

FACULTY OF ENGINEERING

Syllabus for the
M.E. (Industrial Engineering)
(w.e.f 2008-2009)

UNIVERSITY OF PUNE

THE SYLLABUS IS PREPARED BY:

**BOS- Production & Industrial Engineering,
University of Pune**

PEER REVIEW BY:

- Prof. K. N. Nandurkar, (Chairman)
Principal,
K. K. Wagh Institute of Engineering Education & Research, Nashik-03
- Shri G. C. Singhal,
Managing Director,
Pragya Technologies (India) Pvt. Ltd., Pune.
- Mr. Jayant Deo,
Consultant, Deo & Associates, Pune
- Dr. Shailesh Deshpande,
Director,
Intellection Software & Technologies Pvt. Ltd., Pune
- Dr. S. K. Basu,
Prof. Emeritus College of Engineering, Shivaji nagar, Pune
- Shri A. V. Joshi,
Unique Systems, Management Consultants, Pune

UNIVERSITY OF PUNE
COURSE STRUCTURE FOR
ME (Industrial Engineering) (2008 Course)

SEMESTER- I

CODE	SUBJECT	TEACHING SCHEME		EXAMINATION SCHEME					CREDITS
		Lect.	Pr.	Paper	TW	Oral	Pr	Total	
511201	Economics	3		100	-	-	-	100	3
511202	Work Study & Ergonomics	3		100	-	-	-	100	3
511203	Optimization Techniques & Simulation Modeling	3		100	-	-	-	100	3
511204	Elective I	3		100	-	-	-	100	3
511205	Elective II	3		100	-	-	-	100	3
511206	Lab Practice I	-	6	-	50	-	-	50	3
511207	Seminar I	-	4	-	50	-	-	50	2
Total of First Term		15	10	500	100	-	-	600	20

SEMESTER- II

CODE	SUBJECT	TEACHING SCHEME		EXAMINATION SCHEME					CREDITS
		Lect.	Pr.	Paper	TW	Oral	Pr	Total	
511208	Reliability Engineering & Research Methodology	3		100	-	-	-	100	3
511209	Costing & Finance	3		100	-	-	-	100	3
511210	Productivity Management	3		100	-	-	-	100	3
511211	Elective III	3		100	-	-	-	100	3
511212	Elective IV (Open)	3		100	-	-	-	100	3
511213	Lab Practice II	-	6	-	50	-	-	50	3
511214	Seminar II	-	4	-	50	-	-	50	2
Total of Second Term		15	10	500	100	-	-	600	20

SEMESTER- III

CODE	SUBJECT	TEACHING SCHEME		EXAMINATION SCHEME					CREDITS
		Lect.	Pr.	Paper	TW	Oral	Pr	Total	
611201	Seminar III	-	4	-	50	-	-	50	2
611202	Project Stage I	-	18	-	50	-	-	50	6
Total of Third Term		-	22	-	100	-	-	100	08

SEMESTER- IV

CODE	SUBJECT	TEACHING SCHEME		EXAMINATION SCHEME					CREDITS
		Lect.	Pr.	Paper	TW	Oral	Pr	Total	
611203	Project Stage II	-	18	-	150*	50	-	200	12
Total of Fourth Term		-	18	-	150	50	-	200	12

*- The term Work of Project Stage II of Semester IV should be assessed jointly by the pair of internal & external examiners along with the oral examination of the same.

Note- The Contact Hours for the calculation of load of teacher Seminar- 1 Hr / week / student &
Project- 2 Hr / week / student

Elective I

- A. Marketing Management
- B. Human Resource Management
- C. Entrepreneurship Development
- D. World Class Manufacturing

Elective II

- A. Facilities Planning
- B. Network & Project Management
- C. Enterprise Resource Planning & Supply Chain Management
- D. Systems Engineering

Elective III

- A. Human Factors Engineering
- B. Process Planning & Manufacturing Engineering
- C. Management of Service Sector
- D. Industrial & Commercial law

Elective IV

- A. Organizational Behavior
- B. Operations Management
- C. Product Design & Intellectual Property Rights
- D. Environmental Engineering & Energy Management.

M. E. – Industrial Engineering 2008

Subject Code: 511201

Economics

Teaching Schedule:

[Hours / week]

Lectures: 3

Examination Scheme:

[Maximum Marks]

Paper: 100

Credits: 3

Basic Concepts of Price Theory, Law of Demand and Elasticity of Demand, Microeconomics: Theory of Consumer Behavior and demand, law of reducing returns.

Competition – types, equilibrium under perfect competition. Macroeconomics: Inflation and Unemployment, Investment demand, Fiscal Policy, Functions of Money,

Performance of Indian Economy since 1951, Technological changes, Economic growth and development, population, unemployment, poverty; Current Economic Situation, National Product and Income, Consumption, Savings. Foreign Trade, Balance of Payment, Devaluation.

Industrial Development in India – Contribution of Public Sector & Private Sector, problems, sickness – reasons and solution, Industrial Policy – Licensing, MRTP and Competition Act, policy for Small Scale Sector, Disinvestment.

International Trade – Composition of Trade, Trends in the international trade, trade deficit, Globalization – advantages and shortcomings, its effect on Indian Economy.

Role of World Bank, IMF, Asian Development Bank, European Union, ASEAN on Indian Economy.

References:

1. S. C. Kuchal, Indian Economy,
2. Dr. S. N. Maheshwari, Financial Management, Sultan Chand & Sons, New Delhi,
3. Dr. R. L. Varshney and Dr. S. Bhashyam, International Financial Management, Sultan Chand & Sons, New Delhi,
4. Karl Case, Ray Fair, Principles of Macro Economics, Feb 2008 ISBN13:9780132322911, ISBN10: 0132322919, Pearson Publication, UK
5. Roger Miller, Understanding Modern Economics, Jan 2008, ISBN13: 9780321245823 ISBN10: 0321245822 Pearson Publication, UK
6. Biplab Dasgupts, Globalisation, Sagar Publications,
7. Edgardo Favaro, Ashok K Lahiri, Fiscal Policies and Sustainable Growth in India, Oxford University Press.
8. Goodwin And Nelson And Ackerman And Weis, Academic Internet Publisher, 142881017X

Work Study & Ergonomics

Teaching Schedule:
[Hours / week]
Lectures: 3

Examination Scheme:
[Maximum Marks]
Paper: 100
Credits: 3

A – Work Study

1. Introduction: Industrial Engineering – Historical Background. Contributions by F. W. Taylor, Frank Gilbreth. Basic Techniques involved.
2. Method Study: Need for recording the activities, Symbols used in charting, Various charts, Questioning Technique, Process Improvements, Installation of Improved Processes.
3. Work Measurement: Aim, Time Study, Work / Activity Sampling, Predetermined Time Standards, MTM-1.

