGE, and UPDATE statements – Creating and modifying variables using conditional statements (IF–THEN–ELSE, SELECT) – Handling missing values and data errors – Basic SAS functions: numeric, character, and date functions		
UNIT: 2	Data Management and Descriptive Analysis	**09 Hours**
Sorting and filteringdata – Creating user-defined formats with PROC FORMAT – Labelling variables and datasets – Generating frequency and descriptive statistics: PROC FREQ, PROC MEANS, PROC UNIVARIATE – Summarising data with PROC SUMMARY – Data presentation using PROC PRINT and PROC REPORT – Combining datasets (concatenation, merging, and interleaving) – Introduction to SAS dates and time series handling		
UNIT: 3	Statistical Analysis and Reporting	**09 Hours**
Correlation and regression analysis using PROC CORR and PROC REG – Analysis of Variance (ANOVA) using PROC ANOVA or PROC GLM – Chi-square test using PROC FREQ – Introduction to hypothesis testing in SAS – Generating automated reports using ODS (Output Delivery System) – Creating graphical outputs with PROC SGPLOT and PROC GCHART (optional if plotting excluded) – Introduction to macros and automation concept		
	Total Lecture Hours	**45 Hours**
Text Book(s)		
1.	"SAS Essentials: A Guide to Mastering SAS for Research", Alan C. Elliott and Wayne A. Woodward	
2.	"Big Data Analytics with SAS", David Pope	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1.	https://www.sas.com/en_us/learn/academic-programs/resources/free-sas-e-learning.html	
2.	https://www.tutorialspoint.com/sas/	

COURSE OUTCOMES:

CO No.	**Course Outcome**	**K**
CO1	Students will understand how to create, import, and manage data within SAS	K2
CO2	Students will be able to clean, format, and summarise data for reporting and analysis.	K3
CO3	Students will gain the ability to perform statistical analyses and generate analytical reports	K2

CO- PO Mapping

POs / **COs**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**
CO1	2	2	1	1	2	3	1
CO2	3	3	2	1	2	3	2
CO3	2	2	1	2	2	3	2
Average	**2.33**	**2.33**	**1.33**	**1.33**	**2.0**	**3.0**	**1.7**

SEMESTER IV

LIST OF CORE PAPERS

Title of the Paper	Code
Project-2	DA26H4001

ELECTIVES

DA26S3101	DECISION SUPPORT SYSTEMS	L	T	P	C
Core / Elective	Elective	3	0	0	3

Course Objectives:

- To help towards a career in Info. Systems Management.
- To introduce the Basic concepts in Decision Support Systems, illustrating, how they facilitate efficient executive decision-making.

UNIT: 1		**09 Hours**
Decision Support Systems – Definition – Characteristics & capabilities of DSS – Components of DSS-Data Base, Model Base, Communication subsystem & User – Classes of DSS.		
UNIT: 2		**09 Hours**
DSS hardware and software – Group DSS – components & typology – Constructing a DSS – development process.		
UNIT: 3		**09 Hours**
DSS development tools – Yardsticks for choosing DSS software – Executive information and support systems.		
UNIT: 4		**09 Hours**
Illustrative DSS applications – Portfolio Management – Human Resource Management, Marketing Decision Support System, Small Business Application, Manufacturing DSS.		
UNIT: 5		**09 Hours**
Expert Systems – fundamentals – Types of expert systems – Developing ES – Problems & Limitations of ES.		
	Total Lecture Hours	**45 Hours**
Text Book(s)		
1.	Efralm Turbon: DECISION SUPPORT SYSTEM AND EXPERT SYSTEMS, Macmillan.	
Reference Book(s)		
1.	Ralph H. Sprange, Jr. and Eric. D.Carlson: BUILDING EFFECTIVE ESS, Prentice Hall.	
2.	Ralph H. Sprange, JR. & Huga, J. Watson (Eds.): DSS-PUTTING THEORY INTO PRACTICE, Prentice Hall.	
3.	R. Jayshankar: DECISION SUPPORT SYSTEMS, Tata McGraw Hill.	
4.	Janakiraman and Sarukesi, Decision Support Systems, Prentice Hall of India, New Delhi.	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1.	www.sciencedirect .com	
2.	www.ebsco.com	

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Understand the fundamental concepts and structure of Decision Support Systems (DSS)	K2
CO2	Apply the hardware and software environments for DSS	K3
CO3	Evaluate various tools and software used in DSS development	K5
CO4	Analyze DSS concepts to real-world business scenarios	K4
CO5	Gain foundational knowledge of Expert Systems	K1

CO- PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	2	1	2	1	2	1
CO2	2	2	1	2	2	2	1
CO3	3	3	1	2	2	2	1
CO4	3	3	2	3	2	3	2
CO5	3	2	1	2	1	2	1
Average Alignment Score	**2.8**	**2.4**	**1.2**	**2.2**	**1.6**	**2.2**	**1.2**
3 – Strong, 2 – Medium, 1- Low							

DA26S3102	ADVANCED EXCEL	L	T	P	C
Core / Elective	Elective	3	0	0	3

Course Objectives:

- To enable the students to know about the information needs of Management
- To introduce the concepts of Excel tools
- To have hands-on training of Statistical Data Analysis through MS-EXCEL

UNIT: 1		09 Hours
Conditional Logic – Introduction – IF Statement – Nested IF – AND – OR – NOT – IFERROR – SUMIF – AVERAGEIF – COUNTIF & COUNTIFS – SUMIF – AVERAGEIFS Text Formulas – Introduction – Case Formulas – Fix Number Fields – Trim Spaces – Substitute Text		
UNIT: 2		**09 Hours**
Introduction to Charts – Chart types – Instant Chart – Update Chart – Column Chart – Picture Fill – Line Chart – Scatter Chart – Chart Styles – Chart Layouts – Add Labels, Axis Options, Chart Title, Legends, Data Labels Outline, Sort, Filter and Subtotal – Introduction – Group and Ungroup – Sort Data – Sort Multiple Levels – Filter Data – Advanced Filter – Conditional Sorting and Filtering – Sorting with Custom Lists – Subtotal		
UNIT: 3		**09 Hours**
PivotTables – Introduction – Creating PivotTables – Choosing Fields – PivotTable Layout – Filtering PivotTables – Modifying PivotTable Data – PivotCharts Protecting Data – Introduction – Workbook Passwords – Protecting Workbooks – Unlocking Cells Macros – Introduction and Macro Security – Recording a Macro – Assign a Macro to a Button or Shape – Run a Macro upon Opening a Workbook – Inspect and Modify a Macro		
	Total Lecture Hours	**45 Hours**
Text Book(s)		
1.	"Excel 2016 Bible", John Walkenbach	
2.	"Excel 2016 Power Programming with VBA", Dick Kusleika and Michael Alexander	
3.	"Advanced Excel Essentials", Jordan Goldmeier	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1.	https://www.myonlinetraininghub.com/microsoft-excel-online-training-syllabus	
2.	https://excelexposure.com/	
3.	https://corporatefinanceinstitute.com/resources/excel/study/basic-excel-formulas-beginners/	

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Identify and apply conditional logic functions and text formulas	K3
CO2	Create and customize various chart types	K3
CO3	Analyze and organize data	K4

CO- PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	2	3	1	2	1	2	1
CO2	2	3	1	2	2	2	1
CO3	3	3	1	3	2	3	2
Average	**2.6**	**2.8**	**1.0**	**2.4**	**1.8**	**2.3**	**1.3**

DA26S3103	INTRODUCTION TO CALCULUS	L	T	P	C
Core / Elective	Elective	3	0	0	3

Course Objectives:

- Understand all Basic fundamentals of Differentiation and Integration.
- Prepare him/her for finding Area and Volume.
- Apply mathematical formulas in various subjects of Management.

UNIT: 1	Matrices:	09 Hours
Introduction, Defining a Matrix, Matrix Arithmetic, Matrix-Matrix Multiplication(Dot Product), Matrix-Vector Multiplication, Matrix-Scalar Multiplication, Generalization of the Jacobian, Derivatives of vector element-wise binary operators, Derivatives involving scalar expansion, Vector sum reduction, The Chain Rules		
UNIT: 2	**Differential Calculus:**	**09 Hours**
Review of the prerequisites such as limits of sequences and functions, continuity, uniform continuity and differentiability. Successive differentiation, Leibniz's theorem (without proof), Taylor's & Maclaurin's expansions of single variable, Indeterminate forms.		
UNIT: 3	**Partial differentiation and its applications:**	**09 Hours**
Partial and total differential coefficient, Euler's theorem, Transformations, Geometrical interpretation of partial derivatives, Tangent plane and Normal line, Jacobians, Taylor's expansion for two variables, Errors and approximations, Maxima and Minima of functions of two variables, Lagrange method of undetermined multipliers to determine stationary values.		
UNIT: 4	**Integral Calculus:**	**09 Hours**
Reduction Formulae: Reduction formulae of the type sinn x dx , cosn xdx , tann x dx and cotn x dx . Beta & Gamma function, Error function, Elliptic integrals. Applicationof integrationLength of a curve, Area of a bounded region, volume & surface area of a solid of revolution for Cartesian, parametric & polar form.		
UNIT: 5	**Multiple integrals:**	**09 Hours**
Double integral, change of order of integration, transformation of variables by Jacobian only for double integration, change into polar coordinates in double integrals only ,Triple integral, Application of multiple integration to find areas, volumes, C.G., M.I. and mean values.		
	Total Lecture Hours	**45 Hours**

