

**COURSE STRUCTURE & SYLLABUS
FOR
M. Tech. (INDUSTRIAL ENGINEERING & MANAGEMENT)**

(Effective from Academic Session 2015 – 2016)



**Department of Management Studies,
Indian School of Mines,
Dhanbad – 826 004.**

**Course Structure for
M. Tech. (Industrial Engineering & Management)**

Semester	Course No.	Name of the Course	L T P	Credit Hours
Semester I	AMC 51151	Advanced Numerical Methods and Applied Statistics	3 1 0	7
	MSC 51101	Management and Organizational Behaviour	3 0 0	6
	MSC 51102	Accounting for Managers	3 0 0	6
	MSC 51103	Operations Research - I	3 0 0	6
	MSC 51104	Productivity and Quality Management	3 0 0	6
	MSC 51105	Managerial Economics (S)	3 0 0	6
	MSC 51106	Legal Aspect of Business (S)	2 0 0	4
	MSC 51201	Productivity Management (Practical).	0 0 2	2
	MSC 51202	Personality Development Lab.	0 0 2	2
		Total Credit Hours		45
Semester II	MSC 52101	Corporate Finance	3 0 0	6
	MSC 52102	Production and Materials Management	3 0 0	6
	MSC 52103	Supply Chain Management & Logistics	3 0 0	6
	MSC 52104	Project Management	3 0 0	6
	MSC 52105	Operations Research - II	3 0 0	6
		Elective 1 (S)	3 0 0	6
		Elective 2 (S)	3 0 0	6
	MSC 52201	Software Laboratory	0 0 2	2
	MSC 52401	Term Paper & Seminar	0 0 0	4
		Total Credit Hours		48
Summer Training of minimum 6 weeks				
Semester III	MSC 53901	Industrial Training/Minor Project	0 0 0	4
	MSC 53401	Seminar & Viva-voce on Industrial Training	0 0 0	2
	MSC 53501	Comprehensive Viva-voce	0 0 0	4
	MSC 53801	Dissertation (Interim)	0 0 0	15
	MSC 53402	Seminar & Viva-voce on Dissertation	0 0 0	10
	MSC 53001	Teaching Assignment, Evaluation/Laboratory Development Work etc.	0 0 0	5
			Total Credit Hours	
Semester IV	MSC 54801	Dissertation	0 0 0	20
	MSC 54401	Seminar on Dissertation	0 0 0	5
	MSC 54001	Viva-voce on Dissertation	0 0 0	10
	MSC 54002	Evaluation of Teaching Assignment /Laboratory Development work etc.	0 0 0	5
			Total Credit Hours	

(S) indicates Sessional Paper

Electives (Any two from the list of following)

Course No.	Name of the Course
MCE 52105	Advanced Manufacturing Systems
MCE 52108	Quality Engineering and Management
MSE 52101	Human Resource Management
MSE 52102	Analytics and Business Forecasting
MSE 52103	Marketing Research
MSE 52104	Infrastructure and Project Finance
MSE 52105	Marketing Management
MSE 52106	Industrial Marketing
MSE 52107	System Dynamics
MSE 52108	Services Operations Management
MSE 52109	Personnel Management & Industrial Relations
MSE 52110	Soft Computing

SEMESTER I

AMC 51151: Advanced Numerical Methods and Applied Statistics

Part I : Advanced Numerical Methods:

Solution of tridiagonal system, Evaluation of double and triple integrals by numerical method and its application, solution of non-linear simultaneous equations numerical solution of integral equations, Advanced method of interpolation, Numerical solution of simultaneous first order ordinary differential equations and higher order O.D.E. Initial and Boundary value problems, Numerical solution of partial differential equations: Laplace and Poisson equation, Heat conduction and waved equations.

Part: II Applied Statistics

Review of binomial, Poisson, normal and lognormal probability distributions, Interval estimates, tests of significance for mean, variance (one & two population case – Z, t, x^2 and F tests), tests for correlation and regression coefficients. Non-parametric tests: Sign test, Mann-Whitney Wilcoxon U-test, run test and test of randomness. One-way and two-way analysis of variance. Time series analysis, reliability and life testing experiments in engineering problems.