B- Ergonomics

1. Definition and importance. Historical Background. Human Machine Systems – interfaces.
2. Anthropometry: Need, Important Body Dimensions, Data Collection, Statistical Analysis, Percentile
3. Applied Anthropometry and Work Space Design & Seating:

References:

1. ILO, Introduction to Work study
2. Curie R. M. & Faraday, Work study
3. M. S. Sanders and Ernest J. McCormick, Human Factors Engineering and Design. McGraw Hill Inc
4. E. Grad jean, Fitting Task to the Man.

Optimization Techniques and Simulation Modeling

Teaching Schedule:

[Hours / week]

Lectures: 3

Examination Scheme:

[Maximum Marks]

Paper: 100

Credits: 3

Introduction to various optimization techniques and models in operations research, Review of LP concepts, Maximization and minimization solution methods.

Introduction to Integer programming, problem solving using cutting plane, branch and bound method, introduction to goal programming

Queuing theory:

Introduction, classification of queuing models, various models in queuing, problems related to various models, applications of different models in different situations.

Non- linear programming: search methods, stochastic programming, separable programming, fractional programming, decomposition principle, mixed integer programming

Simulation:

Introduction, continuous and discrete simulation, introduction to discrete event simulation, Monte Carlo Simulation, problem solving for single server model. Calculation of WIP for more than one service stations, inventory simulation.

Introduction to simulation softwares like ProModel, Witness, etc. Problem solving using any one software

References:

1. Operations Research: Ravindran and Philips, McGraw-Hill, Fifth Edition(1990)
2. Operations Research – An Introduction; 7e, Pearson Education/ PHI – 2002
3. Operations Research; S. Chand & Company Ltd., Ram Nagar, New Delhi

M. E. – Industrial Engineering 2008

Subject Code: 511204 A - Elective I

Marketing Management

Teaching Schedule:

[Hours / week]

Lectures: 3

Examination Scheme:

[Maximum Marks]

Paper: 100

Credits: 3

The Objectives of the marketing course are

- i) to sensitize the students about importance and structure of marketing function in industrial organizations.
- ii) to help students understand the environment in which marketing decisions are taken and implemented along with the factors which impact its effectiveness.
- iii) to provide conceptual model of influence of marketing decisions on manufacturing / operations function of industrial organizations.

Marketing philosophy of business, an industrial marketing perspective, Understanding and monitoring the environment

Understanding consumer's decision processes, analyzing Consumer Behavior, perspectives of organizational buyers in industrial markets

Gathering marketing information, segmenting markets and positioning products, formulating marketing strategies, planning marketing programmes, managing products

Developing new products, marketing intermediaries, managing market logistics, Price theories, Establishing and managing prices, designing and managing product promotions

Managing sales force and sales territories, Services marketing, marketing and technological innovations, Non-profit and social marketing

Marketing research and its importance, scope, structure and methods, role of quantitative techniques and tools in marketing research.

References:

1. Marketing Management - Philip Kotler
 2. Fundamentals of Marketing - Stanton
 3. Marketing Management - V.S.Ramaswamy and S.Namakumari
 4. Principles of Marketing (9th Edition) - Philip Kotler and Gary Armstrong
 5. Marketing - Bovee and John Thill
 6. Marketing Models – Lilien, Kotler & Moorthy
 7. Case Studies in Marketing - Indian context - R.Srinivas
- Instructor is also expected to discuss minimum of 5 cases on marketing decisions.

M. E. – Industrial Engineering 2008

Subject Code: 511204 B - Elective I

Human Resource Management

Teaching Schedule:

[Hours / week]

Lectures: 3

Examination Scheme:

[Maximum Marks]

Paper: 100

Credits: 3

Human Resources Management - Introduction and Importance - Evolution - Difference between Personnel Management and HRM - Role of HR Manager - Structure of HR Department - Duties and responsibilities of HR Manager

HRD Systems - Evolution - Goals - Elements and their interrelationship - HR Strategies - HR Strategies and Organizational Strategies

Manpower Planning - Objectives - Estimating manpower requirement - Recruitment and selection process - Main resources of recruitment - Assessment Devices - Retention of manpower - Succession Planning
Merit Rating - Promotions - Transfers - Job Description - Job Evaluation - Job Enlargement - Job Enrichment - Job Rotation

Training and Development - Training Process and Methodology - Need and objectives - Training Procedure - Methods of Training - Tools and Aids - Evaluation of Training Programmes

Performance Appraisal Management System - Definition, Ethics and Concepts of Performance Management - Different methods of Performance Appraisal - Rating Errors

Retirement / Separation - Kinds of Retirement - Resignation, Discharge, Dismissal, Suspension, Retirement, Layoff, Voluntary Retirement / Separation Schemes, Golden handshake. Role of HRD in developing Industrial Relations - Concept - Industrial Democracy - Industrial Peace

References:

1. Human Resource Management - Garry Dessler
2. Personnel Management - C. B. Mamoria
3. Managing Human Resources - R. S. Dwiwedi
4. Human Resource Management - B. P. Michael
5. Human Resource Management - De. P. C. Pardeshi
6. Human Resources Management - Mirza & Saiyadin
7. Managing Human Resources - Arun Monappa

M. E. – Industrial Engineering 2008

Subject Code: 511204 C - Elective I

Entrepreneurship Development

Teaching Schedule:

[Hours / week]

Lectures: 3

Examination Scheme:

[Maximum Marks]

Paper: 100

Credits: 3

The Entrepreneurial Development Perspective

1. Concepts of Entrepreneurship Development
2. Evolution of the concept of Entrepreneur
3. Entrepreneur Vs. Intrapreneur, Entrepreneur Vs. Entrepreneurship, Entrepreneur Vs. Manager
4. Attributes and Characteristics of a successful Entrepreneur
5. Role of Entrepreneur in Indian economy and developing economies with reference to Self-Employment Development
6. Entrepreneurial Culture

Creating Entrepreneurial Venture

1. Business Planning Process
2. Environmental Analysis - Search and Scanning
3. Identifying problems and opportunities
4. Defining Business Idea
5. Basic Government Procedures to be complied with

Project Management

1. Technical, Financial, Marketing, Personnel and Management Feasibility
2. Estimating and Financing funds requirement - Schemes offered by various commercial banks and financial institutions like IDBI, ICICI, SIDBI, SFCs
3. Venture Capital Funding

Entrepreneurship Development and Government

1. Role of Central Government and State Government in promoting Entrepreneurship - Introduction to various incentives, subsidies and grants - Export Oriented Units - Fiscal and Tax concessions available
2. Role of following agencies in the Entrepreneurship Development - District Industries Centers (DIC), Small Industries Service Institute (SISI), Entrepreneurship Development Institute of India (EDII), National Institute of Entrepreneurship & Small Business Development (NIESBUD), National Entrepreneurship Development Board (NEDB)

Why do Entrepreneurs fail - The FOUR Entrepreneurial Pitfalls (Peter Drucker)

Women Entrepreneurs

1. Reasons for Low / No Women Entrepreneurs
2. Role, Problems and Prospects

Case studies of Successful Entrepreneurial Ventures, Failed Entrepreneurial Ventures and Turnaround Ventures

References:

1. Entrepreneurship: New Venture Creation - David H. Holt
2. Entrepreneurship - Hisrich Peters
3. The Culture of Entrepreneurship - Brigitte Berger
4. Project Management - K. Nagarajan
5. Dynamics of Entrepreneurship Development - Vasant Desai
6. Entrepreneurship Development - Dr. P.C.Shejwalkar
7. Thought Leaders - Shrinivas Pandit
8. Entrepreneurship, 3rd Ed. - Steven Brandt
9. Business Gurus Speak - S.N.Chary
10. The Entrepreneurial Connection - Gurmit Narula

M. E. – Industrial Engineering 2008

Subject Code: 511204 D - Elective I

World Class Manufacturing

Teaching Schedule:
[Hours / week]
Lectures: 3

Examination Scheme:
[Maximum Marks]
Paper: 100
Credits: 3

Industrial Decline and Ascendancy

Manufacturing excellence - US Manufacturers - French Manufacturers - Japan decade - American decade
- Global decade

Building strength through customer - Focused principles

Customer - Focused principles - General principles - Design - Operations - Human resources - Quality
and Process improvement - Promotion and Marketing

Value and Valuation

Product Costing - Motivation to improve - Value of the enterprises

Quality

The Organization : Bulwark of stability and effectiveness - Employee stability - Quality Individuals Vs.
Teams - Team stability and cohesiveness - Project cohesiveness and stability

Strategic Linkages

Product decisions and customer service - Multi-company planning - Internal manufacturing planning -
Soothing the demand turbulence. Introduction to Biotechnology and Nanotechnology.

Impediments

Bad plant design - Mismanagement of capacity - Production Lines - Assembly Lines - Whole Plant

Remaking Human Resource Management

Associates - Facilitators - Teamsmanship - Motivation and reward in the age of continuous improvement

References:

1. Operations Management for Competitive Advantage - Chase
2. Making Common Sense Common Practice - Moore
3. Managing Technology & Innovation for Competitive Advantage - Narayanan
4. Just In Time Manufacturing - M.G.Korgaonkar
5. World Class Manufacturing - B.S.Sahay
6. World Class Manufacturing – Schonberger
7. Soichio Nagashima, 100 Management Charts, Asian Productivity Press, Tokyo

Facilities Planning

Teaching Schedule:

[Hours / week]

Lectures: 3

Examination Scheme:

[Maximum Marks]

Paper: 100

Credits: 3

1. Facilities planning and industrial engineers-An overview, Facilities planning and supply chain management, Facilities planning and Engineering economic analysis, Facilities location problems-application of various analytical approaches, single/multiple facility location problems, Discrete/continuous location problems, Quadratic assignment problems, minimax location problems and covering problems.
2. Facilities design problems-Structural design, layout design including computerized layout planning and handling system design. Warehouse Management,
3. Application of classical industrial engineering concepts to facilities planning-Work system design including method study and ergonomics; Value engineering.
4. Business Process Reengineering, Value added management, Management System Audit.
5. Appreciation of issues related to facilities planning in conventional and new manufacturing systems. Appreciation of issues related to facilities planning in the context of management of technology. Appreciation of the relationships between competitive strategies, building core competence and facilities planning,
6. Facilities planning and TPM / TQM, Case studies using various concepts and techniques of Operations Research. Planning in service sector. Role of SGA's like KAIZEN, QC and POKA YOKE in facilities planning.

References:

1. R.L Francis and J.A White (1974), Facilities layout and location-An analytical approach, Prentice Hall Inc.
2. J.A Tomkins and J.A White (1984), Facilities Planning, John Wiley & sons.
3. M.E Porter (1985), Competitive Advantage, The Free Press.
4. D.K. Carr and H.J Johansson (1995), Best practices in Reengineering, McGraw Hill, Inc.
5. K.K.Humphreys (1991), Jelen's Cost and Optimization Engineering, McGraw Hill,International.
6. P.Cheekland (1981), Systems thinking, Systems Practice, John Wiley & sons.
7. B.W. Niebel (1972), Motion and Time study, Richard Irwin.
8. L.D.Miles (1971), Techniques of Value analysis and Engineering, McGraw Hill.