Text Book(s)	
1.	"Higher Engineering Mathematics", Dr. B. S. Grewal
2.	"Calculus and analytical geometry", G.B. Thomas and R.L. Finney
Reference Book(s)	
1.	"Calculus: One-Variable Calculus with an Introduction to Linear Algebra", Tom M. Apostol
2.	"Calculus: Multi-Variable Calculus and Linear Algebra with Applications to Differential Equations and Probability", Tom M. Apostol
3.	"Introduction to Deep Learning: From Logical Calculus to Artificial Intelligence", Sandro Skansi

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Understand and apply the fundamental operations on matrices	K3
CO2	Demonstrate conceptual understanding of differential calculus	K2
CO3	Analyze and interpret multivariable functions using partial differentiation	K4
CO4	Evaluate complex integrals using standard reduction formulas, Beta and Gamma functions, and apply integration techniques	K5
CO5	Apply double and triple integrals to compute areas, volumes, centers of gravity, and moments of inertia	K3

CO- PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	2	3	1	2	1	2	1
CO2	2	3	1	2	1	1	1
CO3	2	3	1	3	2	2	1
CO4	2	3	1	3	2	2	1
CO5	2	3	2	3	3	2	1
Average Alignment Score	**2.0**	**3.0**	**1.2**	**2.6**	**1.8**	**1.8**	**1.0**
3 – Strong, 2 – Medium, 1- Low							

DA26S3104	NATURAL LANGUAGE PROCESSING	L	T	P	C
Core / Elective	Elective	3	0	0	3

Course Objectives:

- To Learn natural language processing and to learn how to apply Basic algorithms in this field.
- To get acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, pragmatics, discourse as well as the resources of natural language data – corpora

UNIT: 1	Introducing to Natural Language Processing	09 Hours
Rationalist and Empiricist Approaches to Language, Scientific Content, The Ambiguity of Language: Why NLP Is Difficult Regular Expression and Automata Regular Expressions, Finite-State Automata, Regular Languages and FSAs		
UNIT: 2	**NLP Applications and Text Summary**	**09 Hours**
Semantic Similarity, Thesaurus Based word similarity methods, Vector Space Model, Dimensionality Reduction, NLP Applications Context-Free Grammars and Parsing with Context-Free Grammars Syntax, Parsing, Variou		
UNIT: 3	**Probabilistic Models of Pronunciation and Spelling**	**09 Hours**
Dealing with Spelling Errors, Spelling Error Patterns, Detecting Non-Word Errors, Probabilistic Models, Applying the Bayesian method to spelling, Minimum Edit Distance Language Modelling N-gram Models, Maximum Likelihood Estimation, Smoothing, Backoff, Interpolation, Evaluation of LM: Perplexity & Word Error Rate, Issues with language models and solutions, Word Sense Disambiguation		
UNIT: 4	**Markov Models and Part of Speech Tagging**	**09 Hours**
Noisy Channel Model, Part of Speech Tagging, Hidden Markov Model, Statistical POS tagging, Transformation- Based Tagging Text Summarization Summarization, Summarization Techniques, Summarization Evaluation, Sentence Simplification		
UNIT: 5	**Collocations and Information Retrieval**	**09 Hours**
Collocations, Introduction to Information Retrieval, Evaluation of IR, Text Classification, Text Clustering, IR toolkits Text Categorization Decision Trees, Maximum Entropy Modelling, Perceptrons, k Nearest Neighbor Classification		
	Total Lecture Hours	**45 Hours**

Text Book(s)	
1.	"Speech and language process: An introduction to natural language processing", Jurafsky
2.	"Foundations of statistical natural language processing", Manning, Christopher. D
Reference Book(s)	
1.	"Natural Language Processing with Python: Analyzing Text with Natural Language Toolkit", Steven Bird and Ewan Klein, O'Reilly
2.	"Python Natural Language Processing", Jalaj Thanaki, Packt
3.	"Neural Network Methods for Natural Language Processing", Yoav Goldberg and Graeme Hirst, Morgan & Claypool Publishers

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Understand the fundamental challenges and approaches in Natural Language Processing	K2
CO2	Apply formal models such as regular expressions, finite-state automata, and context-free grammars	K3
CO3	Analyze and evaluate probabilistic models for language tasks	K5
CO4	Develop and assess tagging and summarization systems	K6
CO5	Implement and compare methods for text classification and information retrieval	K5

CO- PO Mapping

POs COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	2	3	1	2	1	3	2
CO2	3	2	1	2	1	2	1
CO3	3	3	1	2	1	3	2
CO4	3	3	2	2	2	3	2
CO5	3	3	2	2	2	3	2
Average Alignment Score	**2.8**	**2.8**	**1.4**	**2.0**	**1.4**	**2.8**	**1.8**
3 – Strong, 2 – Medium, 1- Low							

DA26S3105	SOCIAL & WEB ANALYTICS	L	T	P	C
Core / Elective	Elective	3	0	0	3

Course Objectives:

- To understand the components of the social network.
- To model and visualize the social network.
- To mine the users in the social network.
- To understand the evolution of the social network.
- To mine the interest of the user.

UNIT: 1		**09 Hours**
Introduction- Introduction to Web - Limitations of current Web – Development of Semantic Web – Emergence of the Social Web – Statistical Properties of Social Networks -Network analysis - Development of Social Network Analysis - Key concepts and measures in network analysis - Discussion networks - Blogs and online communities - Web- Based networks.		
UNIT: 2		**09 Hours**
Modelling and Visualization- Visualizing Online Social Networks - A Taxonomy of visualizations - Graph Representation - Centrality- Clustering - Node-Edge Diagrams - visualizing Social Networks with Matrix- Based Representations- Node-Link Diagrams - Hybrid Representations - Modelling and aggregating social network data – Random Walks and their Applications –Use of Hadoop and Map Reduce – Ontological representation of social individuals and relationships.		
UNIT: 3		**09 Hours**
Mining Communities- Aggregating and reasoning with social network data- Advanced Representations - Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks - Evaluating Communities – Core Methods for Community Detection & Mining - Applications of Community Mining Algorithms - Node Classification in Social Networks.		
UNIT: 4		**09 Hours**
Text and Opinion Mining- Text Mining in Social Networks -Opinion extraction – Sentiment classification and clustering - Temporal sentiment analysis - Irony detection in opinion mining - Wish analysis - Product review mining – Review Classification – Tracking sentiments towards topics over time.		
UNIT: 5		**09 Hours**
Tools for Social Network Analysis- UCINET – PAJEK – ETDRAW – StOCNET – Splus – R – NodeXL – SIENA and RSIENA – Real world Social Networks (Facebook- Twitteretc.)		
	Total Lecture Hours	**45 Hours**
Text Book(s)		
1.	1. Charu C. Aggarwal, “Social Network Data Analytics”, Springer; 2011.	
2.	2. Peter Mika, “Social Networks and the Semantic Web”, 1st edition, Springer, 2007.	
3.	3. BorkoFurht, “Handbook of Social Network Technologies and Applications”, 1st edition, Springer, 2010.	
Reference Book(s)		
1.	GuandongXu, Yanchun Zhang and Lin Li, “Web Mining and Social Networking – Techniques and applications”, 1st edition, Springer, 2011.	
2.	Giles, Mark Smith, John Yen, “Advances in Social Network Mining and Analysis”, Springer, 2010.	
3.	Ajith Abraham, Aboul Ella Hassanien, VáclavSnáel, “Computational Social Network Analysis: Trends, Tools and Research Advances”, Springer, 2009.	

4.	Toby Segaran, “Programming Collective Intelligence”, O’Reilly, 2012.
5.	Sule Gündüz-Ogüdücü, A. Şima Etaner-Uyar, “Social Networks: Analysis and Case Studies”, Springer, 2014.

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Explain the evolution of the Web and the foundations of social network analysis	K2
CO2	Apply techniques for modeling and visualizing social network data	K3
CO3	Analyze community structures within social networks	K4
CO4	Evaluate text and opinion mining techniques for social network data	K5
CO5	Use specialized tools and software platforms	K3

CO- PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	2	2	1	2	1	3	2
CO2	3	3	2	2	2	3	2
CO3	3	3	2	2	2	3	2
CO4	3	3	1	2	1	3	2
CO5	2	3	1	2	2	3	2
Average Alignment Score	**2.6**	**2.8**	**1.4**	**2.0**	**1.6**	**3.0**	**2.0**
3 – Strong, 2 – Medium, 1- Low							

DA26S3106	HR ANALYTICS	L	T	P	C
Core / Elective	Elective	3	0	0	3

Course Objectives:

- To understand and enhance the strategic value of human resources through evidence-based insights and analytics.
- To master the use and application of workforce analytics for maximizing returns on human capital.
- To analyze and interpret key HR metrics for informed decisions in recruitment, performance, and retention.
- To evaluate training, development, and talent management processes using quantitative analytics.
- To apply compensation and rewards analytics to optimize pay strategy, incentives, and cost management.

