



Bharatiya Vidya Bhavan's
SARDAR PATEL COLLEGE OF ENGINEERING
Government Aided Autonomous Institute under Mumbai University
Andheri (W), Mumbai - 400058



COURSE CONTENTS

Minor in Engineering Management

Regulation 23

Credit Structure Summary

Component	Sem	Course Title	Credits
Foundation Course	IV	Fundamentals of Management	2
Core Courses	V	Organizational Behaviour & Leadership	4
	VI	Financial Management for Engineers	4
Professional Elective (ANY ONE)	VII	Entrepreneurship & Start-up Management	4
	VII	Business Analytics for Decision Making	4
	VII	Project Management for Engineers	4

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Semester IV	Class: B. Tech. (Civil / Mechanical / Electrical)	
Code : MI-BT071	Course: Fundamentals of Management	
Period Per Week	Lecture	02
	Laboratory	--
	Tutorial	--

Prerequisite:

None

Course Objectives:

- Introduce students to the fundamental concepts, principles, and functions of management.
- Enable understanding of management thought, evolution and different schools of management.
- Develop awareness of planning, organizing, staffing, leading and controlling as core management functions.
- Sensitize engineering students to the managerial environment within which they will work as professionals.

Course Outcomes:

Students will demonstrate the ability to

- Explain the nature, scope and significance of management and its relevance to engineering practice.
- Describe the evolution of management thought and major schools of management theory.
- Apply the functions of management — planning, organizing, staffing, leading, and controlling — to engineering contexts.
- Understand managerial roles, skills and the changing environment of management.

Course Contents:

Module	Details	Hours
1	Introduction to Management: Definition and nature of management; management as a science, art and profession; universality of management; management vs. administration; levels of management; managerial roles and skills (Mintzberg's roles; Katz's skills). Importance of management to engineers.	
2	Evolution of Management Thought: Scientific management (Taylor); administrative management (Fayol's 14 principles); bureaucratic management (Weber); Hawthorne studies and human relations movement; systems approach; contingency approach; modern management trends.	
3	Planning: Nature and importance of planning; types of plans — objectives, policies, procedures, rules, programmes, budgets; steps in planning; Management by Objectives (MBO); strategic, tactical and operational planning; decision-making process and tools.	
4	Organizing: Nature and purpose of organizing; formal and informal organizations; departmentation; span of management; authority, responsibility and accountability; delegation and decentralization; organizational structures — line, line and staff, functional, matrix, project.	
5	Staffing and Human Resource Management: Staffing process; human resource planning; recruitment, selection and induction; training and development; performance appraisal; compensation management; career development.	
6	Directing and Leading: Nature of direction; leadership — concept, types and theories (trait, behavioral, situational); motivation — concept and theories (Maslow, Herzberg, McGregor's Theory X and Y); communication — process, types, barriers and improvements.	
7	Controlling: Nature and importance of controlling; control process; types of control; control techniques — budgetary control, breakeven analysis, management information	

	systems; relationship between planning and controlling; management of change and innovation.	
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Text / Reference Books:

- Stephen P. Robbins & Mary Coulter, Management, 11th Edition, Pearson Education.
- Harold Koontz & Heinz Weihrich, Essentials of Management, Tata McGraw Hill.
- Stoner, Freeman & Gilbert, Management, Pearson Education.
- P. C. Tripathi & P. N. Reddy, Principles of Management, Tata McGraw Hill.

Sr. No.	Examination	Modules
1	Mid semester	1-3
2	End Semester	01–07

Semester V	Class: B. Tech. (Civil / Mechanical / Electrical)	
Code: MI-BT072	Course: Organizational Behaviour & Leadership	
Period Per Week	Lecture	03
	Laboratory	--
	Tutorial	01

Prerequisite:

Fundamentals of Management (Sem IV)

Course Objectives:

- Introduce the concept, scope and significance of Organizational Behaviour (OB) in engineering and managerial contexts.
- Develop understanding of individual, group and organizational dimensions of behaviour.
- Build knowledge of interpersonal processes — communication, conflict, negotiation and power — relevant to engineering teams.
- Enable understanding of leadership theories and their application in organizational settings.