9. K.Hitomi (1996), Manufacturing Systems Engineering; Viva Books Pvt Ltd, India.
10. A.W. Law and W.D.Kelton (1991), Simulation Modeling and Analysis, McGraw Hill International Edition
11. G.F.Bell and J Balkwill (1998), Management in Engineering, Prentice Hall India.
12. J.M.Apple (1972), Plant Layout and Material Handling, McGraw Hill.

Network and Project Management

Teaching Schedule:

[Hours / week]

Lectures: 3

Examination Scheme:

[Maximum Marks]

Paper: 100

Credits: 3

Introduction to Networks, deriving networks on the basis of graph theory, Maximal flow minimal cut theorem, applications of networks in operations research. Various models in OR which can be solved using networks techniques.

Multi-terminal Maximal flows, Multi-terminal shortest paths. Multi commodity flows. Synthesis of networks.

The general minimal cost flow problem, Minimal cost calculation, Network simplex Method.

Matching problems and the bottleneck assignment problem. Application to vehicle routing problems. Determination of size and schedules for transportation fleets.

Synchronization of signalized interactions, Project Scheduling with resource constraints,

Network flows in the economy, Input-output analysis.

References:

1. Philips, Ravindran; Network theory,
2. R. T. Rockafellar (1984), Network Flows and Monotropic Optimization, Wiley.
3. R. K. Ahuja, T. L. Magnanti, and J. B. Orlin (1993), Network Flows: Theory Algorithms and Applications, Prentice Hall.
4. M. S. Bazaraa, J. J. Jarvis, and H. D. Sherali (1990), Linear Programming and Network Flows, 2nd Edition, John Wiley, New York.
5. L. R. Ford, and D. R. Fulkerson (1962), Flow in Networks, Princeton University Press, Princeton.

Enterprise Resource Planning and Supply Chain Management

Teaching Schedule:

[Hours / week]

Lectures: 3

Examination Scheme:

[Maximum Marks]

Paper: 100

Credits: 3

Evolution of ERP – Removal of distance and time, paperless management, Concept of MRP1, MRP2, ERP 1, ERP 2. Introduction to ERP software like SAP, BAAN, ORACLE, Modules in ERP

Logistics - Concept and significance - Distribution Strategies - Customer Service policies and Integrated Logistics Management. Transportation Alternatives - Railway, Road, Air, Waterways, Pipe Lines, Animals and Animal driven vehicles - Economics of transportation - Applications of Quantitative Techniques - Transportation Models

Distribution Network Planning system - Location - Number and size of facilities - Stocking Policies - Storage and handling capacities - Introduction to State and Central Warehouse Acts like Packaging Commodities Order under the Weights and Measures Act.

Packaging - Principles, functions and types - Containerization - Concepts - Infrastructure - Customs Issues - Service Utilization Modes - Rail, Sea and Road. Role of Freight and Insurance in Logistics

Concept of Supply Chain Management and its strategic role in the organization - Intra and Inter Organization Supply Chain, Designing of efficient supply chain policies - Bottlenecks and remedies

Integration of supply chain with corporate strategy - Cost efficiency across supply chain - Impact on Customer Service. Role of computer and IT in supply chain

References:

1. Purchasing & Supply Management - Dobler and Burt
2. Strategic Logistics Management – Lambert
3. Logistical Management - The Integrated Supply Chain Process – Bowersox
4. Logistics & Supply Chain Management – Christopher
5. Supply Chain Management - Sunil Chopra
6. Logistics & Supply Chain Management – Raghuram
7. Supply Chain Management for 21st Century – Sahay
8. The Weights and Measures Act.

M. E. – Industrial Engineering 2008

Subject Code: 511205 D – Elective II

Systems Engineering

Teaching Schedule:

[Hours / week]

Lectures: 3

Examination Scheme:

[Maximum Marks]

Paper: 100

Credits: 3

History and evolution of software engineering: software engineering as a discipline, Information systems and their ramifications.

Software development life cycles: waterfall, prototyping, incremental, spiral, concurrent, reuse, and formal models.

Requirement analysis, user requirements, functional and non-functional requirements, tools for requirement analysis, document flow charts, decision tables, data flow diagrams, data dictionaries,

Tools for analysing real time systems, Use case diagrams, system sequence diagrams, CRC card, software requirement specification.

Software design: the design process, function-oriented design, data base oriented design, object oriented design, data base design, user interface design, output design. Coding: Code documentation, data declaration, statement construction, guidelines for input/output, efficiency with regard to code, memory and input/output.

Testing: Unit testing, black box and white box testing, program flow graphs, test cases, integration testing, top-down and bottom-up testing, validation testing, alpha and beta testing, system testing, security testing, performance testing.

Maintenance: software reliability, availability, and maintainability, Reliability models. Legal Issues; Hardware and Software Acquisition procedures.

References:

1. Software Engineering: Roger S. Pressman, Prentice Hall, 5th Edition.
2. Systems Engineering: Davis and Olson

M. E. – Industrial Engineering 2008

Subject Code: 511206

Lab Practice I

Teaching Schedule:

[Hours / week]

Practical: 6

Examination Scheme:

[Maximum Marks]

TW: 50

Oral: 50

During these 6 hours per week, student is expected to undertake two assignments each from the three compulsory subjects and one assignment each from the two elective subjects.

Performance will be valuated both on the basis of submission and oral.

M. E. – Industrial Engineering 2008

Subject Code: 511207

Seminar I

Teaching Schedule:

[Hours / week]

Practical: 4

Examination Scheme:

[Maximum Marks]

TW: 50

Oral: 50

A student is expected to select a topic relevant to any area of Industrial Engineering, but the topic should not be directly related to any of the subjects being covered in this semester.

The seminar should be either based upon research material published elsewhere or on case studies.

