

B. E. Industrial Engineering 2012 Syllabus

FACULTY OF ENGINEERING

**Syllabus for the
B.E. (Industrial Engineering)
(w. e. f. 2014 – 2015)**

SAVITRIBAI PHULE PUNE UNIVERSITY

BE (Industrial Engineering) Course structure

Semester I									
	Subject	Teaching Scheme Hrs/Week			Examination Scheme				Marks Total
		Lect	Tut	Pr	In-Semester Assessment	Pr / Tw	Or / Tw	End Semester Examination	
411201	Financial Management & Costing	3	-	-	30	-	-	70	100
411202	Project Management	3	-	-	30	-	-	70	100
411203	Quantitative Techniques	4	-	-	30	-	-	70	100
411204	Elective I	3	-	-	30	-	-	70	100
411205	Elective II	3	-	-	30	-	-	70	100
411206	Financial Management & Costing	-	-	2	-	-	50	-	50
411207	Project Management	-	-	2	-	50	-	-	50
411208	Quantitative Techniques	-	-	2	-	50	-	-	50
411209	Elective I	-	-	2	-	-	50	-	50
411210	Project Phase I	-	2	-	-	50	-	-	50
Total		16	2	8	150	150	100	350	750

Semester II									
	Subject	Teaching Scheme Hrs/Week			Examination Scheme				Marks Total
		Lect	Tut	Pr	In-Semester Assessment	Pr / Tw	Or / Tw	End Semester Examination	
411211	Reliability Engineering	3	-	-	30	-	-	70	100
411212	Energy Management	3	-	-	30	-	-	70	100
411213	Elective III	3	-	-	30	-	-	70	100
411214	Elective IV	3	-	-	30	-	-	70	100
411215	Reliability Engineering	-	-	2	-	-	50	-	50
411216	Energy Management	-	-	2	-	50	-	-	50
411217	Elective III	-	-	2	-	50	-	-	50
411218	Elective IV	-	-	2	-	-	50	-	50
411219	Project Phase II	-	6	-	-	50	100	-	150
Total		12	6	8	120	150	200	280	750

Elective I

1. Advanced Ergonomics
2. Logistics & Warehousing Management
3. Material Forming
4. Human Resource Management

Elective II

1. Industrial Laws
2. World class Manufacturing
3. Machine Tool Technology
4. Development of Professional skills

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Elective III

1. IE applications in service sector
2. Supply chain Management
3. Manufacturing Automation
4. Process Planning & Manufacturing Engineering

Elective IV

1. ***
2. Plastics Engineering
3. Manufacturing Strategies
4. Quality Management

*** Any Elective IV from Mechanical Engineering, Production Engineering 2008 Syllabi

Subject Code: 411201

Financial Management and Costing

Teaching Schedule:

[Hours / week]

Lectures: 03

Examination Scheme:

[Maximum Marks]

In Semester Examination - 70

End Semester Examination - 30

Unit I - Financial Management:

[7]

Financial Function, Scope, goals and tools. Sources of finance. Cost of Capital & Means of Finance

UNIT II - Ratio Analysis:

[7]

Classification, Ratio Analysis and its limitations. Index Statement & Common Size Statement

UNIT III - Working Capital Management:

[7]

Concept and design of Working Capital, types of working capital, sources of working capital, Time value of money, definition of cost and capital., Cash management, creditors management, debtors management

Unit IV - Costing:

[7]

Methods of costing and elements of cost.

Material Cost

Different methods of pricing of issue of materials.

Labour Cost

Different methods, wages and incentive plans. Principles of good remunerating system, labour turnover.

Depreciation

Concept, importance and different methods of depreciation

Unit V - Overheads:

[7]

Classification, collection of overheads, Primary and Secondary apportionment of overheads, absorption of overheads- Machine hour and labour hour rate. Under and over absorption of overheads.

UNIT VI - Standard costing:

[7]

Concept, development and use of standard costing, variance analysis.

Marginal Costing

Use of Marginal Costing in decision-making.

Capital Budgeting

Control of Capital Expenditure, Evaluation Process-Payback approach, IRR, present value method.