METHODOLOGY:

- Lectures, Group Discussion, Case Studies
- Seminar Presentations, Laboratory assignments, Field works

UNIT: 1		9 Hours
Human Capital Maturity Framework- leadership practices; engagement practices; access to knowledge practices. People research & analytics practices; HR intelligence cycle; Organizational Intelligence Model (OIM); HR intelligence implementation, HR Scorecard; Workforce Scorecard; constructing HR scorecard.		
UNIT: 2		**9 Hours**
Recruiting tools and practices an overview, measure the quality of hire, measuring the quality of applicants. Measuring the costs of hiring. Recruitment Analytics and On Boarding Analytics Staffing Analytics Performance & Skill Gap Analytics Attrition metrics – techniques used to calculate attrition, manpower planning metrics – push and pull model.		
UNIT: 3		**9 Hours**
Recruiting tools and practices an overview, measure the quality of hire, measuring the quality of applicants. Measuring the costs of hiring. Recruitment Analytics and On Boarding Analytics Staffing Analytics Performance & Skill Gap Analytics Attrition metrics – techniques used to calculate attrition, manpower planning metrics – push and pull model		
UNIT: 4		**9 Hours**
Training ROI, Training evaluation models, tracking the value of career management, measurement, performance metrics, EFQM, and Baldridge criteria, The Intuitive, non-analytic framework for Performance Management; The Targeted Analytics to improve Talent Decisions		
UNIT: 5		**9 Hours**
Calculating various wage/salary related measures. Variable pay systems, types of executive compensation, quantitative application in compensation – percentiles, cost benefit analysis, and comp ratios. Mistakes in compensation designing. Employee benefits, Calculation of incentives, measuring the impact of weak incentives. Monitoring planned and unexpected absence, the cost impact of unplanned absences and staffing.		
	Total Lecture Hours	**45 Hours**
Text Book(s)		
1	Gupta, D., Gupta, M., & Gupta, P. M. (2024). HR Analytics. PHI Learning.	
2	Dhir, S., & Pal, S. (2021). Human Resource Analytics: Theory and Application Techniques. Cengage India.	

3	Singh, K., & Soundararajan, R. (2025). Winning on HR Analytics: Leveraging Data for Competitive Advantage. Atlantic Publishers.
4	Edwards, M. R., & Edwards, K. (2024). Predictive HR Analytics: Mastering the HR Metric (2nd ed.). Kogan Page.
5	Fernandez, V. (2024). A Research Agenda for HR Analytics. Edward Elgar Publishing.
Reference Book(s)	
1	Sharma, S., & Sharma, R. C. (2024). Compensation and Reward Management: Wage and Salary Administration and Benefits. Himalaya Publishing House.
2	Bhattacharyya, D. K. (2023). HR Analytics: Theory & Applications. Oxford University Press.
3	Mohapatra, M., & Dhir, S. (2023). HR Analytics: Theory and Applications. Sage India.
4	Fitz-enz, J. (2010). The New HR Analytics: Predicting the Economic Value of Your Company's Human Capital Investments. AMACOM.
5	Bauer, T., Erdogan, B., Caughlin, D., & Truxillo, D. (2024). Human Resource Management: People, Data, and Analytics. Sage Publications.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.phindia.com/Books/BookDetail/9788119364909/HR-ANALYTICS-GUPTA
2	https://www.cengage.co.in/book-list/print/human-resource-analytics-theory-and-application-techniques-zj
3	https://atlanticbooks.com/products/winning-on-hr-analytics-leveraging-data-for-competitive-advantage-9788126941292
4	https://www.koganpage.com/hr-learning-development/predictive-hr-analytics-9781398615656
5	https://www.e-elgar.com/shop/gbp/a-research-agenda-for-hr-analytics-9781035301089.html

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Explain the principles and approaches of HR analytics	K2
CO2	Analyze HR intelligence models and frameworks	K4
CO3	Apply staffing and attrition metrics	K3
CO4	Evaluate development metrics and training effectiveness	K5
CO5	Calculate and interpret compensation and benefits metrics	K3

CO- PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	2	1	2	1	3	2
CO2	3	3	2	2	2	3	2
CO3	3	3	2	2	2	3	2
CO4	3	3	2	2	3	3	2
CO5	3	3	1	2	2	3	2
Average Alignment Score	**3.0**	**2.8**	**1.6**	**2.0**	**2.0**	**3.0**	**2.0**

DA26S3107	OPERATIONS AND SUPPLY CHAIN ANALYTICS	L	T	P	C
Core / Elective	Elective	3	0	0	3

Course Objectives:

- To provide foundational knowledge associated with the operations analytics
- To provide foundational knowledge associated with the supply chain analytics
- To describe the various tools and techniques for implementation of analytics Based on the
- supply chain drivers such as location, logistics and inventory
- To describe the various techniques for analytics Based on the Multi Attribute Decision
- Making (MADM) and risk
- To provide the applications of analytics in operations and supply chain

UNIT: 1		**09 Hours**
Warehousing Decisions, Mathematical Programming Models, P-Median Methods, Guided LP Approach, Balmer – Wolfe Method, Greedy Drop Heuristics, Dynamic Location Models, Space Determination and Layout Methods		
UNIT: 2		**09 Hours**
Inventory Management, Inventory aggregation Models, Dynamic Lot sizing Methods, MultiEchelon Inventory models, Aggregate Inventory system and LIMIT, Transportation Network Models, Notion of Graphs, Minimal Spanning Tree		
UNIT: 3		**09 Hours**
Shortest Path Algorithms, Maximal Flow Problems, Multistage Transshipment and Transportation Problems, Set covering and Set Partitioning Problems, Traveling Salesman Algorithms, Advanced Vehicle Routing Problem Heuristics, Scheduling Algorithms-Deficit Function Approach and Linking Algorithms		
UNIT: 4		**09 Hours**
Analytic Hierarchy Process, Data Envelopment Analysis, Risk Analysis in Supply Chain, Measuring transit risks, supply risks, delivering risks		
UNIT: 5		**09 Hours**
Risk pooling strategies, Fuzzy Logic and Techniques-Application in SCM		
	Total Lecture Hours	**45 Hours**

Text Book(s)	
1.	"Operations Management", Jay Heizer and Barry Render, Pearson Publications
2.	"Supply Chain Analytics with SAP NetWeaver Business Warehouse", Amol Palekar and Shreekant Shiralkar
3.	"Analytics in Operations/Supply Chain Management", Muthu Mathirajan and Chandrasekharan Rajendran
Reference Book(s)	
1	Gerad Feigin, Supply Chain planning and analytics – The right product in the right place at the right time, Business Expert Press, 2011
2	Peter Bolstorff, Robert G. Rosenbaum, Supply Chain Excellence: A Handbook for Dramatic Improvement Using the SCOR Model, AMACOM Div American MgmtAssn, 2007
3	Robert Penn Burrows, Lora Cecere, Gregory P. Hackett, The Market-Driven Supply Chain: A Revolutionary Model for Sales and Operations Planning in the New OnDemand Economy, AMACOM Div American MgmtAssn, 201

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Understand and explain various warehouse location models and space layout methods	K2
CO2	Apply inventory management techniques	K3
CO3	Analyze and solve network optimization problems	K4
CO4	Evaluate decision-making frameworks	K5
CO5	Design and apply fuzzy logic techniques and risk pooling strategies	K6

CO- PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	2	1	2	1	3	1
CO2	3	2	1	2	2	3	1
CO3	3	3	1	3	2	3	1
CO4	3	3	2	2	2	2	1
CO5	3	3	1	3	2	3	2
Average Alignment Score	**3.0**	**2.6**	**1.2**	**2.4**	**1.8**	**2.8**	**1.2**
3 – Strong, 2 – Medium, 1- Low							

DA26S3108	MARKETING ANALYTICS – I	L	T	P	C
Core / Elective	Elective	3	0	0	3

Course Objectives:

- To enable the students to know about the information needs of Management.
- To introduce software packages like MS-EXCEL/SPSS/R for Marketing Analytics
- To introduce the students to many Excel tools that can be used to analyze marketing problems: PivotTables, charting and Excel statistical functions, including COUNTIF, COUNTIFS, SUMIF, SUMIFS, AVERAGEIF, and AVERAGEIFS functions
- To estimate demand curves and to determine profit maximizing prices, price bundling, nonlinear pricing strategies, and price-skimming strategies
- To introduce forecasting tools
- To analyse the consumer needs and product attributes choices that drives sales

UNIT: 1	***Using Excel to Summarize Marketing Data***	**09 Hours**
Slicing and Dicing Marketing Data with PivotTables- Using Excel Charts to Summarize Marketing Data- sing Excel Functions to Summarize Marketing Data		
UNIT: 2	***Pricing***	**09 Hours**
Estimating Demand Curves and Using Solver to Optimize Price- Price Bundling- Nonlinear Pricing- Price Skimming and Sales		
UNIT: 3	***Forecasting***	**09 Hours**
Simple Linear Regression and Correlation- Using Multiple regression to forecast Sales		
UNIT: 4		**09 Hours**
Forecasting in the event of special Events-Modelling Trend and Seasonality & other forecasting methods [Ratio to Moving Average/Winter Method / Neural Networks]		
UNIT: 5		**09 Hours**
Product related decision: Product Attribute Analysis [Conjoint]- Logistic Regression –Discrete Choice Analysis & Random Utility Theory		
	Total Lecture Hours	**45 Hours**

Text Book(s)	
1.	Wayne L. Winston (2014). Marketing Analytics-Data-Driven Techniques with Microsoft® Excel, John Wiley & Sons, Inc., Indianapolis, Indiana
2.	Stephen Sorger (2013), Marketing Analytics: Strategic Models and Metrics, Atlantic Publishers and Distributors.
3.	Gary L. Lilien and Arvind Rangaswamy (2005), Marketing Engineering: Computer-Assisted Marketing Analysis and Planning, Pearson Education
Reference Book(s)	
1.	Hair, Andersen, Black and Tatham, Multivariate Data Analysis, Pearson India Ltd, New Delhi, 2008 (7th edition)
2.	Paul W.Farris et al (2010), Marketing Metrics, Pearson Education
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1.	www.stattutorials.com *(**Statistics tutorials** including worked examples using softwares like SPSS)*
2.	www.analyzemath.com/statistics.html (***Statistics tutorials)***
3.	www.burns-stat.com/pages/tutorials.html (***Statistics tutorials)***
4.	www.spss.com