MSC 51101: Management and Organizational Behaviour

Management: Definition, The Evolution of Management Thought, Task & Responsibilities of a Professional Manager; Functions of a Manager; Management Style; Managerial Decision Making; Corporate Social Responsibility; Schedule VII in Section 135 of Companies Act, 2013 relating to CSR; Introduction to corporate governance; Ethics in Management. Dimensions of Organizational Structure; Types; Determinants; Motivation, communication and leadership

MSC 51102: Accounting for Managers

Introduction to Accounting, Accounting equation, Preparation of Budget and Budgetary control, Analysis of Financial Statements, Comparative Statements, Common Size Statements, Ratio Analysis, Du-Pont Analysis, Introduction to Cost and Management Accounting, Cost concepts: Absorption & Marginal Costing, Behaviour of Costs, CVP Analysis, Standard Costing and Variance analysis,

MSC 51103: Operations Research - I

Application of Operations Research Models in Management Decision problems; Classification of Decision making situations: Pay-off matrix, Opportunity Cost Matrix, Decision Making under risk and uncertainty; Linear Programming Model and its applications, Solution methods, Duality theory and applications, Post-Optimality Analysis; Transportation and Assignment Problems-solutions Methods; Non-Linear programming models and applications; Concepts and principles of Network Analysis; Concept of Game Theory; Replacement Analysis.

MSC 51104: Productivity and Quality Management

Productivity Management: Concept of Productivity – Partial and Total Productivity, Models for Productivity measurement. Productivity management cycle, Method Study, Work measurement techniques, Incentive Plans, Quality Management – Contributions of Juran, Deming, and Crossby, Quality control tools and techniques.

Ergonomics: Concept and scope of Ergonomics. Assessment of human capabilities and limitations. Human physiological work capacity, Energy cost of Job, recommended energy expenditure levels – case discussion, Environmental Ergonomics: Work environmental stressors, Human error and accidents.

MSC 51105: Managerial Economics (SESSIONAL)

Fundamentals of Economics, Microeconomics and Macroeconomics, Marginal Analysis and Time Value of Money, Firm - Meaning and Objectives, Demand and Supply Analysis, Utility Analysis, Production and Cost Analysis, Market Analysis, Price Discrimination, Pricing Strategies, Public Goods and Externalities, Asymmetric Information, Economics of Uncertainty and Risk.

MSC 51106: Legal Aspect of Business (SESSIONAL)

The Indian Contract Act, 1872, Nature, offer and acceptance consideration, Agreement vis-à-vis contract, void agreement & void able contract, Capacity to contract, Free Consent, Legality of Object, Agreement not declared void, Contingent contracts, The Companies Act, 1956, Modification in Companies Act, Companies Act, 2013, Nature of Company, Registration & Incorporation, MOA, Articles of Association its relation with memorandum of Association, Prospectus, Membership, Kinds of Share Capital, Debentures, Directors-Position, Appointment, Removal, Power & Duties, Majority Powers and Minority Rights, Prevention of Oppression and Mis-management, Compromises Arrangements and Reconstructions and Winding Up, Laws of Partnership, Nature, Relations and Dissolutions, Introduction to Industrial Law, Employee Provident Fund and Payment of Gratuity Act, 1972, The Consumer Protection Act, 1986, Definitions of Consumer, Person, Goods, Service, Trader, Manufacturer, Unfair and Restrictive Trade Practices, The Information Technology Act, 2000, Digital Signature, Electronic Governance, Electronic Records, Certifying Authorities, Introduction to Corporate Tax Planning, Direct Taxes: Income Tax, Corporate Tax, Indirect Taxes: GST, VAT, Central Excise, Incidence and Impact, Recent Developments in Tax Policy.

MSC 51201: Productivity Management (Practical).

The practical classes will be held in the following areas of Work Study and Human Factor Engineering:

- Method Study
- Application of Principles of Motion Economy
- Work Measurement
- Anthropometry and Isometric Strength Data Base
- Assessment of human capabilities and limitation
- Assessment of physical work capacity/aerobic power
- Assessment of work environmental stress and its impact/effect.

MSC 51202: Personality Development Lab.

Concept of Personality, Understanding Personality: nature and Nurture Debate, Personality and human behavior, approaches Personality Development, normal vs. abnormal personality, measuring personality: projective and subjective tests, psychometric techniques, behavioral modification techniques for Personality Development: anxiety, stress and cognitive appraisal, communication, inter-personal skills and emotional intelligence, Personality Development and Managerial Effectiveness.

SEMESTER II

MSC 52101: Corporate Finance

Introduction to Financial Management, Time Value of Money, The Cost of Capital, Basics of Capital Budgeting, Leverage, Management of Working Capital, Introduction to Optimal Capital Structure, Sources of Finance, Introduction to Dividend Decisions.

MSC 52102: Production and Materials Management

Introduction to Production Management, Operations Strategy, Product Design, Process Design, Facility Layout, Facility Location, Forecasting Models, Production Planning and Control – Aggregate Planning, Job Shop Scheduling.

Materials Management – Functions & Objectives, Purchasing policy and sourcing strategies, Supplier Rating, Selection and Development, Stores Management Principles and Practices, Inventory management and techniques – EOQ Models, Learning Curve, MRP I, MRP II & ERP, JIT systems.

