NATIONAL INSTITUTE OF TECHNOLOGY TIRUCHIRAPPALLI - 620015

DEPARTMENT OF MANAGEMENT STUDIES

SYLLABUS FOR WRITTEN TEST

Business Analytics

Descriptive & Exploratory Data Analytics: Probability distributions, descriptive statistics (measures of central tendency and dispersion), and hypothesis testing (parametric & Non-parametric tests). Principles of visual storytelling, dashboard design, and proficiency in tools like **Tableau**, **Power BI**, or **Excel**. Correlation analysis, cross-tabulation, and identifying patterns or trends in business data.

Predictive Analytics & Machine Learning: Linear regression, multiple linear regression, and logistic regression for business forecasting and classification. Forecasting business trends using moving averages, exponential smoothing, and ARIMA models. Decision trees, Random Forests, Naive Bayes, ANN, CNN, Support Vector Machines (SVM) and Genetic algorithm. Clustering techniques (K-Means, Fuzzy C-Means, Hierarchical, Outlier analysis) for market segmentation, and Association Rule Mining (Market Basket Analysis). Confusion Matrix, Accuracy, Recall, Precision, F Measure, ROC AUC, Rand Index, Jaccard Index. Natural Language Processing issues, Opinion Mining, Sentiment Analysis.

Prescriptive Analytics & Optimization: Linear Programming (LP), Integer Programming, and Non-Linear Programming for resource allocation and supply chain management. Decision making under risk and uncertainty, decision trees, and utility theory. Monte Carlo simulation for risk analysis and financial modeling.

Analytics Tools &Technology: Proficiency in **R** and **Python** for data analysis (including libraries like Pandas, NumPy, Scikit-learn). Data extraction and manipulation using **SQL**. Applications of Deep Learning, Natural Language Processing (NLP) in customer sentiment analysis, and Generative AI in business contexts

Information Systems / Management

Foundations of IS & Digital Strategy: Information as a strategic resource; components of IS (Hardware, Software, Data, Networks, People, Processes). IT-Business alignment frameworks; Porter's Competitive

Forces model and Value Chain analysis in the digital age. Emerging business models, platform economies, and digital disruption strategies.

System Analysis and Design (SAD): Phases of SDLC (Planning, Analysis, Design, Implementation, Maintenance). Requirement's elicitation techniques (interviews, JAD sessions), functional vs. non-functional requirements, and Software Requirements Specification (SRS) documentation. Data Flow Diagrams (DFDs), Entity-Relationship (ER) diagrams, and Data Dictionaries. Unified Modelling Language (UML) diagrams (Use Case, Class, Sequence, and Activity diagrams). UI/UX design principles, input/output design, and system prototyping.

Enterprise Systems & IT Architecture: ERP architecture, cross-functional integration, implementation lifecycle, and challenges. Supply Chain Management (SCM) systems, Customer Relationship Management (CRM) systems, and Inter-organizational IS. Cloud Computing (SaaS, PaaS, IaaS) vs. On-premise solutions; Enterprise Architecture (EA) frameworks (e.g., TOGAF).

Software Project Management (SPM): Project scoping, Work Breakdown Structure (WBS), and software estimation techniques (COCOMO model, Function Point Analysis). CPM/PERT networks, Gantt charts, resource levelling, and Earned Value Management (EVM). Scrum framework (sprints, product backlog, daily stand-ups), Kanban, DevOps, and Continuous Integration/Continuous Deployment (CI/CD) pipelines.

Software Quality Management (SQM): Total Quality Management (TQM) in software, ISO 9001, and Capability Maturity Model Integration (CMMI) levels. Verification vs. Validation; White-box and Black-box testing; Unit, Integration, System, and User Acceptance Testing (UAT). Software reliability metrics, defect tracking, quality audits, and continuous process improvement frameworks (Six Sigma).

Database & Knowledge Management: Database Management Systems (DBMS): Relational databases, SQL basics, and Big Data concepts. ETL processes, Data warehousing concepts, Online Analytical Processing (OLAP), and corporate performance management dashboards, Business Intelligence.

Emerging Technologies: Business applications of AI/ML, Robotic Process Automation (RPA), Blockchain, and Business applications of Artificial Intelligence, Machine Learning, and Robotic Process Automation (RPA).

Operations Management

Overview of Production & Operations Management and Supply Management. Introduction to Demand Forecasting – Qualitative Forecasting Techniques – Basic Quantitative Forecasting Techniques – Measures of Errors – Technology S-Curve

Plant location: Factors to be considered–Multi Plant Location–Evaluation of Factors using Rations plan & Cost Analysis–Plant location trends. Plant Layout: Types of Layouts.

Introduction to Capacity Planning – Long range capacity planning process – Measuring Capacities – Evaluating Capacity Alternatives – Economics & Diseconomies if scale.

Master Production Schedule (MPS) – Intermittent demand planning – Costs in creating aggregate plans –Strategies for Aggregate Planning – Formulation of aggregate plants – Policies for creating aggregate plan – Materials Requirement Planning (MRP) – Solving the MRP problem – Overview of JIT, MRP-II – Purchasing and Warehousing Functions – Vendor Development and Rating. Value Analysis

Introduction to Scheduling – Designing a Product Layout (Line Balancing Problem) – Designing a process layout (Job shop) – Johnson's rule - Priority rules – Heuristic approaches to solving the Scheduling ID.