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Summarize and analyze marketing data using Excel functions	K3
CO2	Apply pricing strategies and optimization techniques	K3
CO3	Use regression analysis techniques to forecast and identify key influencers	K3
CO4	Analyze forecasting methods for special events and incorporate trend and seasonality adjustments	K4
CO5	Evaluate and apply product-related decision models	K5

CO- PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	2	3	1	2	1	3	2
CO2	3	2	1	3	2	2	1
CO3	3	3	1	2	1	3	2
CO4	3	3	1	3	2	3	2
CO5	3	2	1	2	2	2	1
Average Alignment Score	**2.8**	**2.6**	**1.0**	**2.4**	**1.6**	**2.6**	**1.6**
3 – Strong, 2 – Medium, 1- Low							

DA26S3109	RETAIL ANALYTICS – I	L	T	P	C
Core / Elective	Elective	3	0	0	3

Course Objectives:

- To enable the students to know about the information needs of Management.
- To introduce software packages like MS-EXCEL/SPSS/R for Retail Analytics
- To introduce Promotion metrics, Web metrics and analysis
- To introduce forecasting tools
- To analyse the consumer needs and product attributes choices that drives sales

UNIT: 1		**09 Hours**
Introduction to Retail Analytics – Overview of modern retailing marketplace and understanding technological aspects - Promotion metrics		
UNIT: 2		**09 Hours**
Advertising/Web metrics – Promotion Analysis - Syndicated scanner data analysis – Retail POS data analysis		
UNIT: 3		**09 Hours**
Consumer Insights with retail data – Overall Marketing Metrics – Introduction to R/R-Studio		
UNIT: 4		**09 Hours**
Brief tutorial of data access using R – Loading different types of data in R – Accessing Online data using R – Basic Statistical Analysis using R		
UNIT: 5		**09 Hours**
Multivariate regressions – Machine Learning methods – Random coefficient logit models – Nonparametric models		
	Total Lecture Hours	**45 Hours**

Text Book(s)	
1.	Wayne L. Winston (2014). Marketing Analytics-Data-Driven Techniques with Microsoft® Excel, John Wiley & Sons, Inc., Indianapolis, Indiana
2.	Stephen Sorger (2013), Marketing Analytics: Strategic Models and Metrics, Atlantic Publishers and Distributors.
3.	Hasty and Reardon: Retail Management, McGraw-Hill
Reference Book(s)	
1.	Hair, Andersen, Black and Tatham, Multivariate Data Analysis, Pearson India Ltd, New Delhi, 2008 (7th edition)
2.	Paul W.Farris et al (2010), Marketing Metrics, Pearson Education
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1.	http://www.dmsretail.com/
2.	http://www.bizmove.com/marketing/m2c.htm
3.	http://www.12manage.com
4.	http://www.buzzle.com/articles/marketing-ideas-for-retail-stores.html
5.	http://www.retailmarketingblog.com/list-growing/

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Explain the fundamentals of retail analytics and the technological aspects of modern retailing	K2
CO2	Apply advertising and promotion analysis techniques	K3
CO3	Analyze consumer insights from retail data	K4
CO4	Demonstrate Basic data handling and statistical analysis skills using R/R-Studio	K3
CO5	Evaluate and apply advanced analytics techniques	K5

CO- PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	2	1	2	1	3	1
CO2	3	3	1	2	2	3	1
CO3	3	3	1	2	2	3	2
CO4	2	3	1	2	1	3	2
CO5	3	3	1	3	2	3	2
Average Alignment Score	**2.8**	**2.8**	**1.0**	**2.2**	**1.6**	**3.0**	**1.6**
3 – Strong, 2 – Medium, 1- Low							

DA26S3110	BUSINESS FORECASTING AND ECONOMETRICS (USING R)	L	T	P	C
Core / Elective	Elective	3	0	0	3

UNIT: 1		**09 Hours**
The Importance of Forecasting-Time Series Data-Component Factors of the Time- Series Model		
UNIT: 2		**09 Hours**
Trend Analysis-Seasonal and Cyclical Behaviour-Smoothing of Annual Time Series: Moving averages, Exponential smoothing -Least-Squares Trend Fitting and Forecasting: Linear, quadratic and exponential models		
UNIT: 3		**09 Hours**
Autocorrelation and Auto regression-Autoregressive Models - ARIMA time-series Model		
UNIT: 4		**09 Hours**
Time-Series Forecasting of Monthly or Quarterly Data-Accuracy Statistics and Forecast Model Selection-Families of Forecasting Models –Hierarchical Forecasting-Adjustments to Statistical Forecasts		
UNIT: 5		**09 Hours**
Event Variables-Outlier Variables and Other Model Inputs-Using Event Variables Based on Calendar Effects-Combined Model Forecasts-Honest Assessment		
	Total Lecture Hours	**45 Hours**
Text Book(s)		
1.	"Business Forecasting", Hanke/Wichern, Pearson Publications	
2.	"Business Forecasting: A Practical Approach", A. Reza Hoshmand	
3.	"Introduction to Econometrics", H Stock James and W. Watson Mark	
4.	"Applied Econometric Time Series", Walter Enders and Fourth	
Reference Book(s)		
1.	Damodar Gujarati & Dawn Porter, Sangeetha Gunasekar, " Bas*ic Econometrics*", 5th Edition McGraw Hill Education (India) Private Limited.	
2.	Peter Kennedy, "*A Guide to Econometrics*", 6th Edition -Wiley.	

COURSE OUTCOMES:

CO	Course Outcome	K Level
CO1	Understand the importance of forecasting and the components of time-series data	K2
CO2	Apply trend analysis and smoothing techniques	K3
CO3	Analyze and model autocorrelation and autoregressive patterns	K4
CO4	Evaluate the accuracy of time-series forecasting models	K5
CO5	Incorporate event and outlier variables	K6

CO- PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	2	1	2	1	3	1
CO2	3	3	1	2	1	3	1
CO3	3	3	1	2	1	3	2
CO4	3	3	1	2	2	3	2
CO5	3	3	1	3	2	3	2
Average	**3.0**	**2.8**	**1.0**	**2.2**	**1.4**	**3.0**	**1.6**

DA26S3111	SUPPLY CHAIN RISK ANALYTICS	L	T	P	C
Core / Elective	Elective	3	0	0	3

UNIT: 1	INTRODUCTION TO KEY CONCEPTS IN SCM AND RISK	09 Hours
Typologies of risk · Quantifying risk · Risk measures		
UNIT: 2		**09 Hours**
Risk models in SCM – operational risks vs. disruption risks CUSTOMER AND DEMAND SIDE ANALYTICS Models for demand uncertainty· Service level policies		
UNIT: 3		**09 Hours**
Production-distribution model Risk mitigation strategies to manage disruptions MODULE 3: SUPPLY SIDE ANALYTICS Supply chain network design		
UNIT: 4		**09 Hours**
Models accounting for resource availability uncertainty · Supply capacity extension Process flexibility · Supply chain preparedness for humanitarian and disaster management		
UNIT: 5		**09 Hours**
MODULE 4: INTEGRATED MODELS FOR MANAGING OPERATIONAL AND DISRUPTION RISKS Multi-objective models with alternative performance measures · Models for sourcing decisions Information management: models of information sharing.		
	Total Lecture Hours	**45 Hours**

Text Book(s)	
1.	Basu G., Ben-Hamida M., Butner K., Cope E., Dao H., Deleris L., Dong J., Helander M., Katircioglu K., Ray B., Torpy J., "*Supply Chain Risk Management: A Delicate Balancing Act",* White Paper, IBM Global Business Services 2008.
Reference Book(s)	
1.	Kirkwood C.W., Slaven M.P., Maltz A., "*Improving Supply-Chain-Reconfiguration Decisions at IBM*". *Interfaces* 35, 460-473 2005.
2.	Sashihara S., "*The Optimization Edge"* Reinventing Decision Making to Maximize All Your Company's Assets. McGraw-Hill 2011.

COURSE OUTCOMES:

CO	Course Outcome	K
CO1	Understand the key concepts and typologies of risk in SCM	K2
CO2	Analyze demand-side uncertainties and service level policies	K4
CO3	Apply risk mitigation strategies	K3
CO4	Design supply chain networks that account for resource availability	K6
CO5	Evaluate and integrate multi-objective models for managing operational and disruption risks	K5

CO- PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	2	1	3	1	3	1
CO2	3	3	1	3	2	3	2
CO3	3	3	1	3	2	3	2
CO4	3	2	1	2	2	2	1
CO5	3	3	1	3	2	3	2
Average	**3.0**	**2.6**	**1.0**	**2.8**	**1.8**	**2.8**	**1.6**

DA26S3112	SOCIAL MEDIA MARKETING	L	T	P	C
Core / Elective	Elective	3	0	0	3

Course Objectives:

- To understand the foundations of Social media and its role in marketing
- To conceptualize Social media marketing strategy formulation
- To understand the typology of Social media platforms and their utility for marketers
- To become familiar with Social media analytics and metrics