Reliability Engineering & Research Methodology

Teaching Schedule:

[Hours / week]

Lectures: 3

Examination Scheme:

[Maximum Marks]

Paper: 100

Credits: 3

Reliability: Definition, stochastic processes, bathtub curve, Maintainability and availability, success and failure models, MTBF, MTTR, hazard rate, probability distribution function

Exponential and Weibull models, System reliability-Series, parallel and standby system, redundancy

Reliability testing, types of tests, standard life testing plans, accelerated life testing, system safety analysis-FMECA, risk priority number and its allocation

Correlation and Regression analysis: Simple, Partial and multi-variate

Role and process of research, Problem Formulation, Types of research designs, Data collection methods and forms, Sampling technique and data analysis

Research reports and marketing intelligence, Role of computers and software in research planning and carrying out research projects

References:-

1. Juran, Quality Control Handbook
2. Kaoru Ishikawa, Guide to Quality Control
3. Amtava Mitra, Quality Control and Improvement
4. Shrinath, Reliability Engineering
- 5 Basu S. K., Terotechnology -Reliability Engineering and Maintenance

M. E. – Industrial Engineering 2008

Subject Code: 511209

Costing and Finance

Teaching Schedule:

[Hours / week]

Lectures: 3

Examination Scheme:

[Maximum Marks]

Paper: 80

Credits: 3

Costing:

1. Significance of Costing for Engineers. Limitations of Financial Accounting. Corporate Objectives - Profitability and other objectives. Product, Services and Market Mix. Elements of Cost – Material, Labour, Expenses. Overheads. Direct and Indirect Cost, Fixed and Variable cost, other classifications.
2. Cost Allocation: Cost Accumulation and Allocation. Allocation of cost of Service Departments- Reciprocal Method, allotting cost from one department to other.
3. Depreciation as a cost – various methods of calculation. Joint and by-product cost – Joint cost problems. Treatment of by-product costs. Decision making with joint products.
4. Cost-Volume-Profit Analysis: Assumptions, determination of break-even point, CVP under multiple products. Marginal Costing: Use of Marginal costing in decision-making.
5. Activity Based Costing: Concept. Cost Drivers. Applications. Process Costing: Concept. Transfer Cost. Concept of by-products, scrap, waste, losses.
6. Cost Control as a Management Tool: Standard Costing: concept. Development and use of Standard Costing. Budget and Budgetary Control, Variance Analysis. Target Costing.

Finance

- 1) Introduction: Finance Function – scope, Goals of Financial Management. Sources of Financial Information. Corporate Planning & Financial Management: Objectives & goals, Goals of Top Management, Capital Expenditure & Corporate Planning.
- 3) Tools of Financial Management:
 - a) Funds Flow Analysis: Concept, Objectives. Technique of Funds Flow Statement.
 - b) Ratio Analysis: Classification of Ratios: Structural group, Turnover group, Standards for Comparison; limitations of Ratio Analysis, Return on Investment an Integral Ratio.
 - c) Cost-Volume-Profit Analysis: Mechanics of break-even Chart. Profit planning & break-even Analysis. Margin of Safety.
 - d) Operating & Financial Leverage: Effects of Leverages on Variability of Earnings, Leverage & Financial Management.
- 4) Financial Forecasting & Cash Management:
 - a) Financial Forecasting: Tools- pro-forma financial statement, Cash Budget, Reconciliation of pro forma financial statement & cash budget.
 - b) Managing Cash: inflow & outflow. Investing surplus cash.
 - c) Management of Short Term Finance: Working Capital Management, Accounts Receivable, Inventory, Banks & Working Capital.

- d) Management of Term Loans: Raising the Loans, Term Loan Appraisal, Security, Effective Negotiations.
- 5) Allocation of Resources: Capital Budgeting-Control of Capital Expenditure, Evaluation Process-Payback approach, Accounting of Rate of Return, Present Value Method Vs Internal Rate of Return.
- 6) Cost of Capital: Relevant Cost. Measurement of Cost of Capital, Cost of Debt, Preference Shares, Equity Shares. Internal Financing: Dividends, Cost of Retained Earnings Concept.

References:

- 1. Henry M. Steiner, Engineering Economic Principles
- 2. C. B. Gupta, Fundamentals of Business, Sultan Chand & Co.
- 3. P. A. Samuelson, Economics, McGraw Hill International.
- 4. K. K. Dewett, Modern Economic Theory, Sultan Chand & Co.
- 5. S. C. Shukla, T. S. Grewal; Advanced Accounts, S. Chand and Sons, New Delhi
- 6. Bhar B. K.; Costing.
- 7. Prasad N. K.; Cost Accounting, Book Syndicate Pvt. Ltd., Calcutta
- 8. Colin Drury; Management and Cost Accounting, English Language Book Society, Chapman & Hall, London EC 4 P 4EE. [ISBN 0 412 34120 4]

Productivity Management

Teaching Schedule:

[Hours / week]

Lectures: 3

Examination Scheme:

[Maximum Marks]

Paper: 100

Credits: 3

Concept of Productivity - Importance of Productivity - Labour Productivity and its limitations - Different types of Productivity - Measurement of Productivity

Value Analysis and Value Engineering - Concept - Procedure - Application and role in Productivity

Learning and Experience Curves - Concepts - Application - Quantitative Estimation - Barriers to application

Quality Management Systems & Quality Certification Systems: Introduction to ISO 9000-2000, TQM, TS 16949. Objectives, Important Clauses, Benefits & Advantages

Business Process Re-engineering, Continuous Improvement v/s Radical Improvement. Steps in Business Process Engineering

JIT, Toyota Production System & Lean Manufacturing. Concept & Characteristics of JIT – Pull System, Kanban, Uniform Production, TPM, SMED, Quality at Source, Supplier Relationships, Cellular Manufacturing

Concept of Value Stream Mapping, Current State VSM v/s Future State VSM

References:

1. The new Manufacturing Architecture – Mahadevan
2. Productivity Management – Sumant
3. Reengineering the Business Corporation – Micheal Hammer & Champy, Productivity Press
4. The Lean Thinking – James Womack and Daniel Jones, Productivity Press
5. Toyota Production System – Shigeo Shingo, Productivity Press

M. E. – Industrial Engineering 2008

Subject Code: 5112011 A – Elective III

Human Factors Engineering

Teaching Schedule:

[Hours / week]

Lectures: 3

Examination Scheme:

[Maximum Marks]

Paper: 80

Credits: 3

1. Introduction: Historical background. Definition, importance.
2. Human Machine Systems – interfaces, Ergonomics at Work Place.
3. Anthropometric Principles. Anthropometric Data – sample, equipment, analysis.
4. Applied Anthropometry and Work Space Design & Seating. Product design.
5. Work related musculoskeletal disorders, visual environment, thermal environment, auditory environment, Vibrations.
6. Legal and Safety Aspects.