Text Books:

1. Bhattacharya A. K., "*Principles and Practice of Cost Accounting*", Prentice Hall India.
2. B K Bhar, "*Cost Accounting – Methods and Problems*", Academic Publishers
3. Khan M. Y., Jain P. K., "*Financial Management*", Tata McGraw Hill

Reference Books:

1. Colin Drury, "*Management and Cost Accounting*", English Language Book Society, Chapman and Hall London.

Subject Code: 411202

Project Management

Teaching Schedule:
[Hours / week]
Lectures: 03

Examination Scheme:
[Maximum Marks]
In Semester Examination - 70
End Semester Examination - 30

Unit 1: Introduction: [7]
Definition of project, difference with respect to standard routine production. Parameters involved in Project identification. Difference in projects under private, public & joint sector.

Unit 2: Types of project: [7]
Projects under BMRED – Balancing, Modernization, Replacement, Expansion & Diversification; Consideration involved in decision-making in each of these.

Unit 3: Project Formulation: [7]
Preparation of feasibility Report & Specification; Budgeting; criteria for pre-investment decision; Incentives from state & central govt.; Import-substitution projects.

Unit 4: Project Finance: [7]
Sources of Finance for project; Local & Foreign investments. Project Appraisal-i) Techno-commercial, ii) Financial- Discounted cash flow, rate of return, iii) Non financial benefit, iv) Socio-economic cost benefit analysis.

Unit 5 Project costing: [7]
Costs of Contracting; Labour & Equipment costs; Development & Codification of cost data; Accounting; Activity-Based costing.

Unit 6 Project Administration: [7]
Cash flow planning; Project scheduling; PERT, CPM & GANTT Charts; Crashing, resource leveling, resource smoothening, Time- Cost trade –off; Project overruns costs; Participation & Team work.

Text Books:

1. Narendra Singh; “*Project Management & Control*”; Himalaya Publishing House, Mumbai.
2. Prasanna Chandra; “*Preparation, Appraisal, Budgeting, Implementation & Review*”, Tata McGraw Hill Publishing Company, New Delhi

Subject Code: 411203

Quantitative Techniques

Teaching Schedule:
[Hours / week]
Lectures: 04

Examination Scheme:
[Maximum Marks]
In Semester Examination - 70
End Semester Examination - 30

Unit I - Advanced Linear programming [7]
Duality, Economic interpretation of Dual, Solution of LPP using duality concept, Dual simplex method. integer programming by branch & bound ,cutting plane method

Unit II - Inventory Management: [7]
New product planning, inventory system, different Inventory models, problems on inventory model.

Unit III - Dynamic programming: [7]
Introduction, application, capital budgeting, different problems solved by Dynamic programming

Unit IV - Geometric and Goal Programming: [7]
Definition, Introduction, application of Geometric and Goal Programming

Unit IV - Queuing theory: [7]
Operating characteristics, Poisson single and multi channel queuing system models like M/M/1, M/M/C, M/E_k/1.

Unit VI – Simulation: [7]
Definition, Introduction, application, Monte Carlo simulation, Need of simulation in manufacturing and material handling systems, Components of manufacturing systems – product, resources, demand, control; Downtime, Rework and reentrancy, Random events and performance measures used in manufacturing systems with a case study on any manufacturing system

Term Work:
Term work should consist of at least one assignment per unit. Each assignment should be analyzed through relevant softwares (e.g. Lindo, Arena, promodel, Tora, etc.)

TEXT BOOKS:

1. S. D. Sharma, “*Introduction to Operations Research*”, Discovery Publishing House, New Delhi
2. P. K. Gupta, D. S. Hira, “*Operations Research*”, S Chand and Co. Ltd., ISBN 81-219-0281-9.

REFERENCE BOOKS:

1. F. S. Hillier, G. J Lieberman, “*Introduction to Operations Research*”, Tata McGraw-Hill, ISBN 0-07-047387-0.
2. H. M. Wagner, “*Principles of Operations Research*”, Prentice-Hall India, ISBN 81-203-0162-5.
3. A. Ravindran, “*Operations Research*”, Tata McGraw-Hill.
4. S. K. Basu, D. K. Pal, H. Bagchi, “*Operations Research for Engineers*”, Oxford and IBH Publishing Co. Pvt. Ltd., ISBN 81-204-1251-6.

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5. R. Panneerselvam, "*Operations Research*", Prentice Hall of India Ltd., ISBN 81-203-1923-0.
6. H. A Taha., "*Operations Research - An introduction*", Prentice Hall Pvt. Ltd., ISBN 81-203-1222-8.

Subject Code: 411204 – Elective I - I

Advanced Ergonomics

Teaching Schedule:

[Hours / week]

Lectures: 03

Examination Scheme:

[Maximum Marks]

In Semester Examination - 70

End Semester Examination - 30

Unit 1- Introduction:

[7]

Historical background. Modern ergonomics, Future direction. Human Machine Systems – interfaces.