UNIT: 1	FOUNDATIONS OF SOCIAL MEDIA MARKETING	09 Hours
Social media and its role within Marketing - The Social media environment – Social consumers – Social applications – Social business ecosystem – Network structure and group influences in Social media		
UNIT: 2	SOCIAL MEDIA MARKETING STRATEGY AND PLANNING	**09 Hours**
Rules of engagement for Social media marketing Target audience – Influencers – Message/Content Developing a Social media marketing plan		
UNIT: 3	SOCIAL MEDIA PLATFORMS: TYPOLOGY, SCOPE AND UTILITY	**09 Hours**
Scope and marketing utility of blogging, micro-blogging, social networks, social bookmarking, collaboration, video sharing, podcasts, picture sharing, live streaming, webinars		
UNIT: 4	SOCIAL MEDIA DATA MANAGEMENT AND MEASUREMENT	**09 Hours**
Social media analytics, social media metrics – Introduction to analytics tools for popular social media (Facebook, Twitter, LinkedIn, YouTube, Instagram) Social media monitoring and Online reputation management		
UNIT: 5	**USING POPULAR SOCIAL MEDIA PLATFORMS**	**09 Hours**
Marketing through Facebook– Community building and engagement Marketing through LinkedIn – B2B lead generation and personal branding Marketing through Twitter – Driving traffic and conversations Marketing through YouTube – Viral marketing - Marketing through Instagram – Visual story telling Planning and creating multi-channel Social media strategy		
	Total Lecture Hours	**45 Hours**
Text Book(s)		
1.	Social Media Marketing: A Strategic Approach (2e). Barker, Barker, Bormann, Zahay and Roberts, 2017, Cengage Learning(https://www.cengage.com/c/socialmedia-marketing-a- strategic-approach-2e-barker#overview)	
2.	Social Media Marketing (3e), Tuten and Solomon, 2018, Sage (https://in.sagepub.com/en- in/sas/social-media-marketing/book257852)	
Reference Book(s)		
1.	Social Media Marketing For Dummies (3e). Singh and Diamond, 2014, Wiley (https://www.wiley.com/enus/Social+Media+Marketing+For+Dummies%2C+3rd+Edition- p9781118985533)	
2.	Social Media Marketing: Next generation of business engagement, Evans and McKee, 2010, Wiley https://www.pauladaunt.com/books/Social%20Media%20Marketing.pdf)	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		

1.	www.hubspot.com – offering in-bound marketing software, support and methodology
2.	www.socialmediatoday.com – provides social media industry news and analysis
3.	www.socialmediaexaminer.com – a popular social media marketing resource site
4.	www.econsultancy.com – Internet marketing research and training company

COURSE OUTCOMES:

CO No.	**Course Outcome**	**K Level**
CO1	Understand the foundational concepts of social media marketing	K2
CO2	Apply social media marketing strategies and planning techniques to develop targeted content and engagement strategies	K3
CO3	Analyze the scope and marketing utility of various social media platforms	K4
CO4	Evaluate social media data management practices	K5
CO5	Create and implement multi-channel social media strategies	K6

CO- PO Mapping

POs COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**
CO1	3	2	1	2	1	3	1
CO2	3	3	2	2	2	3	2
CO3	3	3	1	2	2	3	1
CO4	3	3	1	2	2	3	2
CO5	3	3	2	2	3	3	2
Average Alignment Score	**3.0**	**2.8**	**1.4**	**2.0**	**2.0**	**3.0**	**1.6**
3 – Strong, 2 – Medium, 1- Low							

DA26S3113	MARKETING ANALYTICS – II	L	T	P	C
Core / Elective	Elective	3	0	0	3

Course Objectives:

- To enable the students to know about the information needs of Management.
- To explore customer value analysis and value models
- To introduce the segmentation analysis
- To explore the retail analytics tools
- To analyse the advertising analytical tools
- To introduce Internet and social media analytics

UNIT: 1	***Customer Value***	**09 Hours**
Calculating Lifetime Customer Value- Using Customer Value to Value a Business- Customer Value, Monte Carlo Simulation, and Marketing Decision Making- Allocating Marketing Resources between Customer Acquisition and Retention		
UNIT: 2	***Market Segment***	**09 Hours**
Clustering- User- Based Collaborative Filtering-Using Classification Trees for Segmentation		
UNIT: 3	***Retail Analytics***	**09 Hours**
Market Basket Analysis and Lift - Allocating Retail Space and Sales Resources- Identifying the Sales to Marketing Effort Relationship		
UNIT: 4	***Advertising Analytics***	**09 Hours**
Measuring the Effectiveness of Advertising -Media Selection Models- Pay per Click Advertising- Introduction to Internet and Social Marketing		
UNIT: 5		**09 Hours**
Introduction to dashboard – Need for Visualization – various visualization tools – Using Visualization tools for Marketing data – Creating dashboards		
	Total Lecture Hours	**45 Hours**

Text Book(s)	
1.	Wayne L. Winston (2014). Marketing Analytics-Data-Driven Techniques with Microsoft® Excel, John Wiley & Sons, Inc., Indianapolis, Indiana
2.	Stephen Sorger (2013), Marketing Analytics: Strategic Models and Metrics, Atlantic Publishers and Distributors.
3.	Gary L. Lilien and Arvind Rangaswamy (2005), Marketing Engineering: Computer-Assisted Marketing Analysis and Planning, Pearson Education
Reference Book(s)	
1.	Hair, Andersen, Black and Tatham, Multivariate Data Analysis, Pearson India Ltd, New Delhi, 2008 (7th edition)
2.	Paul W.Farris et al (2010), Marketing Metrics, Pearson Education
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1.	www.stattutorials.com *(Statistics tutorials including worked examples using softwares like SPSS)*
2.	www.analyzemath.com/statistics.html (*Statistics tutorials)*
3.	www.burns-stat.com/pages/tutorials.html (*Statistics tutorials)*
4.	www.spss.com
5.	www.search.ebscohost.com

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Understand and calculate customer lifetime value (CLV)	K2
CO2	Apply market segmentation techniques	K3
CO3	Analyze retail data and determining the relationships	K4
CO4	Evaluate advertising effectiveness and impact assessment on sales and marketing performance	K5
CO5	Create and use interactive dashboards for marketing data visualization	K6

CO- PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	2	1	2	1	3	1
CO2	3	3	1	2	2	3	1
CO3	3	3	1	2	1	3	2
CO4	3	3	1	2	2	3	2
CO5	3	3	1	2	2	3	2
Average Alignment Score	**3.0**	**2.8**	**1.0**	**2.0**	**1.6**	**3.0**	**1.6**
3 – Strong, 2 – Medium, 1- Low							

DA26S3114	RETAIL ANALYTICS – II	L	T	P	C
Core / Elective	Elective	3	0	0	3

Course Objectives:

- To enable the students to know about the information needs of Management.
- To introduce software packages like MS-EXCEL/SPSS/R for Retail Analytics
- To introduce Promotion metrics, Web metrics and analysis
- To introduce forecasting tools
- To analyse the consumer needs and product attributes choices that drives sales

UNIT: 1		**09 Hours**
Measuring price and promotion response in retailing – Location strategy in retailing – Retailer's site location decision – Retail Assortment Decisions: Consumer Choice, Private Labels, Assortment Planning		
UNIT: 2		**09 Hours**
Retailer's expansion, contraction, and franchising decisions – Omni-channel in retailing - Retail Trends: Online Retailing		
UNIT: 3		**09 Hours**
Retail Trends: Internationalization, hard Discounters – Future of retailing - Spatial analysis: descriptive		
UNIT: 4		**09 Hours**
Spatial analysis: spatial regressions – Probit model – Nonlinear model – Difference-in-differences (DID) models		
UNIT: 5		**09 Hours**
Introduction to dashboard – Need for Visualization – various visualization tools – Using Visualization tools for Retail data – Creating dashboards		
	Total Lecture Hours	**45 Hours**
Text Book(s)		
1.	Wayne L. Winston (2014). Marketing Analytics-Data-Driven Techniques with Microsoft® Excel, John Wiley & Sons, Inc., Indianapolis, Indiana	
2.	Stephen Sorger (2013), Marketing Analytics: Strategic Models and Metrics, Atlantic Publishers and Distributors.	
3.	Hasty and Reardon: Retail Management, McGraw-Hill	
Reference Book(s)		
1.	Hair, Andersen, Black and Tatham, Multivariate Data Analysis, Pearson India Ltd, New Delhi, 2008 (7th edition)	
2.	Paul W.Farris et al (2010), Marketing Metrics, Pearson Education	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1.	http://www.dmsretail.com/	
2.	http://www.bizmove.com/marketing/m2c.htm	
3.	http://www.12manage.com	
4.	http://www.buzzle.com/articles/marketing-ideas-for-retail-stores.html	
5.	http://www.retailmarketingblog.com/list-growing/	

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Understand the key factors influencing price and promotion response in retailing	K2
CO2	Apply retail expansion, contraction, and franchising strategies	K3
CO3	Analyze retail trends	K4
CO4	Evaluate advanced spatial analysis models	K5
CO5	Create interactive dashboards for visualizing retail data	K6

CO- PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	3	1	2	1	3	1
CO2	3	2	1	2	2	3	1
CO3	3	3	1	2	1	3	2
CO4	3	2	1	3	2	3	2
CO5	3	3	1	2	2	3	2
Average Alignment Score	**3.0**	**2.6**	**1.0**	**2.2**	**1.6**	**3.0**	**1.6**
3 – Strong, 2 – Medium, 1- Low							

DA26S3115	FINANCIAL RISK ANALYTICS	L	T	P	C
Core / Elective	Elective	3	0	0	3

Course Objectives:

- Financial Risk Analytics involves the use of Quantitative Models, Statistical Methods, Numerical Algorithms, and software to address the challenging and important issues associated with Big Financial Data.