References:

1. ILO, Introduction to Work study
2. Curie R. M. & Faraday, Work study
3. M. S. Sanders and Ernest J. McCormick, Human Factors Engineering and Design. McGraw Hill Inc.
4. E. Grad jean, Fitting Task to the Man.
5. The Factories Act, 1948.

Process Planning and Manufacturing Engineering

Teaching Schedule:

[Hours / week]

Lectures: 3

Examination Scheme:

[Maximum Marks]

Paper: 100

Credits: 3

Casting and Welding

Introduction to metal casting, types of patterns, their materials and allowances. Types of Moulds, Elements of Gating systems and Risers and their design, Cupola and its operation, Casting Processes, casting defects, their causes and remedies.

Welding: Introduction and classification of welding processes, welding terms (terminology), general principles, welding positions, joint design and filler metals. Introduction to different Welding Processes.

Machining Processes

Lathe machine and its operations, Milling Machine and its operations, Drilling machine and its operations, Shaper, planer and Slotting machine and its operations, Grinding Machines and Press working.

Material Forming

Classification of metal forming processes, hot and cold working processes- their advantages and disadvantages.

Introduction to material forming processes like Rolling, Forging, Extrusion, Tube and Wire Drawing, Sheet metal working.

Product Engineering

Concept of a product – Its elements, units, subassemblies and assemblies, scope of product engineering function, Flow charts of assemblies, Product analysis and planning: Design for Manufacturing and assembly (DFMA). Product selection and criteria of Product acceptability based on market research.

Process Engineering

Organizational activities, functional activities, relation with other departments, classification of processes, manufacturing operations, operational elements - machining, handling, setting, inspection and approach for selecting and planning a process: determining machining sequences - criteria, classification of operations and manufacturing sequence, criteria for analysis for selection of best process.

Selection of proper Equipment

Process capability of Equipments, prime accuracies and producible accuracies of Equipments, Factors influencing make or buy decisions, relation between Process selection and Machine selection, basic factors in machine selection in terms of cost and design factors, Determining machining conditions and computing manufacturing times.

Selection of Tooling

Factors affecting selection of Tooling, commercial tooling, special tooling, selection of Tools: jigs, fixtures, gauges, form tool in relation to process selected .Use of multi-tooling set up, tooling economics as applied to Process Engineering. Stock preparations and blank selection with material estimates.

Process Sheet design

Study of the parts to be processed, Logical design of a process plan, stock preparations, blank selection with material estimates, Selection of datum features, identification of machining surfaces, incorporation of dimensions including tolerance analysis, selection of machining methods with time estimates and time standard for each operation, Process Picture sheet including process symbols, processing dimensions. Process plan sheet design for complete manufacturing part

References:

1. R.K Jain, Production Technology, Khanna Publication.
2. O.P. Khanna, Production Technology, Dhanpat Rai Publication.
3. Kalpacjian, Manufacturing Technology.
4. Dieter, Mechanical Metallurgy
5. P.N. Rao, Manufacturing Technology, Tata McGraw Hill
6. G.W. Rowe, Principles of industrial metal working process, Edward Arnold
7. D. F. Eary, G. E Johnson, "Process Engineering for Manufacturing", Prentice Hall of India Pvt. Ltd.

M. E. – Industrial Engineering 2008

Subject Code: 511211 C – Elective III

Management of Service Sector

Teaching Schedule:

[Hours / week]

Lectures: 3

Examination Scheme:

[Maximum Marks]

Paper: 100

Credits: 3

Transport

Rail, Road, Sea and Air transport - features, advantages and limitations. Importance of transport in Business

Warehousing

Meaning and need for warehousing, Types of warehouses, Characteristics of an ideal warehouse, Functions of warehousing, Advantages of warehousing

Communication

Meaning and importance, Types of Communication, Postal Services - Nature of Postal Services, Services provided by Post Office, Importance of Post Services

Banking and Insurance

Promissory Note, Cheque, Insurance -Business risks, Concept and importance of Insurance, Types of Insurance – Life, -General - Fire, Marine and other types, Principles of Insurance

Healthcare in India

Strategies for globalization, Marketing of Integrated health care unit. Marketing of hospital services, Total quality management in hospitals. Ethics and values, Biomedical waste management, Marketing Practices in corporate hospitals and appraisal. Prospects of herbal formulation and export potential

Selling and Distribution

Purchase and Sale : Concept of purchasing and selling Types: Cash, Credit, Hire Purchase System and Installment Payment System, Documents used in the process of purchase and sale; Channels of Distribution - Concept of channels of distribution, Direct and indirect channels of distribution, Role of wholesalers and retailers in the process of distribution, Types of retail trade- small scale and large scale

Large-scale Retail Trade

Forms of large scale retail trade - Departmental Store, Super Bazaar, Multiple shops Non-store retailing- Mail order business, Tele-shopping, Automated vending machine, selling through Internet

Personal Selling

Meaning and Importance, Qualities of a successful salesman

Advertising

Meaning and importance, Media of advertising

Sales Promotion

Meaning and Importance, Tools of sales promotion

Entrepreneurship

Concept and Importance, Qualities of a successful Entrepreneur, Functions of an Entrepreneur, How to start a small Business Enterprise

References:

1. Robert G. Cooper, Scott J. Edgett, Product Development for the Service Sector: Lessons from Market Leaders, Published 1999, Perseus Books, ISBN 0738201057
2. Mike Asher, Managing Quality in the Service Sector, 1996, ISBN 0749419547
3. Service Sector in Indian Economy edited by Talluru Sreenivas, New Delhi, Discovery Pub., 2006, ISBN 81-8356-050-4.
4. Jan Owen Jansson, The Economics of Services. Development and Policy_Edward Elgar Publishing (2006), ISBN: 9781845423971
5. Dieter Spath Editor, Advances in Services Innovations, Springer (2006), ISBN: 9783540298588
6. Peter W. Daniels Tom Hutton Kong Chong Ho, Service Industries and Asia Pacific Cities. New Development Trajectories,_Taylor & Francis Group (2005), ISBN: 9780415327497

M. E. – Industrial Engineering 2008

Subject Code: 511211 D – Elective III

Industrial and Commercial Law

Teaching Schedule:

[Hours / week]

Lectures: 3

Examination Scheme:

[Maximum Marks]

Paper: 100

Credits: 3

Aim: To ensure a grasp of fundamentals of Industrial and Commercial Laws required for the functioning of an Industrial Engineer.