Unit 2 – Anatomy, Posture and Body Mechanics:

[7]

Muscle Functionin, Spine, Musculoskeletal problems in Sitting and Standing.

Unit 3 - Anthropometric Principles:

[7]

Anthropometric Data – sample, equipment, analysis. Applications of Anthropometry in Design. Workstation design for standing and seated posture.

Unit 4 – Upper Body at Work:

[7]

Injuries due to upper body at work, Neck problems, shoulder, elbow and wrist, Design of manual handling tasks.

Unit 5 – Physiology, Workload and Work Capacity:

[7]

Energy for action, cardiovascular system, Physical work capacity, Factors affecting work capacity, fitness for work. Vision – Measurement of light, Lighting design consideration, visual fatigue. Sound and Noise – Measurement, Industrial Noise control, Thermal conditions – Measurement, effect on human being.

Unit 6 – Legal Aspects:

[7]

Legal and Safety Aspects.

Practical: One assignment based on each of the topics mentioned above.

Text Books:

1. M. S. Sanders and Ernest J. McCormick, “*Human Factors Engineering and Design*”, McGraw-Hill Inc.
2. E. Grad jean, “*Fitting Task to the Man*” Taylor and Francis.
3. The Factories Act, 1948.

Reference Books:

1. ILO, “*Introduction to Work study*”.
2. Curie R. M. & Faraday, “*Work study*” Pitman for the British Institute of Management
3. R. S. Bridger, “*Introduction to Ergonomics*”, Taylor and Francis

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4. Nordin, Anderson, Pope, *Musculoskeletal Disorders at Workplace: Principles and Practice* – ISBN-13: 978-0-323-02622-2, Mobsy Inc.
5. ILO, *“Encyclopedia of Occupational Health and Safety”*.
6. Waldemar Karwowski, William Steven Marras, *“Occupational ergonomics: design and management of work systems”*, CRC Press,

Subject Code: 411204 – Elective I - II

Logistics and Warehousing Management

Teaching Schedule:

[Hours / week]

Lectures: 03

Examination Scheme:

[Maximum Marks]

In Semester Examination - 70

End Semester Examination - 30

UNIT 1 - Introduction:

[7]

Logistics. Producer – Consumer system. Logistics communication, costs & role of modern technology in logistics management

UNIT 2 - Marketing and product distribution:

[7]

Inter dependence and interaction. Multilevel system and sensitivity analysis

UNIT 3 - Logistic information system:

[7]

Nature, purpose and scope of information system, Customer order cycle and order processing neutral networks bar-coding.

UNIT 4 – Transportation:

[7]

Time and place utility, transportation -logistic –marketing interface different modes of transportation – merits demerits and costs

UNIT 5 – Warehousing:

[7]

Nature purpose and scope of warehousing. Own warehouse, third party warehouses. Economics of warehousing. Inventory management; Material handling storage and packaging issues

UNIT 6 – Logistics Support:

[7]

Organizing for effective logistic support –strategies supply chain management in the context of globalisation

Practical: One assignment based on each of the topics mentioned above.

Text Books:

- 1) Douglas Lambert, James Stock Ellram; “*Fundamentals of Logistics Management*”, Mc Graw Hill Publication
- 2) Ronald H.,.Balfour, “*Basic Business Logistics*”, Prentice Hall of India
- 3) Benjamin & Blamhord, “*Logistics Engineering and Management*”; Prentice Hall of India

Subject Code: 411204 – Elective I - III

Material Forming

Teaching Schedule:

[Hours / week]

Lectures: 03

Examination Scheme:

[Maximum Marks]

In Semester Examination - 70

End Semester Examination - 30

UNIT I - Fundamentals of Material Forming:

[7]

Engineering stress-strain and true stress-strain, Strain hardening, work done in tensile test, temperature rise in plastic deformation compression test, Concept of flow stress determination, Effect of temperature, strain rate, Mohr's circle for three dimensional state of stress Theory of plasticity- Yield criteria of Von Mises criteria and Tresca criteria. Classification of material forming process. Concept of workability, formability and forming diagram.

UNIT II - Forging Processes:

[7]

Comparison of forging with other manufacturing processes. Classification of forging processes- open die and closed die forging Forging equipment- Hammers and presses, construction working capacities and selection of equipment. Basic forging operations such as drawing, fullering, edging, blocking etc. Determination of forging load considering friction, Other forging techniques- Liquid metal forging, Isothermal forging, Rotary swaging, Orbital forging Lubrications in forging. Forgability tests, Forging defects and remedies.