UNIT: 1	CREDIT RISK FOUNDATION & RISK MODELING	09 Hours
Credit Risk Foundation - Overview of Consumer Credit Products - Credit Risk Fundamentals - Credit Rating Agencies - External Analysis for Credit Information - Verification Frameworks Risk modeling – Fundamentals - Different approaches for risk modeling - Binomial Logistic, Multinomial Logistic, Survival Analysis, Penalized Models, Hazard Models, ARIMA		
UNIT: 2	**RISK MODELING: DEEP DIVE**	**09 Hours**
Decision Trees – Clustering - Build Model to Predict Probability of Default (PD) - Rare Event Modeling - Business case studies using industry relevant datasets on almost all the models - Advanced Modeling Techniques – Neural Networks (Pros/Cons), Support Vector Machines and how they are used in Risk Analytics		
UNIT: 3	**CREDIT RISK REGULATIONS (GLOBAL)**	**09 Hours**
BasEL II Concepts – Pillar 1, 2 and 3 - BasEL II vs BasEL III - IFRS9 standards - Comparison between requirements by FSA and APRA - Comparison between IFRS9 standard and CECL (FASB) - CCAR - Regulation and calculation overview - Asset Classes - Business case studies		
UNIT: 4	**MODEL VALIDATION – REGULATIONS' CONTEXT**	**09 Hours**
Data Cleaning & Model Diagnostics, Variable Selection, Candidate Models, Residual Diagnostics, Holdout / OOT Sample Testings - SR 11-7 Requirements – Detailed understanding (Conceptual Soundness, Outcome Analysis, and Model Monitoring) - Model Documentation		
UNIT: 5	**ADVANCED CREDIT RISK MODELS – SETTING UP LGD, EAD MODELS**	**09 Hours**
Economic LGD Calculations - Selection of "Discount" Factor in creating Economic LGD - Conversion of model LGD to "Downturn LGD" - How EAD is calculated for Loan Products vs Products with Limits - EAD Modeling options for / approach comparison		
	Total Lecture Hours	**45 Hours**

Text Book(s)	
1.	Jimmy Skoglund, Weichen, Financial Risk Management, John Wiley & Sons Inc.
Reference Book(s)	
1.	Richard Apostolik, Foundations of Financial Risk: An Overview of Financial Risk and Risk- Based Financial Regulation
2.	Victoria Lemieuz, Financial Analysis and Risk Management, Springer Publication
3.	Bart Baesens, Daniel Roesch, Harald Scheule, Credit Risk Analytics: Measurement Techniques, Applications, and Examples in SAS, Wiley and SAS Business Series

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Understand the foundations of credit risk and various risk modeling approaches	K2
CO2	Apply machine learning techniques such as decision trees, clustering, and neural networks	K3
CO3	Evaluate global credit risk regulations and frameworks	K5
CO4	Analyze and validate risk models	K4
CO5	Design and implement advanced credit risk models	K6

CO- PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	2	1	2	1	3	1
CO2	3	3	1	2	1	3	2
CO3	3	2	1	3	2	2	2
CO4	3	3	1	2	2	3	2
CO5	3	3	1	2	2	3	2
Average Alignment Score	**3.0**	**2.6**	**1.0**	**2.2**	**1.6**	**2.8**	**1.8**
3 – Strong, 2 – Medium, 1- Low							

DA26H3116	Big Data Analytics	L	T	P	C
Core / Elective	Core	3	0	0	3

Course Objectives:

- To optimize business decisions and create competitive advantage with Big Data analytics
- To explore the fundamental concepts of big data analytics.
- To learn to analyse the big data using intelligent techniques.
- To understand the various search methods and visualization techniques.
- To learn to use various techniques for mining data stream.

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UNIT: 1		**09 Hours**
Introduction to big data: Introduction to Big Data Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting.		
UNIT: 2		**09 Hours**
Mining data streams: Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams - Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications – Case Studies - Real Time Sentiment Analysis- Stock Market Predictions.		
UNIT: 3		**09 Hours**
Hadoop: History of Hadoop- the Hadoop Distributed File System – Components of Hadoop Analysing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFS Basics- Developing a Map Reduce Application-How Map Reduce Works- Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features - Hadoop environment.		
UNIT: 4		**09 Hours**
Frameworks: Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of Base and ZooKeeper - IBM InfoSphere BigInsights and Streams.		
UNIT: 5		**09 Hours**
Predictive Analytics- Simple linear regression- Multiple linear regression- Interpretation of regression coefficients. Visualizations - Visual data analysis techniques- interaction techniques - Systems and applications.		
	Total Lecture Hours	**45 Hours**
Text Book(s)		
1.	Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.	
2.	Tom White “Hadoop: The Definitive Guide” Third Edition, O’reilly Media, 2012.	
3.	Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data”, McGrawHill Publishing, 2012.	
Reference Book(s)		
1.	Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, CUP, 2012.	
2.	Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley& sons, 2012.	
3.	Glenn J. Myatt, “Making Sense of Data”, John Wiley & Sons, 2007.	

4.	Pete Warden, "Big Data Glossary", O'Reilly, 2011.
5.	Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", 2nd Edition, Elsevier, Reprinted 2008.
6.	Da Ruan, Guoquing Chen, Etienne E.Kerre, Geert Wets, "Intelligent Data Mining", Springer, 2007.
7.	Paul Zikopoulos, Dirkde Roos, Krishnan Parasuraman, Thomas Deutsch, James Giles , David Corrigan, "Harness the Power of Big Data The IBM Big Data Platform", Tata McGraw Hill Publications, 2012.
8.	Arshdeep Basga, Vijay Madisetti, "Big Data Science & Analytics: A HandsOn Approach", VPT, 2016
9.	Bart Baesens "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)", John Wiley & Sons,2014

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Understand the fundamental concepts of Big Data, including challenges of conventional systems and analytic processes used in big data platforms.	K2
CO2	Analyze and apply techniques for mining data streams, including sampling, filtering, and counting elements in a stream, and apply them to real-time analytics.	K4
CO3	Understand the core components of Hadoop, including HDFS, MapReduce, and the Hadoop ecosystem, and develop a MapReduce application.	K2
CO4	Apply frameworks like Pig and Hive to process big data, understand HiveQL for querying data, and develop applications on big data platforms.	K3
CO5	Evaluate predictive analytics techniques such as linear regression and visualize data using visual analytics tools and systems.	K5

CO- PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	2	2	1	2	1	3	1
CO2	2	3	1	2	2	3	2
CO3	2	2	1	2	1	3	1
CO4	3	3	1	2	2	3	1
CO5	2	3	1	2	2	3	2
Average Alignment Score	**2**	**2.6**	**1**	**2**	**1.6**	**3.0**	**1.4**
3 – Strong, 2 – Medium, 1- Low							

DA26S3117	COMPUTER SIMULATION	L	T	P	C
Core / Elective	Elective	3	0	0	3

Course Objectives:

- To understand stochastic models
- To know the various aspects of simulation
- To use high level languages and GPSS etc. In a stochastic environment

UNIT: 1		09 Hours
System concept, Need for simulation, Types of model, Major steps of simulation, Types of simulation, Advantages of simulation, Monte-Carlo simulation, Methods of random number generation- Mid-square method, Multiplicative Congruential method, Testing of randomness of random numbers- Chi-square method, Kolmogorov-Smirnov Test, Run test		
UNIT: 2		**09 Hours**
Random variate formulas for Uniform distribution, Exponential distribution, Poisson distribution, Methods of Random varitae generation for Normal distribution, Gamma distribution. Introduction to simulation languages – GPSS, SIMULA I, SIMSCRIPT, GASP, SIMAN, DYNAMO.		
UNIT: 3		**09 Hours**
Simulation using high level language- Single server model with single queue, Parallel server model with single queue, Single server queueing system with two queues with alternate service, Single server queueing system with balking and with reneging, Single server queueing model with single queue with bulk arrivals, Inventory system, Assembly line system		
UNIT: 4		**09 Hours**
Gpss Preliminary Blocks- Generate, Queue, Depart, Terminate, Seize, Release, Advance, Table Of Definition, Enter, Leave, Stoeag, Transfer Blocks, Sampling Probability Distribution		
UNIT: 5		**09 Hours**
GPSS- Standard Numerical attributes (SNAs), Transaction parameters, Priority block, Select Block, Equivalence Declaration, Table Entity. ARENA Modules - Basic Process Modules, Advanced Process Module Panel, Data Modules Simulation case Studies in Manufacturing and Service organizations.		
	Total Lecture Hours	**45 Hours**

Text Book(s)	
1.	R. PANNEERSELVAM and P. SENTHILKUMAR, SYSTEM SIMULATION, MODELLING AND LANGUAGES, PHI Learning, Delhi.
2.	J. Banks, J.S. Carson B.L. Nelson, D.M. Nicol, S. Shah and P. Shahabudeen, DISCRETE EVENT SYSTEM SIMULATION, Pearson Education, 2011, New Delhi.
Reference Book(s)	
1.	G. Gordon, System Simulation, Prentice- Hall.
2.	T.H. Naylor, et.al., COMPUTER SIMULATION TECHNIQUES, John Wiley.
3.	Michael Pidd, COMPUTER SIMULATION IN MANAGEMENT SCIENCE, John Wiley.
4.	R.E. Shannon, SYSTEM SIMULATION: THE ART OF SCIENCE, Prentice-Hall.
5.	R. Panneerselvam, OPERATIONS RESEARCH, PHI Learning, Delhi.

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Understand the fundamental concepts of simulation, including types of models.	K2
CO2	Apply random variate generation techniques to simulate distributions	K3
CO3	Model and simulate real-world systems such as queueing models and inventory systems	K3
CO4	Demonstrate proficiency in using GPSS simulation blocks	K4
CO5	Develop advanced simulation models using Arena, including the use of process and data modules	K5

CO- PO Mapping

POs COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	2	1	2	1	3	1
CO2	3	3	1	2	1	3	1
CO3	3	3	1	2	2	3	2
CO4	3	2	1	2	1	3	1
CO5	3	3	1	2	2	3	2
Average Alignment Score	**3.0**	**2.6**	**1.0**	**2.0**	**1.4**	**3.0**	**1.4**
3 – Strong, 2 – Medium, 1- Low							

DA26S3118	NEXT GENERATION DATA BASES	L	T	P	C
Core / Elective	Elective	3	0	0	3

Course Objectives:

- To explore the concepts of NoSQL Data Bases.
- To understand and use columnar and distributed Data Base patterns.
- To learn to use various Data models for a variety of Data Bases.