Course Outcomes:

Students will demonstrate the ability to

- Explain individual behaviour variables — personality, perception, learning, attitude, and motivation — and their impact on organizational performance.
- Analyze group dynamics, team effectiveness, interpersonal behaviour and conflict management.
- Apply leadership theories to assess and develop leadership competencies in professional situations.
- Describe organizational structure, culture, change management and organizational development interventions.

Course Contents:

Module	Details	Hours
1	Introduction to Organizational Behaviour: Definition, scope and significance of OB; OB model; relationship between OB and management; historical evolution of OB; challenges and opportunities in OB; contributing disciplines — psychology, sociology, social psychology, anthropology, political science.	
2	Individual Dimensions — Personality, Perception and Learning: Personality — determinants, theories (trait, type, psychoanalytic), Big Five model; perception — process, factors, perceptual errors; learning — classical conditioning, operant conditioning, social learning; attitudes — components, formation, attitude-behaviour relationship, job satisfaction and organizational commitment.	
3	Motivation: Concept and importance; content theories — Maslow's hierarchy, Herzberg's two-factor theory, McClelland's theory of needs, Alderfer's ERG theory; process theories — Vroom's expectancy theory, Adams' equity theory, goal-setting theory; motivation in practice; Transactional Analysis (basics).	
4	Interpersonal Behaviour and Group Dynamics: Transactional Analysis — ego states, types of transactions, life positions; foundations of group behaviour — types of groups, stages of group development, group norms, cohesiveness, group think; team building and team effectiveness; interpersonal conflict — types, sources, conflict management styles.	
5	Communication, Power and Politics: Communication process; types of organizational communication; barriers to communication; improving organizational communication; power — sources and bases (French and Raven), dependency; organizational politics — factors contributing to political behaviour, managing politics in organizations.	
6	Leadership: Concept and importance; leadership vs. management; trait theories; behavioural theories — Ohio State, Michigan, Managerial Grid; situational and contingency theories — Fiedler's model, Hersey-Blanchard situational leadership, Path-	

	Goal theory; transformational and transactional leadership; servant leadership; emotional intelligence and leadership.	
7	Organizational Structure, Culture and Change: Organizational structure — mechanistic vs. organic; organizational culture — definition, functions, types, creating and sustaining culture; organizational change — forces for change, resistance to change, managing change (Lewin's model, Kotter's 8-step model); organizational development (OD) — OD interventions, stress management.	

Text / Reference Books:

- V. G. Kondalkar, Organizational Behaviour, New Age International Publishers.
- Stephen P. Robbins, Timothy A. Judge & Neharika Vohra, Organizational Behaviour, 15th Edition, Pearson Education.
- Fred Luthans, Organizational Behaviour, McGraw Hill Education.
- Udai Pareek, Understanding Organizational Behaviour, Oxford University Press.

Sr. No.	Examination	Modules
1	Mid semester	1-3
2	End Semester	01–07

Semester VI	Class: B. Tech. (Civil / Mechanical / Electrical)	
Code: ml-BT073	Course: Financial Management for Engineers	
Period Per Week	Lecture	03
	Laboratory	--
	Tutorial	01

Prerequisite:

Fundamentals of Management (Sem IV); Engineering Economics

Course Objectives:

- Introduce engineers to the principles and practice of financial management in business organizations.
- Enable understanding of financial statements, sources of finance and capital structure decisions.
- Develop knowledge of investment decision-making through capital budgeting techniques.
- Build competence in working capital management and an appreciation of financial markets and the Indian financial system.

Course Outcomes:

Students will demonstrate the ability to

- Interpret financial statements and apply ratio analysis, funds flow and cash flow analysis to assess organizational financial health.
- Evaluate sources of long-term and short-term financing and determine an appropriate capital structure.
- Apply capital budgeting methods — payback, ARR, NPV, IRR — to evaluate engineering projects for investment decisions.
- Manage working capital components — inventory, cash and receivables — and understand the structure and role of the Indian financial system.