UNIT III - Wire and Tube Drawing:

[7]

Introduction rod and wire drawing machines - construction and working. Preparation of stock for wire drawing. Wire drawing dies, material and design. Variables in wire drawing, Maximum reduction in wire in one pass, forces required in drawing. Multiple drawing, work hardening, lubrication in wire drawing. Tube drawing: Methods, force calculation, stock preparation. lubrication in tube drawing

UNIT IV - Rolling of Metals:

[7]

Scope and importance of rolling. Types of Rolling Mills- Construction and working. Roll bite, reduction, elongation and spread. Deformation in rolling and determination forces required. Process variables, redundant deformation. Roll flattening, Roll camber - its effect on rolling process, mill spring. Defects in rolling. Automatic gauge control- Lubrication in rolling

UNIT V – Extrusion:

[7]

Direct, reverse, impact, hydrostatic extrusion. Dies for extrusion, stock penetration. Extrusion ratio Force equipment (with and without friction), metal flow in extrusion, defects. Role of friction and lubricants. Manufacture of seam-less tubes.

UNIT VI - Miscellaneous Forming processes:

[7]

High velocity forming- principles, comparison of high velocity and conventional Forming processes. Explosive forming, Magnetic pulse forming, Electro hydraulic forming, Stretch forming, coining embossing, curling, spinning, flow forming advantages, limitations and application of the process.

Practical: To be based upon each of the units above.

TEXT BOOKS:

1. Rao P. N., "*Manufacturing Technology*", Tata McGrawHill Publishing Company Ltd.
2. Groover Micel P., "*Fundamentals of Manufacturing*", John Wiley & Sons.
3. Banabick Dorel, "*Advanced Methods in Material Forming*", Springer, Verlag, Berlin, Heidenberg
4. Date P. P., "*Introduction to Manufacturing Technology, Principles and Practices*", , Jayco Publishers, Mumbai

Reference Books:

1. George Ellwood Dieter, *Mechanical Metallurgy*, McGraw-Hill
2. William F. Hosford, Robert M. Caddell - *Metal forming: mechanics and metallurgy*, Cambridge University Press (2007) - Hardback - 312 pages - ISBN 0521881218
3. ASM Metal handbook Volume IV Forming.
4. G. W. Rowe, "*Principles of Industrial Metal Working Process*", Edward Arnold

Subject Code: 411204 – Elective I - IV

Human Resource Management

Teaching Schedule:

[Hours / week]

Lectures: 03

Examination Scheme:

[Maximum Marks]

In Semester Examination - 70

End Semester Examination - 30

UNIT I - Fundamentals of HR Management:

[7]

Importance of HRM to an organization. Changes in technology, work-force diversity, and skill requirements affect human resource management. Identify the four external influences affecting human resource management. Characterize how government legislation, Labor unions, and management practices affect HRM. Describe the goals, components and major activities within HRM.

UNIT II – Job Design and HR Planning:

[7]

Job design: definition, approaches, job design options; Job analysis: definition, process, benefits of job analysis

HR planning: introduction, objectives of HRP, linkage of HRP to other plans, definition and need for HRP, benefits of HRP, factors affecting HRP, process, problems and limitations of HRP

UNIT III - Recruiting & Selection:

[7]

Define what is meant by the term recruiting. Identify the principal sources involved in recruiting employees. Describe the selection process. Discuss the problems associated with job interviews and means of correcting them. Discuss the use of various types of interview questions

UNIT IV - Benefits & Rewards:

[7]

Explain various classifications for rewards. Define goal of compensation administration. Discuss job evaluation and approaches. Describe competency and team-based compensation programs. Discuss why employers offer benefits to their employees. Contrast Social Security unemployment compensation and worker's compensation benefits. Identify and describe insurance options

UNIT V - Evaluating Performance:

[7]

Identify purposes of performance management systems and who is served by them. Describe the two categories of difficulties in Performance Management Systems. Explain the steps in the appraisal process. Describe the absolute and relative methods of appraising employees. Discuss how management by objectives (MBO) can be used as an appraisal method. Identify ways to make performance management systems more effective

UNIT VI - Ethics in HRM & Labor Relations:

[7]

Define “ethics” and “code of ethics”. Describe what determines whether or not a code of ethics will be effective in an organization. Discuss HRM’s role in ensuring that ethics exist in an organization and are adhered to. Describe the guidelines for making ethical choices. Define what is meant by the term unions. Discuss the effect of Wagner and Taft-Hartley Acts on labor management relations. Describe the components of the collective-bargaining process

Practical: To be based upon each of the units above.