MSC 52103: Supply Chain Management & Logistics

Supply Chain Management – genesis, definitions and basic structure, Value Chain concept, Relevant issues in supply chain, Strategy formulation, Product type- Supply Chain Matrix, Strategic sourcing and management of supply, Suppliers evaluation and development, Outsourcing strategy.

Logistic Management – functions and basic issues, Indian Scenario, Areas of logistical decision making, Design of transportation network, Warehousing, Introduction to e-commerce, Performance measurement of Supply Chain Management.

MSC 52104: Project Management

Project Management– an Overview, Project Life Cycle, Feasibility Study, Market and Demand Analysis, Technical Analysis, Financial Analysis, Social Cost-Benefit Analysis, Detailed Project Report.

Project Planning and Scheduling- Planning Time Scales, Project Planning using Network techniques, Scheduling of Project with Limited Resources, Implementation and Control, Project Organization, Project Management Information Systems, Basics of Software Project Management.

MSC 52105: Operations Research – II

Integer Programming and its application in Decision Making, Solution Methodologies, Zero-one programming; Dynamic Programming: Principle of Optimality, Concepts of State and Stage, Solution of Discrete and Continuous Dynamic Programming Problems; Introduction to Markov Process; Queuing Theory: Definitions & Classification, Applications; Discrete-event Simulation and its applications; Concept of Multi Criteria Decision Making; Decision Tree; Introduction to Stochastic Programming Model.

MSC 52201: Software Laboratory

- Spreadsheet (EXCEL) based applications using built-in functions and Analysis tools
- Application of Statistical Tools and Techniques.
- Financial modeling using EXCEL.
- Operations Research Models, Sensitivity Analysis, Monte Carlo Simulation.
- Use of Application packages like **SPSS, MINITAB, LINDO** and **LINGO**.
- Project Management Software like, Primavera.

LIST OF ELECTIVES (ANY TWO)

MCE 52105: Advanced Manufacturing Systems

Group Technology: Concepts, applications, Opitz system of classifications, merits and demerits. Cellular Manufacturing system(CMs): Principle of cell formations, applications, different methods of cell formations, Scheduling in CMS, merits and demerits., Assignment scheduling and sequencing problems, Lean Manufacturing: concepts, implementation methodology, case studies, Agile Manufacturing: Definition, agility, method of implementation, relationship between lean and agile manufacturing, Concepts of Flexible manufacturing system (FMS), components of FMS, FMS layouts and design, Computer Integrated Manufacturing system(CIM): Concepts, applications.

MCE 52108: Quality Engineering and Management

Introduction, Acceptance Sampling, Control Charts, Types of Control Charts, X-Chart, p-Chart, Control charts for attributes, Need for TQM, evolution of quality, definition of quality, TQM philosophy, Contribution of Deming, Juran, Crosby and Ishikawa. TQM Models, Vision, Mission, Quality policy and objective, Planning and Organisation for quality, Quality policy development, Quality Function Deployment, Introduction to BPR and analysis of Quality Costs, TQM principles – customer focus, leadership and top management commitment, employee involvement, empowerment and team work, Supplier Quality Management, continuous process improvement, Training, performance measurement and customer satisfaction, TQM tools and techniques – the seven tools of quality, new seven tools, concept of six sigma, FMEA, benchmarking, JIT, poka yoke, 5S, kaizen, quality circles, Quality Systems – Need for ISO 9000 systems, clause, documentation, implementation, introduction to ISO 14000 and OSHAS 18000. Implementation of TQM, Case studies.

MSE 52101: Human Resource Management

Definition and Concept; Challenges of HRM; HR as a factor of Competitive Advantage; Human Resource Planning; Job Analysis, Job Description, Recruitment and Selection; Performance Appraisal: Process and pitfalls; Compensation: Types & benefits; Maintenance & Separation; Training & Development; Gender Issues at work place.

MSE 52102 Analytics and Business Forecasting

An Introduction to econometric modeling and business forecasting, Regression based forecasting: Bivariate Model and Multivariate Model, Assumptions and Tests, Specification and Measurement Errors, Interpolation and Extrapolation, Multicollinearity and Serial Correlation, Heteroskedasticity, Dummy Variable Modeling, Panel Data Modeling, Simultaneous Equation Modeling, Time series based forecasting, Basic Features of Time Series, Forecasting by Decomposition Method and Smoothing Technique, Box Jenkins Methods.

MSE 52103 Marketing Research

Basic Concepts, Marketing Research Process, Sources of Information, Experiment and Survey Design, Multivariate Techniques for Marketing Research – Multiple Regression, Multiple Discriminant Analysis, Factor Analysis, Cluster Analysis, Conjoint Analysis, Multiple Dimensional Scaling.