Course Contents:

Module	Details	Hours
1	Introduction to Financial Management: Meaning and definition of finance; types of finance; definition and scope of financial management; objectives — profit maximization vs. wealth maximization; approaches to financial management; functions of a finance manager; importance of financial management for engineers.	
2	Financial Statement Analysis: Meaning and types of financial statements — income statement, balance sheet, statement of changes in equity; comparative statement analysis; trend analysis; common size analysis; funds flow statement; cash flow statement; ratio analysis — liquidity, activity, solvency and profitability ratios.	
3	Sources of Financing: Long-term financial requirements; short-term financial requirements; sources of finance — ownership securities (equity shares, preference shares, deferred shares), creditorship securities (debentures); internal finance — depreciation funds, retained earnings; loan financing — financial institutions, commercial banks, development banks.	
4	Capitalization and Capital Structure: Meaning of capital — fixed and working capital; capitalization — meaning, definition, types (over-capitalization, under-capitalization, watered capitalization), causes, effects and remedies; capital structure — definition, financial structure, optimum capital structure; capital structure theories — traditional, NI, NOI and Modigliani–Miller approach.	
5	Cost of Capital and Leverage: Cost of capital — meaning, classification, importance; computation of cost of equity, cost of debt, cost of preference shares, cost of retained earnings, weighted average cost of capital (WACC); leverage — operating leverage, financial leverage, combined leverage, working capital leverage; EBIT–EPS analysis.	

6	Capital Budgeting: Meaning, definitions and importance; capital budgeting process; types of capital budgeting decisions; evaluation methods — payback period, accounting rate of return (ARR), net present value (NPV), internal rate of return (IRR), profitability index; risk and uncertainty in capital budgeting — sensitivity analysis, probability technique, decision tree analysis.	
7	Working Capital Management and Financial System: Concept and types of working capital; factors determining working capital requirements; working capital management policy; inventory management — EOQ, ABC analysis; cash management; receivables management; Indian financial system — banking institutions, development financial institutions, capital market, money market, SEBI, mutual funds, special financing — lease financing, venture capital, factoring.	

Text / Reference Books:

- C. Paramasivan & T. Subramanian, Financial Management, New Age International Publishers.
- I. M. Pandey, Financial Management, Vikas Publishing House.
- Prasanna Chandra, Financial Management — Theory and Practice, Tata McGraw Hill.
- Eugene F. Brigham & Joel F. Houston, Fundamentals of Financial Management, Cengage Learning.

Sr. No.	Examination	Modules
1	Mid semester	1-3
2	End Semester	01–07

Semester VII	Class: B. Tech. (Civil / Mechanical / Electrical)	
Code: MI-BT074	Course: Entrepreneurship & Start-up Management	
Period Per Week	Lecture	03
	Laboratory	--
	Tutorial	01

Prerequisite:

Fundamentals of Management (Sem IV); Financial Management for Engineers (Sem VI)

Course Objectives:

- Introduce the concept, importance and ecosystem of entrepreneurship with a focus on technology and engineering-driven ventures.
- Develop understanding of the start-up lifecycle — idea generation, validation, business modeling, funding and growth.
- Build awareness of intellectual property rights, legal structures and government policies supporting start-ups in India.
- Enable engineering students to evaluate entrepreneurship as a career option and apply management tools to new venture creation.

Course Outcomes:

Students will demonstrate the ability to

- Explain the concept of entrepreneurship, types of entrepreneurs and factors driving entrepreneurship in the Indian and global context.
- Generate, screen and validate business ideas and build a business model using structured frameworks such as the Business Model Canvas.
- Develop a business plan encompassing market analysis, operational planning, financial projections and funding strategy.
- Navigate the start-up ecosystem — incubators, accelerators, government schemes, angel investors, venture capital — and understand legal and IPR considerations for new ventures.