TEXT BOOKS:

1. DeCenzo, David A. and Robbins, Stephen P., “*Fundamentals of Human Resource Management*”, John Wiley and Sons, Inc. New York (ISBN 978-0-470-00794-5)
2. Raymond Noe, Raymond Andrew Noe, John Hollenbeck, Barry Gerhart, Patrick M. Wright, “*Humna Resource Management*”, McGraw-Hill Irwin

REFERENCE BOOKS:

1. K. Ashwathappa, “*Human Resource & Personnel Management*”, Tata McGraw Hill
2. Fisher Cynthia, Schoenfeldt Lyle F., Shaw James B., “*Human Resource Management*”, Houghton Mifflin Co.
3. Dessler Gary, “*Human Resource Management*”, Person Publications

Subject Code: 411205 – Elective II - I

Industrial Laws

Teaching Schedule:

[Hours / week]

Lectures: 03

Examination Scheme:

[Maximum Marks]

In Semester Examination - 70

End Semester Examination - 30

UNIT I - The Industrial Disputes Act, 1947:

[7]

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.

UNIT II - The Trade Union Act 1926:

[7]

Formation of Trade Unions, Collective bargaining capacity.

UNIT III - 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.

UNIT IV - The Factories Act, 1948:

[7]

Health, Safety, Provisions relating to Hazardous Processes, Welfare, Working Hours of Adults, Employment of young persons, Annual Leave with wages.

UNIT V 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.

UNIT V - The Sale of Goods Act, 1930 (3 of 1930):

[7]

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.

UNIT VI - The Monopolies and Restrictive Trade Practices Act, 1969 (54 of 1969) & The Competition Act, 2002:

[7]

Monopolies and Restrictive Trade Practices Commission, Unfair and Restrictive trade practices. The Competition Commission,

Text Books:

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. Taxman, Commercial Laws.
4. Taxman, Labour Laws.

Reference Books: Bare Acts and Bare Acts with Cases for each of these.

Subject Code: 411205 – Elective II - II

World Class Manufacturing

Teaching Schedule:

[Hours / week]

Lectures: 03

Examination Scheme:

[Maximum Marks]

In Semester Examination - 70

End Semester Examination - 30

Unit 1 - Industrial Decline and Ascendancy: [7]

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

Unit 2 - Building strength through customer - Focused principles: [7]

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

Unit 3 - Value and Valuation: [7]

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

Unit 4 - Strategic Linkages: [7]

Product decisions and customer service - Multi-company planning - Internal manufacturing planning - Soothing the demand turbulence

Unit 5 – Impediments: [7]

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

Unit 6 - Remaking Human Resource Management: [7]

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

Text Books

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1. By Richard B. Chase, Nicholas J. Aquilano, F. Robert Jacobs – “*Operations Management for Competitive Advantage*”, McGraw-Hill Irwin, ISBN 0072323159
2. Moore Ran, “*Making Common Sense Common Practice: Models for Manufacturing Excellence*”, Elsevier Multiworth
3. Narayanan V. K., “*Managing Technology & Innovation for Competitive Advantage*”, Pearson Education Inc.
4. Korgaonkar M. G., “*Just In Time Manufacturing*”, MacMillan Publishers India Ltd.,
5. Sahay B. S., Saxena K. B. C., Ashish Kumar, “*World Class Manufacturing*”, MacMillan Publishers

Subject Code: 411205 – Elective II - III

Machine Tool Technology

Teaching Schedule:

[Hours / week]

Lectures: 03

Examination Scheme:

[Maximum Marks]

In Semester Examination - 70

End Semester Examination - 30

Unit I – Drives:

[7]

Design considerations for drives based on continuous and intermittent requirement of power, Types and selection of motor for the drive, Regulation and range of speed based on preferred number series, geometric progression. Design of speed gear box for spindle drive and feed gear box. Stepless drives, Design considerations of Stepless drives, electromechanical system of regulation, friction, and ball variators, PIV drive, Epicyclic drive, principle of self locking,

Unit II - Design of Machine Tool Structures:

[7]

Analysis of forces on machine tool structure, static and dynamic stiffness. Design of beds, columns, housings, bases and tables.