A - Industrial Laws

1. The Industrial Disputes Act, 1947.
Extent. Works Committee, Conciliation Officers, Board of Conciliation, Court of Inquiry, Labour Courts, Tribunals, National Tribunal.
Procedure, power and duties of the authorities.
Strikes and lockouts, layoffs and retrenchment, closure.
Unfair labour practices, Penalties.
2. The Trade Union Act 1926.
Formation of Trade Unions, Collective bargaining capacity.
3. The Industrial Employment [Standing Orders] Act, 1946 (20 of 1946).
Draft Standing Orders, conditions for certification of Standing Orders, Appeals, Register of Standing Orders, Temporary application of model standing orders.
4. The Factories Act, 1948.
Health, Safety, Provisions relating to Hazardous Processes, Welfare, Working Hours of Adults, Employment of young persons, Annual Leave with wages.
5. The Employees' Provident Fund & Miscellaneous Provisions Act, 1952 (10 of 1952).
Employee's Provident Fund Schemes, Central Board, Employee's Pension Scheme, Employee's Deposit Linked Insurance Scheme, Contributions.

B – Commercial Acts:

1. The Monopolies and Restrictive Trade Practices Act, 1969 (54 of 1969) & - The Monopolies and Restrictive Trade Practices Commission, unfair and restrictive trade practices.
2. The Competition Act, 2002. Competition Commission, Anti competitive agreements, relevant markets, cartel.
3. The Sale of Goods Act, 1930 (3 of 1930).
Contract of Sale, Formalities of Contract, Subject Matter of Contract, the Price, Conditions and Warranties.
Transfer of Property as between seller and buyer, Transfer of title.

References:

1. Pramod Verma, Management of Industrial Relations, Oxford and IBH Publishing Co., Mumbai.
2. C. Jagamohandas and Co., Mumbai – Publications of Acts with short notes.
3. Bare Acts,
4. Taxman Publications for the Acts

M. E. – Industrial Engineering 2008

Subject Code: 511212 A – Elective IV

Organizational Behavior

Teaching Schedule:

[Hours / week]

Lectures: 3

Examination Scheme:

[Maximum Marks]

Paper: 100

Credits: 3

Necessity of organizational changes and managing changes in order to make the organisation competitive, organizational change, dilemma of change, pressure for change

Types of changes, force field analysis, change process, resistance to change, overcoming the resistance to change, theories of change

Organizational Development and Behavior, definition, characteristics, objectives and values, management development and process

Sensitivity training, T groups, team building, survey feedback, grid training

Testing: Unit testing, black box and white box testing, program flow graphs, test cases, integration testing, top-down and bottom-up testing, validation testing, alpha and beta testing, system testing, security testing, performance testing.

MBO Techniques, system 4 – management, Process consultation, case studies

References-

1. Organisational Behavior – Fred Luthans, McGraw Hill Publication
2. Organisational Behavior – Hellrigel, Solcum, Woodman, South Western Publication
3. Organisational Behavior – Robbins S.P., Prentice Hall Publication
4. Organisational Behavior – Luthans, Fred, McGraw Hill Publication
5. Organisational Development and Change – Cummings and Worley, South Western Publication
6. Organisational Development – W.L. French, Pearson Education

M. E. – Industrial Engineering 2008

Subject Code: 511212 B – Elective IV

Operations Management

Teaching Schedule:

[Hours / week]

Lectures: 3

Examination Scheme:

[Maximum Marks]

Paper: 100

Credits: 3

History and development of Manufacturing Management - Contribution of various pioneers beginning from Division of Labour to Quality Revolution and Environmental Control

Manufacturing Management - Nature, Scope, Importance and Functions

Methods of Manufacturing - Project / Jobbing, Batch Production, Flow / Continuous Production, Process Production - Characteristics of each method

Plant Location - Importance - Factors affecting location - Factory Building - Plant Layout - Installation of facilities

Introduction to Production Planning & Control - Scheduling - Gantt Charts - Documentation - Production Work Order

Introduction to PERT / CPM - Importance in Manufacturing Management - Network Crashing

Maintenance Management - Importance and types of maintenance - Maintenance Planning - Spare Parts Management - Equipment Replacement problem, Concept of TPM, 5S , OEE

Inspection - Cent percent Inspection, Sample Inspection, Operation Characteristics Curves, Statistical Quality Control - Control Charts - X-R Charts, Process Capability

Work Study - Objectives, Scope and Uses - Methods Study - Man Machine Charts - Work Measurement - Elements - Performance Rating - Allowances - Methods of Remuneration - Time Based and Efficiency Based - Incentive Schemes - Individual (Halsey, Rowan and Taylor) and Group Incentive Schemes - Standard Time - Synthetic Time Standards - Work Sampling

References

1. Operations Management, 5th Ed. - Krajewski
2. Production & Operations Management – Chary, McGraw Hill Publications,
3. Production & Operations Management – Chase, Pearson Publications
4. Production & Operations Management – Panneerselvam, McGraw Hill Publications,

Product Design and Intellectual Property Rights

Teaching Schedule:

[Hours / week]

Lectures: 3

Examination Scheme:

[Maximum Marks]

Paper: 100

Credits: 3

Visual Design

Basic elements and concept of visual design-line color, balance proportion, size and shape, mass, unity and variety, special relationships and composition in two and three dimensions.