Course Contents:

Module	Details	Hours
1	Introduction to Entrepreneurship: Concept, definition and significance of entrepreneurship; entrepreneur vs. intrapreneur vs. manager; types and characteristics of entrepreneurs; entrepreneurial motivation — McClelland's theory of achievement motivation; entrepreneurship ecosystem — global and Indian context; role of entrepreneurship in economic development; challenges and opportunities for tech entrepreneurs.	
2	Creativity and Opportunity Recognition: Creativity and innovation — sources of innovative ideas; opportunity recognition and evaluation; design thinking as a tool for innovation; ideation techniques — brainstorming, SCAMPER, mind mapping; opportunity screening — market need validation, feasibility assessment; lean startup methodology — build-measure-learn feedback loop; minimum viable product (MVP).	
3	Business Model and Planning: Business Model Canvas — nine building blocks; value proposition design; customer segmentation and customer development; revenue streams and cost structures; competitive analysis; business plan — components, structure and importance; market analysis — market sizing (TAM, SAM, SOM); marketing and sales strategy for startups; operational and resource planning.	
4	Financial Planning for Start-ups: Financial projections — revenue model, break-even analysis, cash flow planning; startup valuation methods — DCF, comparables, scorecard; funding stages and instruments — bootstrapping, friends and family, angel investment, venture capital, private equity; convertible notes and SAFE; understanding term sheets; financial ratios relevant to startups.	

5	Start-up Ecosystem and Support Systems: Indian start-up ecosystem — Startup India initiative, DPIIT recognition, government schemes and incentives; incubators and accelerators — role, selection, IIT/IIM and industry incubators; technology business incubators (TBIs); SIDBI, MUDRA, NSIC and other support agencies; science and technology parks; networking and mentorship; global startup ecosystems — Silicon Valley, Israel, Singapore.	
6	Legal Aspects and Intellectual Property: Forms of business organization — sole proprietorship, partnership, LLP, private limited company — registration and compliance; Startup India registration process; intellectual property rights — patents (filing process in India), trademarks, copyrights, trade secrets; technology transfer and licensing; contracts and agreements for startups; employment agreements; regulatory compliance for tech startups.	
7	Growth, Scale and Sustainability: Stages of startup growth — seed, early, growth, expansion; scaling strategies — product extension, geographic expansion, strategic alliances; managing growth — organizational challenges, people management, culture at scale; mergers and acquisitions for startups; exit strategies — IPO, strategic sale, buyback; social entrepreneurship; sustainable business practices; measuring startup performance — KPIs and metrics.	

Text / Reference Books:

- Robert D. Hisrich, Michael P. Peters & Dean A. Shepherd, Entrepreneurship, Tata McGraw Hill.
- S. S. Khanka, Entrepreneurial Development, S. Chand.
- Steve Blank & Bob Dorf, The Startup Owner's Manual, K&S Ranch.
- Eric Ries, The Lean Startup, Crown Business.
- Alexander Osterwalder & Yves Pigneur, Business Model Generation, Wiley.

Semester VII	Class: B. Tech. (Civil / Mechanical / Electrical)	
Code: MI-BT075	Course: Business Analytics for Decision Making	
Period Per Week	Lecture	03
	Laboratory	--
	Tutorial	01

Prerequisite:

Fundamentals of Management (Sem IV); Basic knowledge of statistics and probability

Course Objectives:

- Introduce the concept, types and value of business analytics in organizational decision-making.
- Enable application of descriptive, predictive and prescriptive analytical tools to business problems.
- Develop competence in data visualization, regression modelling and forecasting for managerial use.
- Build awareness of big data, machine learning applications and ethical dimensions of data-driven decision-making relevant to engineering managers.

Course Outcomes:

Students will demonstrate the ability to

- Distinguish between descriptive, predictive and prescriptive analytics and identify their appropriate application to business and engineering management problems.
- Apply statistical tools — regression, correlation, forecasting, hypothesis testing — to analyze organizational data and draw managerial inferences.
- Use optimization techniques (linear programming, decision analysis) to support managerial decision-making under certainty and uncertainty.
- Interpret data visualizations and appreciate the role of big data, machine learning and business intelligence tools in evidence-based management.