Unit III - Design of Guide-ways and Power Screws:

[7]

Functions and types of guideways, design criteria and calculation for slideways, design of hydrodynamic, hydrostatic and aerostatic slideways, Stick-Slip motion in slideways. Design of power screws: Distribution of load and rigidity analysis.

Unit IV - Design of Spindles and Spindle Supports:

[7]

Design of spindle and spindle support using deflection and rigidity analysis, analysis of anti-friction bearings, preloading of antifriction bearing.

Unit V - Dynamics of machine tools:

[7]

Dynamic characteristic of the cutting process, Stability analysis, vibrations of machine tools. Control Systems: Mechanical and Electrical, Adaptive Control System, relays, push button control, electrical brakes, drum control.

Unit VI - Advances in Machine Tool Design:

[7]

Design considerations for SPM, NC/CNC, and micro machining, Retrofitting, Recent trends in machine tools, Design Layout of machine tool using matrices.

Text Books:

1. N. K. Mehta, "*Machine Tool Design*", Tata McGraw Hill, ISBN 0-07-451775-9.
2. Bhattacharya A., Sen S. G., "*Principles of Machine Tool*", New Central Book Agency, Kolkata, ISBN 81-7381-1555.
3. D. K Pal, S. K. Basu, "*Design of Machine Tool*", Oxford & IBH Publishing Company, New Delhi, ISBN 81-204- 0968.
4. N. S. Acherkan, "*Machine Tool*", Vol. I, II, III and IV, MIR Publications.
5. F. Koenigsberger, "*Design Principles of Metal Cutting Machine Tools*", The Macmillan Company New York 1964.

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Reference Books:

1. Joshi P. H., "*Machine Tools Handbook – Design & Operation*", Tata McGraw Hill Publishing Company Ltd., New Delhi
2. Date P. P., "*Introduction to Manufacturing Technology, Principles and Practices*", , Jayco Publishers, Mumbai

Subject Code: 411205 – Elective II - IV

Development of Professional Skills

Teaching Schedule:

[Hours / week]

Lectures: 03

Examination Scheme:

[Maximum Marks]

In Semester Examination - 70

End Semester Examination - 30

Unit I - Introduction:

[7]

Status of youth employment – Global, Asian and Indian scenario, employment by organized and unorganized sectors in India, challenges and opportunities in turning job seekers into job creators, An entrepreneurship as an alternative.

Unit II - Types of Organizations and Current issues:

[7]

The Government policy environment, problems in current youth environment, problems in India, Education gaps, role of stakeholders in entrepreneurship – Government, NGOs, financial institutions, corporate sector, industrial parks, educational and training institutes, Overview on rules and regulations for different types of business units.

Unit III - Entrepreneur::

[7]

Meaning of Entrepreneur; Evolution of the Concept; Functions of an Entrepreneur, Types of entrepreneur, Intrapreneur – an emerging class, Concept of Entrepreneurship-Evolution of Entrepreneurship; Development of Entrepreneurship; The entrepreneurial Culture; Stages in entrepreneurial process.

UNIT IV – Creativity and Innovation:

[7]

Creativity and Innovation: Creativity, Exercises on Creativity, Source of New Idea, Ideas into Opportunities. Creative problem solving: Heuristics, Brainstorming, Syntectics, Value Analysis, Innovation and Entrepreneurship: Profits and Innovation, Globalization, Modules of Innovation, Sources and Transfer of Innovation, Why Innovate, What Innovation, How to Innovate, Who Innovates.

UNIT V – Intellectual Property Rights:

[7]

Origins of Intellectual Property Law, Trade Secrets Trademark, Rights of Publicity & Moral Rights Copyright, Patent International Protection and the Future of Intellectual Property Law. The competing rationales for protection of rights in Copyright Trade marks Patents designs Introduction to the leading international instruments concerning intellectual property rights: the

Berne convention, Universal Copyright Convention, the Paris Union, the World Intellectual Property Rights Organization (WIPO) and the UNESCO; TRIPS; WIPO.

UNIT VI – Copyrights and Trademarks:

[7]

Meaning of Copyright Copyright in literacy, dramatic and musical works ,Copyright in Musical and Works and cinematograph films , Ownership of Copyright, Assignment of Copyright, Author's special rights, Infringement of copyright, Fair use Provisions, Remedies.