UNIT: 1		**09 Hours**
Data Base Revolutions- System Architecture- Relational Data Base- Data Base Design - Data Storage- Transaction Management- Data warehouse and Data Mining- Information Retrieval.		
UNIT: 2		**09 Hours**
Big Data Revolution- CAP Theorem- Birth of NoSQL- Document Data Base-XML Data Bases- JSON Document Data Bases- Graph Data Bases.		
UNIT: 3		**09 Hours**
Column Data Bases— Data Warehousing Schemes- Columnar Alternative- SyBase IQ-CStore and Vertica- Column Data Base Architectures- SSD and In-Memory Data Bases— InMemory Data Bases- Berkeley Analytics Data Stack and Spark.		
UNIT: 4		**09 Hours**
Distributed Data Base Patterns— Distributed Relational Data Bases- Non-relational Distributed Data Bases- MongoDB - Sharing and Replication- Base- Cassandra Consistency Models— Types of Consistency- Consistency MongoDB- Base Consistency- Cassandra Consistency.		
UNIT: 5		**09 Hours**
Data Models and Storage- SQL- NoSQL APIs- Return SQL- Advance Data Bases - PostgreSQL- Riak- CouchDB- NEO4J- Redis- Future Data Bases — Revolution Revisited - Counter revolutionaries- Oracle HQ- Other Convergent Data Bases- Disruptive Data Base Technologies.		
	Total Lecture Hours	**45 Hours**
Text Book(s)		
1.	Guy Harrison, “Next Generation Data Bases”, Apress, 2015.	
Reference Book(s)		
1.	Abraham Silberschatz, Henry F. Korth, S. Sudarshan, “Data Base System Concepts”, Sixth Edition, McGrawHill.	
2.	Eric Redmond, Jim R Wilson, “Seven Data Bases in Seven Weeks”, LLC. 2012.	
3.	Dan Sullivan, “NoSQL for Mere Mortals”, Addison-Wesley, 2015.	
4.	Adam Fowler, “NoSQL for Dummies “, John Wiley & Sons, 2015	

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Understand the fundamental concepts of Data Base systems	K2
CO2	Analyze the impact of the Big Data revolution on modern Data Base systems, focusing on NoSQL Data Bases.	K4
CO3	Evaluate the architectures and performance of columnar Data Bases	K5
CO4	Design and implement distributed Data Bases, both relational and non-relational	K3
CO5	Develop and compare SQL and NoSQL Data Base systems by utilizing various APIs	K6

CO- PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	2	1	2	1	3	1
CO2	3	3	1	2	2	3	1
CO3	3	2	1	2	1	3	1
CO4	3	3	1	2	2	3	2
CO5	3	3	1	2	2	3	2
Average Alignment Score	**3.0**	**2.6**	**1.0**	**2.0**	**1.6**	**3.0**	**1.4**
3 – Strong, 2 – Medium, 1- Low							

DA26S3119	IMAGE AND VIDEO ANALYTICS	L	T	P	C
Core / Elective	Elective	3	0	0	3

Course Objectives:

- To teach the fundamentals of digital image processing, image and video analysis.
- To understand the real time use of image and video analytics.
- To demonstrate real time image and video analytics applications and others.

UNIT: 1		09 Hours
Digital image representation- Visual Perception- Sampling and Quantization- Basic Relations between Pixels- Mathematical Tools Used in Digital Image Processing: Fundamental Operations –Vector and Matric Operations- Image Transforms (DFT, DCT, DWT, Hadamard).		
UNIT: 2		**09 Hours**
Fundamentals of spatial filtering: spatial correlation and convolution-smoothing blurring-sharpening- edge detection - Basics of filtering in the frequency domain: smoothing-blurring-sharpening--Histograms and Basic statistical models of image.		
UNIT: 3		**09 Hours**
Colour models and Transformations – Image and Video segmentation-Image and video demonising- Image and Video enhancement- Image and Video compression.		
UNIT: 4		**09 Hours**
Object detection and recognition in image and video-Texture models Image and Video classification models- Object tracking in Video.		
UNIT: 5		**09 Hours**
Applications and Case studies- Industrial- Retail- Transportation & Travel-Remote sensing-Video Analytics in WSN: IoT Video Analytics Architectures.		
	Total Lecture Hours	**45 Hours**
Text Book(s)		
1.	R.C. Gonzalez and R.E. Woods.” Digital Image Processing”. 3rd Edition. Addison Wesley, 2007.	
2.	W. Härdle, M. Müller, S. Sperlich, A. Werwatz, “Nonparametric and Semiparametric Models”, Springer, 2004.	
3.	Rick Szelisk, “Computer Vision: Algorithms and Applications”, Springer 2011.	
Reference Book(s)		
1.	Jean-Yves Dufour, “Intelligent Video Surveillance Systems”, Wiley, 2013.	
2.	Caifeng Shan, Fatih Porikli, Tao Xiang, Shaogang Gong, “Video Analytics for Business Intelligence”, Springer, 2012.	
3.	AsierPerallos, Unai Hernandez-Jayo, Enrique Onieva, Ignacio Julio García Zuazola, “Intelligent Transport Systems: Technologies and Applications”, Wiley, 2015.	
4.	Basudeb Bhatta, “Analysis of Urban Growth and Sprawl from Remote Sensing data”, Springer, 2010	

COURSE OUTCOMES:

CO No.	Course Outcome	K Level
CO1	Understand the fundamental concepts of digital image representation	K2
CO2	Analyze and apply spatial and frequency domain filtering techniques	K4
CO3	Evaluate and transform color models, and apply image and video segmentation.	K5
CO4	Apply object detection, recognition, tracking, and classification models	K3
CO5	Examine real-world applications of digital image and video processing	K6

CO- PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	2	1	2	1	3	1
CO2	3	3	1	2	1	3	2
CO3	3	3	1	2	1	3	2
CO4	3	3	1	2	2	3	2
CO5	3	3	1	2	2	3	2
Average Alignment Score	**3.0**	**2.8**	**1.0**	**2.0**	**1.4**	**3.0**	**1.8**
3 – Strong, 2 – Medium, 1- Low							

DA26S3120	HEALTHCARE DATA ANALYTICS	L	T	P	C
Core / Elective	Elective	3	0	0	3

Course Objectives:

- To explore the various forms of electronic health care information.
- To learn the techniques adopted to analyse health care data.
- To understand the predictive models for clinical data

UNIT: 1		09 Hours
Introduction: Introduction to Healthcare Data Analytics- Electronic Health Records– Components of EHR- Coding Systems- Benefits of EHR- Barrier to Adopting EHRChallenges- Phenotyping Algorithms.		
UNIT: 2		**09 Hours**
Analysis: Biomedical Image Analysis- Mining of Sensor Data in Healthcare- Biomedical Signal Analysis- Genomic Data Analysis for Personalized Medicine.		
UNIT: 3		**09 Hours**
Analytics: Natural Language Processing and Data Mining for Clinical Text- Mining the Biomedical - Social Media Analytics for Healthcare.		
UNIT: 4		**09 Hours**
Advanced Data Analytics: Advanced Data Analytics for Healthcare– Review of Clinical Prediction Models- Temporal Data Mining for Healthcare Data- Visual Analytics for Healthcare-Predictive Models for Integrating Clinical and Genomic Data- Information Retrieval for Healthcare- Privacy-Preserving Data Publishing Methods in Healthcare.		
UNIT: 5		**09 Hours**
Applications: Applications and Practical Systems for Healthcare– Data Analytics for Pervasive Health- Fraud Detection in Healthcare- Data Analytics for Pharmaceutical Discoveries- Clinical Decision Support Systems- Computer-Assisted Medical Image Analysis Systems- Mobile Imaging and Analytics for Biomedical Data.		
	Total Lecture Hours	**45 Hours**
Text Book(s)		
1.	Chandan K. Reddy and Charu C Aggarwal, "Healthcare data analytics", Taylor & Francis, 2015	
2.	Hui Yang and Eva K. Lee, "Healthcare Analytics: From Data to Knowledge to HealthcareImprovement, Wiley, 2016.	
Reference Book(s)		
1.	"Healthcare Analytics Made Simple", Vikas Kumar, Packt	
2.	"Competing on Healthcare Analytics: The Foundational Approach to Population HealthAnalytics", J. Bennett	
3.	"Machine Learning for Healthcare Analytics Projects", Eduonix Learning Solutions	

COURSE OUTCOMES:

CO	Course Outcome	K Level
CO1	Understand the fundamentals of Healthcare Data Analytics	K2
CO2	Analyze and process biomedical data by applying techniques	K4
CO3	Apply natural language processing (NLP) and data mining techniques to clinical text data	K3
CO4	Evaluate and apply advanced data analytics techniques in healthcare, including clinical prediction models	K5
CO5	Design and assess practical applications of data analytics in healthcare, including fraud detection	K6

CO- PO Mapping

POs COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	3	1	2	1	3	2
CO2	3	3	1	2	1	3	2
CO3	3	3	1	2	1	3	2
CO4	3	3	1	2	2	3	2
CO5	3	3	1	2	2	3	2
Average Alignment Score	**3.0**	**3.0**	**1.0**	**2.0**	**1.4**	**3.0**	**2.0**
3 – Strong, 2 – Medium, 1- Low							

DA26S3121	ACCOUNTING FOR ANALYTICS	L	T	P	C
Core / Elective	ELECTIVE	3	0	0	3

Course Objectives:

- Understand the scope, role, and tools of analytics in modern accounting and finance.
- Apply analytical methods to financial reporting and disclosures for improved compliance and transparency.
- Use auditing and assurance analytics to detect irregularities, fraud, and strengthen governance.
- Employ analytics in managerial and cost accounting for budgeting, forecasting, and performance evaluation.
- Explore emerging technologies and ethical considerations in accounting analytics, including ESG, AI/ML, and big data.