Form & Color

Elementary forms their characteristics and significance in design. Form transition, Form in relation to ergonomics, material and manufacturing process, color as an element of design, color clarification dynamics, interrelation of colors, colors and traditions; Psychological use of color form and material.

Product Graphics

Meaning and objectives of product graphics, Basic principles of graphic design, Visual communication aspects of product graphics, Graphics of displays and control panels,

Product Detailing

Standard fastening and joining details in different materials; Temporary and permanent joints: Detailing for plastic products, Detailing for fabricated products in sheet metal.

Product Development

Definition and objective, Role of designer in product development, Manufacturing and economic aspects of product development, Product promotions, product developments.

Intellectual Properties Right

Definition and Objective, issues involved with IPR. Patent, copyright and Trademark, difference between them. Patent Search, European databases, American Databases. Accessing free and paid sights, International patent classification, Procedure for filing patent. Legal issues involved.

References:

1. Mayall W.H., "Industrial Design for Engineers" London Liifce Books Ltd. 1967
2. Dale Huchingson R "New Horizons for Human Factors in Design " McGraw Hill Company 1981
3. Mayall W. H, " Principles in Design"
4. Svensson, "Engineering Design"
5. Matousek, "Engineering Design"
6. McCormick K.J. (Ed) "Human Factor Engineering " (4th edition) McGraw Hill Book Company Ltd. USA 1992
7. Patent sights - USPTOV.GOV , Espacenet.com

Environmental Engineering and Energy Management

Teaching Schedule:

[Hours / week]

Lectures: 3

Examination Scheme:

[Maximum Marks]

Paper: 100

Credits: 3

-
1. Introduction: Energy Scenario – global, sub continental and Indian, Energy economy relation, Future energy demand and supply scenario, Integrated energy planning with particular reference to Industrial Sector in India, Captive power units and others – demand v/s supply. The Prevention and Control of Pollution Act, 1974, The Energy Conservation Act, 2001, The Environmental Protection Act, 1986.
 2. Physical Aspects of Energy: Classification of energy – Hydel, Thermal, Nuclear, Wind, & from Waste Products. Efficiency and effectiveness of energy utilisation in Industry. Energy and energy analysis.
 3. Legal provisions in Energy Management and its impact: The Energy Conservation Act, 2003, The Electricity Act, 2003. National Electricity Policy. Rural Electrification.
 4. Energy Demand Management: Energy utilisation, Instrumentation and data analysis, Financial aspects of energy management, Energy management as a separate function and its place in plant management hierarchy.
 5. Energy Demand Management: Scope, Methodology, modes of energy savings, Plant energy and utility systems,
Efficient energy management – Nine steps – i) Identification ii) Investigation
iii) Quantification iv) Decisions v) Presentation vi) Implementation vii) follow-up
viii) Set Targets ix) Re-examine;
Renewable energy sources.
 6. Energy Audit: Audit and analysis, Energy load measurements, System evaluation and simulation, Energy saving techniques and guidelines: Administrative control, Proper Measurement and monitoring system, Process control, proper planning & scheduling, Increasing capacity utilisation, Improving equipment control, waste heat recovery, Change of energy source. Upgradation of Technology. Change of product specifications, Use of High efficiency equipment, Design modification for better efficiency, Improved periodic maintenance; Energy conservation with particular reference to waste heat recovery in different industries; Improvement in combustion system and use of Industrial waste; Co-generation and rational operation of production processes. Case study analysis.

References:

1. Paul W., O'callaghan; Energy Management.
2. Wayne C. Turner; Energy Management Handbook.
3. B.L. Capheart, W.J. Kennedy; Guide to Energy Management.
4. Reay; Industrial Energy Conservation.
5. CII Reports on Indian Energy Management.
6. Murphy W R & Mckay G: Energy Management. Butterworth Heinemann Oxford, 1982.
7. Energy Conservation Act 2001(Act No 52 OF 2001) with short comments, Allahabad Law Publishers (India) Pvt Ltd, 2003.
8. Electricity Act 2003(Act No 36 of 2003) Bare Act with short comments. Professional Book Publishers, New Delhi, 2003.

M. E. – Industrial Engineering 2008

Subject Code: 511213

Lab Practice II

Teaching Schedule:

[Hours / week]

Practical: 6

Examination Scheme:

[Maximum Marks]

TW: 50

Oral: 50

During these 6 hours per week, student is expected to undertake two assignments each from the three compulsory subjects and one assignment each from the two elective subjects.

Performance will be valued both on the basis of submission and oral.

M. E. – Industrial Engineering 2008

Subject Code: 511214

Seminar II

Teaching Schedule:

[Hours / week]

Practical: 4

Examination Scheme:

[Maximum Marks]

TW: 50

Oral: 50

A student is expected to select a topic relevant to any area of Industrial Engineering, but the topic should not be directly related to any of the subjects being covered in this semester.

The topic of the seminar may be related to the proposed Project Work a student is expected to undertake.

The seminar should be either based upon research material published elsewhere or on case studies.

M. E. – Industrial Engineering 2008

Subject Code: 611201

Seminar III

Teaching Schedule:

[Hours / week]

Practical: 4

Examination Scheme:

[Maximum Marks]

TW: 50

Oral: 50

A student is expected to select a topic relevant to any area of Industrial Engineering, but the topic should not be directly related to any of the subjects covered during the first year.

The seminar should be either based upon research material published elsewhere or on case studies.

M. E. – Industrial Engineering 2008

Subject Code: 611202

Project Stage I

Teaching Schedule:

[Hours / week]

Practical: 18

Examination Scheme:

[Maximum Marks]

TW: 50

Oral: 50

Credits: 6

Student has to submit a report based upon the following:

- Original Objective of the Project
- Progress Achieved
- Difficulties encountered
- Conclusions, if any
- Future plan of action.

M. E. – Industrial Engineering 2008

Subject Code: 611203

Project Stage II

Teaching Schedule:

[Hours / week]

Practical: 18

Examination Scheme:

[Maximum Marks]

TW: 150

Oral: 50

Credits: 18

Student has to submit a report based upon the following:

- Original Objective of the Project
- Progress Achieved
- Difficulties encountered
- Conclusions.