Intellectual Property in Trademarks: The rationale of protection of trade marks as (a) an aspect of commercial and (b) of consumer rights, definition, conception of Trade Marks, Registration; Distinction Between Trade Mark and Property Mark, Geographical Indicators.

TEXT BOOKS:

1. Phansalkar S. J., "*Making Growth Happen – Learning from First Generation Entrepreneurs*", Response Books, division of Sage Publications India Private Limited, New Delhi
2. Kanungo Rabindra N, "*Entrepreneurship & Innovation Models for Development*", Sage Publications India Private Limited, New Delhi
3. Dr. Mathew J. Manimala, Entrepreneurship theory at crossroads, Biztantra,
4. Vasant Desai, Entrepreneurial Development and Management, Himalaya Publishing House,
5. Maddhurima Lall, Shikha Sahai, Entrepreneurship, Excel Books
6. Kurakto, Entrepreneurship-Principles and practices, Thomson publication
7. P. Narayanan: Patent Law, Eastern Law House.2. Roy Chowdhary, S.K. & Other, Law of Trademark, Copyrights, Patents and Designs.
8. Dr. G.B. Reddy, Intellectual Property Rights and the Law, Gogia Law Agency.
9. John Holyoak and Paul Torremans, Intellectual Property Law.
10. B.L. Wadhera, Intellectual Property Law, Universal Publishers.

REFERENCE BOOKS:

1. Juneja J. S., "*Small and Medium Enterprise: Challenges and Opportunities*", Vanity Books International, New Delhi
2. "*Harvard Business Review on The Innovative Enterprise*", Harvard Business School Publishing Corporation

Subject Code: 411206

Financial Management & Costing

Teaching Schedule:

[Hours / week]

Practical: 02

Examination Scheme:

[Maximum Marks]

Oral – 50

During the practical students should be asked to solve real life cases on

1. Financial Management – theory assignment
2. Ratio Analysis
3. Working Capital Management
4. Costing
5. Depreciation
6. Overheads
7. Standard costing
8. Marginal Costing

Subject Code: 411208

Quantitative Techniques

Teaching Schedule:

[Hours / week]

Practical: 02

Examination Scheme:

[Maximum Marks]

Oral – 50

During the practical students should be asked to solve at least 8 real life cases on the following topics making sure that there is at least one case on each topic.

Subject Code: 411207

Project Management

Teaching Schedule:

[Hours / week]

Practical: 02

Examination Scheme:

[Maximum Marks]

Oral – 50

During the practical students should be asked to solve at least 8 real life cases on the following topics making sure that there is at least one case on each topic.

1. Project Management – General write up
2. Types of project
3. Project Formulation
4. Project Finance
5. Project costing
6. Project Administration

Subject Code: 411209

Elective I

Teaching Schedule:

[Hours / week]

Practical: 02

Examination Scheme:

[Maximum Marks]

Oral – 50

During the practical students should be asked to solve at least 8 real life cases on each unit making sure that there is at least one case on each unit.

Subject Code: 411210 & 411219

Project Work

Teaching Schedule:

[Hours / week]

Practical: 02 – I Term

Practical: 06 – II Term

Examination Scheme:

[Maximum Marks]

Term Work: 50 each I and II Term

Oral: 100 – II Term

The student shall take up suitable project; the scope of the project shall be such as to complete it with the time schedule. The term work shall consist of, extensive analysis of some problems done with the help of a computer individually or in a group not exceeding two students. The assignment can be on any aspect of the industrial engineering. The work can be done in a laboratory or in any other organization.

Each student should prepare report based upon his contribution in the work and review of at least two research papers relating to the work at the end of the first term.

The final report should be based upon the work done during both the terms.

The oral examination, shall be based on the term work submitted and jointly conducted by an internal and an; external examiner from industry, at the end of second semester. Format of the project report should be as follows:

1. Paper: The Project report should be types. printed on white paper of A-4 size.
2. Typing: The typing shall be with single spacing and on one side of the paper.
3. Binding: The Industrial Inplant Report should be submitted with front and back cover in black hand bound, with golden embossing.
4. Margins: Left - 1.25", Right - 1". Top and Bottom 1 "
5. Sequence of Pages:
 1. Title page
 2. Certificate form Institute
 3. Completion Certificate form Industry, if sponsored.
 4. Acknowledgement
 5. Abstract
 6. Index
 7. Nomenclature and Symbols
 8. Actual Content
 9. Conclusion
 10. References.
6. Front cover: The front cover shall have the following details in block capitals
 - i. Title at the top.
 - ii. Name of the candidate in the centre, and
 - iii. Name of the Institute, Name of Industry, if sponsored and the year of submission on separate lines, at the bottom.
7. Blank sheets: No blank sheets be left any where in the report.
8. Project Completion Certificate: The approval sheet follow the title sheet and shall be as shown with proper spacing.