MSE 52104 Infrastructure and Project Finance

An Overview of Infrastructure and Project Finance, Project Finance in Developing Countries, The Importance of using project Finance, Concept of Capital Budgeting, Time Value of Money, Cost of Capital, Concept of Risk & Return and calculation of required rate of return for a Project: Project Identification and Feasibility Studies, Preliminary Screening,

Analysis: Market, Technical, Financial, Economic and Environmental Analysis: Financial Analysis: Estimation of Cost of Project: Estimation of Cash Flows of the Project, Elements of the cash flow stream, Basic principles of cash flow estimation, Biases in Cash Flow estimation. Financial Estimates and Projections: Projection of Profit, Projection of Cash Flow Statement, Projection of Balance Sheet. Financing Of Projects: SEBI Guidelines on Project Financing in India, Sources: Equity, Debentures and Term Loans from Financial Institutions, Policies and practices of Indian Financial Institutions

MSE 52105 Marketing Management

Marketing Concepts – Approaches to Marketing/ Marketing Mix –Functions of Marketing- Marketing Environment– The changing marketing environment – Analyzing needs and trends in Macro Environment and Micro Environment - The Marketing Process - Market Segmentation , Market Targeting and positioning strategies, B2B and B2 C marketing, New Product Development, Packaging – Purpose, Types and New Trends in packaging, Product Life Cycle, Physical Distribution – Importance and role of distribution in marketing, Introduction to the various channels of distribution –Promotion Tools – Sales Promotion, Advertising, Personal Selling, Direct Marketing and Online Marketing, Pricing Integrated Marketing Communication, Branding and Packaging, Recent Trends in Marketing.

MSE 52106 Industrial Marketing

Basics of Industrial Marketing, Industrial Markets and Environment, Industrial buyer behaviour, STP framework in industrial market, Product strategy and new product development, industrial distribution channels, Communications for Industrial market, Industrial pricing strategies and policies, International industrial marketing.

MSE 52107 System Dynamics

Systems Concept and System Dynamics, Evolution of System Dynamics as a System Enquiry Methodology, Physical and information flows, causality and its interpretation, Causal loop diagramming. Flow diagramming, Level and rate configurations, Principles of modeling, Behavioural characteristics of low order systems, Smoothing of information, Exponential delays, Response characteristics of smoothing and delay functions, Model formulation, Simulation of system dynamics models, Software packages for System Dynamics Simulation, Model validation, Policy design, Some applications of system dynamics methodology to policy design problems in industrial, economic, social, environmental, and technological systems etc.

MSE 52108 Services Operations Management

Matrix of Service Characteristics, Challenges in Operations Management of Services, Aggregate Capacity Planning for Services, Facility Location and Layout for Services, Job and Work Design- Safety and Physical Environment, Effect of Automation, Operations Standards and Work Measurement, Measurement and Control and improvement of Quality of Services, Concept of a Total Quality Service, Dynamics of Service Delivery System, Aggregate Planning for Services, Scheduling for Service Personnel and Vehicles, Inventory Management in Services, Supply Chain and Distribution of Services, Total Productive Maintenance (TPM) in Services, Case Studies of Exemplary Professional Services.

MSE 52109 Personnel Management & Industrial Relations

Personnel Management: Nature & Evolution, Personnel as a Specialist Function, Qualities of a Personnel Manager, Personnel Policies, , Discipline & Grievance Procedure: Definition, Disciplinary Procedure Model, Termination of Employment: Retirement, Resignation & Termination of Contract, Layoff & Exit Interview, Dealing with Human Aspects of Termination, Cases in Indian & International Context.

Industrial Relations: Definition, Approaches to IR, Parties to IR, Industrial Worker in India: Profile of Indian Workers in India, Problems of Industrial Workers: Absenteeism, Commitment, Work Ethics, Industrial Dispute: Causes, Types, Settlement of Disputes, Collective Bargaining: Prerequisites, Process, Growth of Collective Bargaining in India, Workers Participation in Management: Concept, Purpose, Workers Participation Scheme in India Trade Unions: Origin, Growth, Structure, Problems in India Labour Welfare: Concept, Purpose, Statutory & Non-Statutory Provisions: Contract Labour Act 1970, Laws related to Remuneration: Payment of Wages Act 1936, Minimum Wages Act 1948, Payment of Bonus Act 1965, Equal Remuneration Act 1976, Laws related to Industrial Relations: Industrial Disputes Act 1946, Industrial Employment (Standing Orders) Act 1946, Trade Union Act 1926, Laws related to Social Security: Workmen Compensation Act 1926, Employee State Insurance Act 1948, Employee Provident Funds & Miscellaneous Provisions Act 1952, Maternity Benefit Act 1961, Payment of Gratuity Act 1972, Current Developments & Amendments in various Laws.

MSE 52110 Soft Computing

Soft Optimization Methods: Genetic Algorithm, Simulated Annealing, Neural Network and Heuristic Programming Methods.