Course Contents:

Module	Details	Hours
1	Introduction to Business Analytics: Definition and scope of business analytics; types of analytics — descriptive, predictive and prescriptive; the analytics value chain; role of analytics in managerial decision-making; analytics applications in operations, finance, marketing, supply chain and HR; data types and sources; data collection methods; overview of the analytics process — CRISP-DM framework.	
2	Descriptive Analytics — Statistics and Data Visualization: Measures of central tendency and dispersion; probability distributions — normal, binomial, Poisson; sampling and estimation; confidence intervals; hypothesis testing — z-test, t-test, chi-square, ANOVA; data visualization — charts, dashboards; Excel and basic tools for descriptive analytics; exploratory data analysis (EDA); outlier detection.	
3	Regression Analysis and Correlation: Simple linear regression — model, estimation (OLS), interpretation, goodness-of-fit (R^2); multiple linear regression — assumptions, multicollinearity, model building; residual analysis; logistic regression — concept and applications; correlation analysis; dummy variables; regression for prediction; case studies in engineering and business contexts.	
4	Forecasting Techniques: Time series components — trend, seasonality, cyclical, irregular; moving averages; exponential smoothing — simple, Holt's and Holt-Winters methods; trend projection; decomposition method; ARIMA basics; accuracy measures — MAE, MAPE, RMSE; judgmental forecasting; demand forecasting in supply chain; new product forecasting.	
5	Optimization and Decision Analysis: Linear programming — formulation, graphical and simplex method; sensitivity analysis; transportation and assignment models; network models; decision analysis — decision under certainty, risk and uncertainty; decision trees;	

	game theory basics; integer programming concepts; applications in project scheduling, resource allocation and logistics.	
6	Predictive and Prescriptive Analytics: Classification techniques — decision trees, k-nearest neighbours, naïve Bayes (concepts); clustering — k-means, hierarchical clustering; association rules (market basket analysis); neural networks — concept and applications; simulation — Monte Carlo method; Markov chains; prescriptive analytics tools; revenue management; yield management applications.	
7	Big Data, Business Intelligence and Ethics: Big data — characteristics (5Vs), infrastructure (Hadoop, Spark — concepts); data warehousing and data mining; business intelligence tools — Tableau, Power BI, QlikView (overview); text analytics and sentiment analysis; social media analytics; web analytics; IoT data analytics; ethics in analytics — data privacy, bias, fairness; GDPR and Indian data protection framework; responsible use of AI-driven analytics.	

Text / Reference Books:

- Amar Sahay, Business Analytics — A Data-Driven Decision-Making Approach for Business, Volumes 1 & 2.
- Christian Albright & Wayne Winston, Business Analytics — Data Analysis and Decision Making, Cengage Learning.
- James Evans, Business Analytics — Methods, Models and Decisions, Pearson Education.
- Thomas Davenport & Jeanne Harris, Competing on Analytics, Harvard Business Press.

Sr. No.	Examination	Modules
1	Mid semester	1-3
2	End Semester	01–07

Semester VII	Class: B. Tech. (Civil / Mechanical / Electrical)	
Code: MI BT076	Course: Project Management for Engineers	
Period Per Week	Lecture	03
	Laboratory	--
	Tutorial	01

Prerequisite:

Fundamentals of Management (Sem IV); Financial Management for Engineers (Sem VI)

Course Objectives:

- Introduce the concepts, principles and knowledge areas of project management as applicable to engineering projects.
- Develop competence in project planning tools — WBS, CPM, PERT, Gantt charts — for time and resource management.
- Build understanding of project cost estimation, earned value management and quality management in projects.
- Develop awareness of risk management, procurement, agile methodologies and project management software tools.