Introduction to Job Design – Motion Study. Job Evaluation – Job Evaluation Techniques. Work Measurement: Time Study–Work Sampling.

Product and Service Design – Factors affecting product design – Phases in product design – Importance for product design/ redesign – Difference between product design and service design

Introduction and Evolution of Quality Management, Inspection overview, objectives and scope; Quality control, Overview Total Quality management and its importance. Introduction to Six-Sigma.

Project Systems Management – Project System Lift Cycle – Feasibility Analysis – Financial Economic Appraisal of a project, Social Cost Benefit Analysis in India - PERT- GERT- LOB - GAN - Time Cost Trade off and Crashing Procedure — Multi Project Scheduling with limited resources - Project Management Information System. Value analysis in Project Management. Project organization and Communication. Ecology and bio diversity issues - Environmental Impact assessment.

Micro and Macro Economics and Legal Aspects of Business

Microeconomic Foundations & Market Dynamics: Nature, scope, and optimization techniques; the relationship between economic theory and business decision-making. Law of demand, determinants, elasticity of demand (price, income, cross, and advertising), demand forecasting techniques, and market equilibrium. Production function (short-run and long-run), Law of Diminishing Returns, Economies and Diseconomies of Scale; Cost concepts, cost-output relationships, and break-even.

Market Structures & Pricing Strategies: Price and output determination under Perfect Competition, Monopoly, Monopolistic Competition, and Oligopoly (Kinked demand curve, Collusive models). Price discrimination, peak-load pricing, transfer pricing, predatory pricing, and game theory applications in business competition.

Macroeconomic Environment & Policy Frameworks: Concepts of GDP, GNP, NDP, NNP; measurement methods and challenges in circular flow models. Inflation (types, causes, and impacts), Deflation, Business Cycles (phases and stabilization strategies), Unemployment, and Stagflation. Monetary Policy (instruments of central banking, credit control) and Fiscal Policy (government spending, taxation, budgetary deficits) and their impact on corporate strategy. Balance of Payments (BOP), Foreign Exchange market mechanisms, and international trade policies.

Law of Contracts & Commercial Transactions: Essentials of a valid contract; offer, acceptance, consideration, capacity of parties, free consent; legality of object; performance, breach of contract, and remedies. Indemnity, Guarantee, Bailment, Pledge, and Agency frameworks. Formation of contract of sale, conditions and warranties, transfer of ownership, performance, and rights of an unpaid seller.

Corporate Governance, Structure, & Partnership Laws: Meaning, characteristics, and types of companies; steps in incorporation; Memorandum of Association (MoA) and Articles of Association (AoA); Prospectus; shares and debentures; corporate meetings and resolutions; provisions regarding Directors; Corporate Social Responsibility (CSR) and winding-up procedures. Indian Partnership Act, 1932 (nature, rights, dissolution) and Limited Liability Partnership (LLP) Act, 2008.

Regulatory, Consumer, & Intellectual Property Laws: Consumer Protection Act (latest updates on consumer rights and dispute redressal commissions); Competition Act, 2002 (prohibition of anti-competitive agreements, abuse of dominant position, and regulation of combinations). Legal dimensions of Patents, Trademarks, Copyrights, and Geographical Indications in business strategy. Information Technology Act, 2000 (electronic governance, digital signatures, cyber offenses, and data privacy principles).

Entrepreneurship Management

Foundations of Entrepreneurship & Mindset: Types of entrepreneurs; Innovation, risk-taking, opportunity recognition, proactiveness, and resilience; Fostering innovation within established organizations; models of corporate venturing and barriers to intrapreneurship.

Opportunity Identification, Ideation, & Design Thinking: Environmental scanning for identifying market gaps, trends, and business opportunities. Human-centred design principles—Empathize, Define, Ideate, Prototype, and Test. Assessing market, technical, financial, and operational feasibility; product-market fit validation.

Business Model Development & Business Planning: Minimum Viable Product (MVP), Build-Measure-Learn feedback loop, and pivoting strategies. Developing a comprehensive business plan (Executive summary, market analysis, marketing strategy, operations plan, and financial projections) for investors and stakeholders.

Entrepreneurial Finance & Venture Capital: Bootstrapping strategies, crowdfunding, friends and family, and government grants/subsidies (e.g., Start-up India initiatives). Angel investors, Venture Capital (VC) networks, Corporate Venture Capital (CVC), and Private Equity (PE). Valuation methodologies for pre-revenue start-ups; understanding term sheets, cap tables, dilution, and exit strategies (IPOs, acquisitions, M&As).

Launching, Scaling, & Managing New Ventures: Customer acquisition strategies, digital marketing for start-ups, and growth hacking techniques. Managing transitions from a start-up to an established enterprise; operational scaling, internationalization strategies, and managing fast-paced growth crises. E-commerce models, platform economies, SaaS ventures, and leveraging AI/Automation in new venture creation.