METHODOLOGY:

- Integrate experiential learning through real-world financial datasets, fraud case simulations, and compliance analytics.
- Encourage collaborative group projects analyzing listed companies' disclosures, dashboards, and ESG reports.

UNIT: 1	Foundations of Accounting Analytics	9 Hours
Overview of Accounting Analytics: Scope and applications - Data-driven decision-making in accounting - Types of accounting data (structured/unstructured; financial statements, ERP systems, audit logs) - Analytical approaches: descriptive, diagnostic, predictive, prescriptive - Introduction to tools: Excel, Power BI, Python/R Basics for finance		
UNIT: 2	**Financial Reporting and Disclosure Analytics**	**9 Hours**
Ratio analysis with advanced visualization - Earnings quality and manipulation detection (e.g., Beneish M-score) - Voluntary and mandatory disclosure analytics - Text analytics on annual reports, MD&A, and ESG disclosures - Case studies: IFRS/IndAS compliance analytics		
UNIT: 3	**Auditing and Assurance Analytics**	**9 Hours**
Audit data analytics: standards and best practices - Outlier detection and anomaly analysis (Benford's Law, Z-score methods) - Fraud analytics in accounting records - Continuous monitoring and assurance frameworks - Use of ACL/IDEA, Tableau, and Python for audit analytics		
UNIT: 4	**Managerial & Cost Accounting Analytics**	**9 Hours**
Budgeting and variance analysis using analytics - Cost behavior modeling and activity- Based costing - Performance dashboards and KPIs - Predictive analytics for forecasting costs, demand, and revenues - Profitability analysis and resource allocation models		
UNIT: 5	**Emerging Trends and Applications in Accounting Analytics**	**9 Hours**
Big data and cloud- Based accounting systems - ESG and sustainability reporting analytics - Analytics for risk management and internal controls - AI/ML applications in accounting (forecasting, fraud detection) - Ethical and governance issues in accounting analytics - Industry cases and projects (FinTech, RegTech, Blockchain- Based accounting).		
	Total Lecture Hours	**45 Hours**

Text Book(s)	
1	Warren, C. S., Reeve, J. M., & Duchac, J. E. (2022). Financial & Managerial Accounting. Cengage Learning.
2	Albrecht, W. S., Albrecht, C. O., Albrecht, C. C., & Zimbelman, M. F. (2019). Fraud Examination (6th ed.). Cengage Learning.
3	Gupta, A. (2017). Data Analytics for Accounting (2nd ed.). McGraw Hill Education.
4	Gepp, A., Linnenluecke, M. K., O'Neill, T., & Smith, T. (2018). *Big Data in Accounting: Theory and Practice*. Routledge.
Reference Book(s)	
1	Benford, F. (2008). *Benford's Law: Applications for Forensic Accounting, Auditing, and Fraud Detection*. Wiley
2	Madsen, R. E. (2020). *Practical Data Science for Accounting and Finance*. Springer.
3	EY, KPMG, Deloitte, PwC publications on *Audit Analytics, Continuous Auditing, and ESG Reporting* (free practitioner reports).
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.coursera.org/learn/accounting-data-analytics-python?utm_source=chatgpt.com
2	https://onlinecourses.nptel.ac.in/noc25_cs09/preview?utm_source=chatgpt.com
3	https://www.coursera.org/learn/intro-accounting-data-analytics-visual?utm_source=chatgpt.com
4	https://www.coursera.org/learn/intro-to-data-analytics?utm_source=chatgpt.com

COURSE OUTCOMES On Completion of the course, the students will be able to	
CO1	Identify and clean accounting datasets (financial reports, ERP extracts) for analytics using Excel/Python.
CO2	Conduct ratio analysis, earnings manipulation tests, and sentiment analysis of corporate reports.
CO3	Apply anomaly detection techniques (Benford's Law, Z-scores) to real-world accounting datasets for audit assurance.
CO4	Develop dashboards for cost analysis, variance reporting, and predictive forecasting using visualization tools.
CO5	Critically assess ethical, sustainability, and governance implications of accounting analytics practices.

Mapping of COs with POs							
POs COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	2	-	-	-	**3**	-
CO2	3	**3**	-	-	-	3	-
CO3	3	**3**	2	-	-	3	2
CO4	3	**2**	-	-	2	3	-
CO5	-	**2**	**3**	**3**	-	-	3
	3	**2.4**	**2.5**	**3**	**2**	**3**	**2.5**

DA26S3122	BUSINESS ANALYTICS FOR MANAGEMENT DECISION MAKING	L	T	P	C
Core / Elective	CORE	3	0	0	3

Course Objectives:

- Understand the fundamental concepts and scope of business analytics for effective data-driven decision-making.
- Apply analytical tools and techniques to solve business problems across marketing, finance, and human resource functions.
- Develop the ability to interpret data insights and formulate strategies that enhance organizational performance

METHODOLOGY:

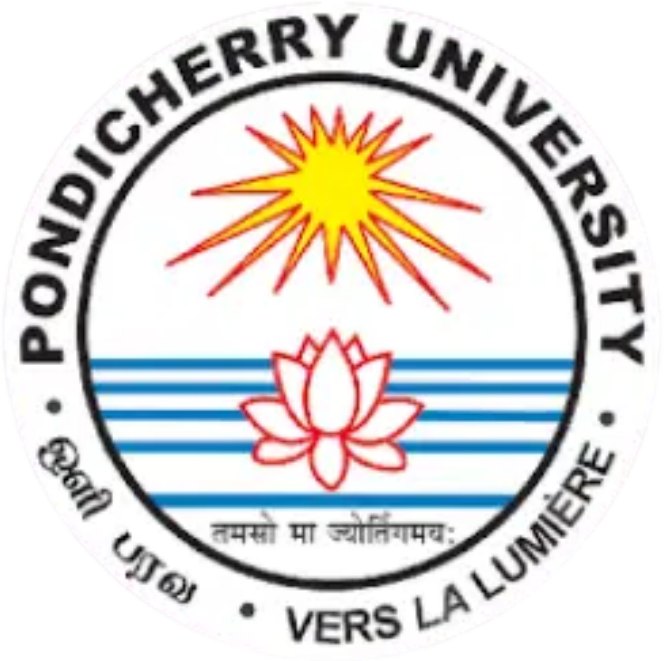
- The course will be delivered through interactive lectures, case studies, and hands-on sessions using analytical tools. Emphasis will be placed on real-world business applications, group discussions, and data-driven decision-making exercises

UNIT: 1	Introduction to Business Analytics	9 Hours
Business Analytics: The Science of Data-Driven Decision Making, Descriptive Analytics, Predictive Analytics, Prescriptive Analytics, Big Data Analytics, Web and Social Media Analytics, Challenges in Data-Driven Decision Making and Future, Data Types: Structured and Unstructured Data, Cross-Sectional, Time Series, and Panel Data.		
UNIT: 2	**The Business Analytics Cycle**	**9 Hours**
Introduction, Objective of Business Analytics, Significance of Data, Understanding the Analytic Tools and Methods, Implementation, Guiding Questions, and Requirements for Integrating Business Analytics.		
UNIT: 3	**Marketing Analytics**	**9 Hours**
Calculating Customer Life Time Value, Forecasting New Product Sales using S Curves to Forecast Sales of a New Product, Forecasting Sales from Few Data Points, Identifying customer wants using Logistic regression.		
UNIT: 4	**Financial Analytics**	**9 Hours**
Predictive sales analytics - Customer Profitability analytics - Product Profitability analytics - Cash flow analytics - Value Driver Analytics - Shareholder value analytics		
UNIT: 5	**HR Analytics**	**9 Hours**
Capability Analytics - Employee Churn Analytics - Employee Performance Analytics - Corporate Culture Analytics - Leadership Analytics		
	Total Lecture Hours	**45 Hours**

Text Book(s)	
1	Business Analytics: The Science of Data-Driven Decision Making, (2017.) U Dinesh Kumar, Wiley Publications.
2	Getting Started with Business Analytics: Insightful Decision – Making by David Hardoon, Galit Shmueli, Chapman & Hall/CRC, 2013.
Reference Book(s)	
1	Wayne L.Winston (2014), Marketing Analytics, Wiley India Private Ltd
2	Bernard Marr, Key Business Analytics, Financial Times Publishing

COURSE OUTCOMES On Completion of the course, the students will be able to	
CO1	Explain the role and importance of business analytics in management decision-making.
CO2	Differentiate between descriptive, predictive, and prescriptive analytics, and their applications in real-world scenarios.
CO3	Analyze business problems using marketing, financial, and HR analytics tools.
CO4	Interpret analytical results to support strategic and operational decisions.
CO5	Integrate data analytics insights into business plans for improved decision-making and performance outcomes.

Mapping of COs with Pos							
POs COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO1	3	2	**-**	**-**	**-**	**3**	**-**
CO2	3	**3**	**-**	**-**	**-**	3	**-**
CO3	3	**3**	2	**-**	**-**	3	2
CO4	3	**2**	**-**	**-**	2	3	**-**
CO5	**-**	**2**	**3**	**3**	**-**	**-**	3
	3	**2.4**	**2.5**	**3**	**2**	**3**	**2.5**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तमसो मा ज्योतिर्गमय:
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