Course Outcomes:

Students will demonstrate the ability to

- Define a project, apply the project life cycle framework and describe the PMBOK knowledge areas relevant to engineering project management.
- Develop a project plan using WBS, CPM/PERT network analysis and Gantt charts; calculate critical path, float and project duration.
- Apply cost estimation techniques, earned value management (EVM) and quality management tools to monitor and control engineering projects.
- Identify and assess project risks, develop a risk response plan and appreciate agile project management approaches and project management software.

Course Contents:

Module	Details	Hrs.
1	Introduction • Basics of project management, operations management and organizational strategy, • Project management framework, organizational structures, • Project Management Processes – Initiating, Planning, Executing, Monitoring & Control, Closing.	03
2	Project Integration Management • Integrated change control, Developing project management plan and project charter, • Project selection, corrective action, preventive action, defect repair, change control board, • Cost benefit analysis, Net present value, internal rate of return, payback period, present value, economic value added, • Opportunity costs, sunk costs, law of diminishing returns, working capital, depreciation. Project Scope Management • Scope baseline, WBS, Project scope statement, WBS dictionary, benefits and uses of WBS • Requirement documentation, requirements traceability matrix, requirements management plan	04
3	Project Time Management • Schedule baseline, schedule compression, Network diagram, • Precedence Diagramming Method (PDM), Three point estimating, analogous estimating, parametric estimating, • Schedule management plan, resource optimization, Critical path method, Program Evaluation Review Technique (PERT). Project Cost Management • Earned value measurement, cost baseline, cost budget, Cost management plan, • Reserve analysis, contingency reserve, management reserves, cost risk, • Variable / fixed costs, direct / indirect costs, life cycle costing, value analysis, control thresholds, cost of quality, Return of Interest (RoI), and discounted cash flow.	09

	Project Quality Management • Seven basic quality improvement tools – control chart, Pareto diagram, Cause and effect diagram, flow chart, scatter diagram, histogram. • Quality assurance tools and techniques – Affinity diagram, tree diagrams, process decision program charts, matrix diagrams, prioritization matrices, network diagrams.	
4	Project Human Resource Management • Role of PM, sponsor, stakeholders, functional manager, portfolio manager, program manager, • HR management plan, recognition and reward systems, team building, stages of team formation and development, team types. • Conflict Management, • Responsibility Assignment Matrix (RAM), RACI Chart, • Motivation theory, Management and Leadership styles, Project Communication Management • Communication models, channels, method, communication blockers.	04
5	Project Risk Management • Risk management plan, risk response strategies, threats, opportunities, risk register, contingency plans, fallback plans, residual risks, secondary risks, • Risk types and categories, SWOT analysis, Project Procurement Management • Procurement management plan, types of agreements and contract types, advantages and disadvantages of each contract type, • PM's role in procurement, procurement documents : RFP, IFB, RFQ, RFI, • Types of procurement, procurement negotiations, centralized / decentralized contracting, contract interpretation, price, profit, cost, target price, sharing ratio, ceiling price	06
6	Project Stakeholder Management • Stakeholder analysis, stakeholder register, stakeholder expectations, stakeholder engagement, • Power and interest grid, stakeholders engagement assessment matrix	03
7	Professional and Social Responsibility • Project management traits in professional and social responsibility, • Code of Ethics and Professional conduct w. r. t. responsibility, respect, fairness, honesty. Project Management Case Study / Activity	05

Text / Reference Books:

- Harold Kerzner, Project Management — A Systems Approach to Planning, Scheduling and Controlling, Wiley.
- A Guide to the Project Management Body of Knowledge (PMBOK Guide), 7th Edition, PMI.
- Prasanna Chandra, Projects — Planning, Analysis, Selection, Financing, Implementation and Review, Tata McGraw Hill.
- S. Choudhury, Project Management, Tata McGraw Hill.
- Mike Beedle & Ken Schwaber, Agile Software Development with Scrum, Pearson.

Sr. No.	Examination	Modules
1	Mid semester	1-3
2	End Semester	01–07