B. E. Industrial Engineering 2012 Syllabus

CERTIFICATE

This is to certify that Mr. /Ms

Has carried out a Project entitled, (Name)

.....during the course of his

(Name of Project)

training at.....in

(Name of Industry)

partial fulfillment of the requirement of the B.E. Production Course of
University of Pune

atduring the academic Year

(Name of Industry)

Date:

(Guide)

Place:

(Examiner)

(Head of Department)

Subject Code: 411211

Reliability Engineering

Teaching Schedule:
[Hours / week]
Lectures: 03

Examination Scheme:
[Maximum Marks]
In Semester Examination - 70
End Semester Examination - 30

Unit I - Introduction to Reliability: [7]

Importance of reliability, performance cost and reliability, quality and safety, system configuration with examples, stochastic processes, bathtub concept, MTBF, MTTR, hazard rate, failure rate, probability and sampling, cumulative probability distribution function, data and distributions.

Unit II - System safety analysis: [7]

Fault tree and event tree concept, construction and analysis, failure modes effects and criticality analysis, systems approach, techno-physio constraints, typical failure analysis, risk priority number and its allocation.

Unit III - Reliability in design and Life Cycle costing: [7]

Survival rate, bath-tub curve analysis of characteristics of failure regimes, design synthesis, reliability effort function, safety margin, allocation of reliabilities by AGREE, ARINC, proportional distribution of unreliability, heuristic method, mean and median methods.

Unit IV - System reliability and redundancy: [7]

Active and Passive Redundancy, redundancy allocation and limitations, Evaluation of overall system reliability, Conditional probability, Matrix methods, set theory analysis of system reliability.

Unit V - Loads, capacity, maintainability and availability: [7]

Reliability and safety factors, Repetitive loading, Preventive maintenance, Testing and repair, reliability centered maintenance, system availability and maintainability.

Unit VI - Reliability testing and Failure Interactions: [7]

Reliability growth models, grouped. and ungrouped data, censored data, accelerated life testing, Markov analysis .of two independent components, reliability with standby system, multi component systems, DTMC and CTMS models.

Text Books:

1. Srinath L. S., "*Reliability Engineering*", East-West Press Pvt. Ltd., ISBN 81-85336-39-3.

B. E. Industrial Engineering 2012 Syllabus

2. Bhadury B., Basu S. K., "*Terotechnology-Reliability Engineering and maintenance*", Asian Books Private Limited, ISBN 81-86299-40-6.

References Books:

1. Lewis Elmer Eugene, "*Introduction to Reliability Engineering*", John Wiley and Sons
2. Ross Sheldon M., "*Stochastic Processes*", John Wiley and Sons.
3. Rao S. S., "*Reliability Engineering*", McGraw Hill

Subject Code: 411212

Energy Management

Teaching Schedule:

[Hours / week]

Lectures: 03

Examination Scheme:

[Maximum Marks]

In Semester Examination - 70

End Semester Examination - 30

Unit 1 : Introduction:

[7]

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.

Unit 2 : Types of Energy:

[7]

Physical Aspects of Energy: Classification of energy – Hydel, Thermal, Nuclear, Wind, & from Waste Products. Efficiency and effectiveness of energy utilization in Industry. Energy and energy analysis. Renewable and non-renewable energy, Conventional and unconventional energy.

Unit 3 : Legal Provisions:

[7]

Legal provisions in Energy Management and its impact: The Energy Conservation Act, 2003, The Electricity Act, 2003. National Electricity Policy. Rural Electrification.

Unit 4 : Demand Side Management:

[7]

Energy Demand Management: Energy utilization, Instrumentation and data analysis, Financial aspects of energy management, Energy management as a separate function and its place in plant management hierarchy.

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;

Unit 5 : Energy Audit and Energy Saving:

[7]

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 utilization, Improving equipment control, waste heat recovery, Change of energy source. Up gradation 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. Provisions under the Electricity Act, functions of Bureau of Energy Efficiency

Unit 6 : Legal Provisions relating to Conservation of Energy:

[7]

The Prevention and Control of Pollution Act, 1974, The Energy Conservation Act, 2001, The Environmental Protection Act, 1986.

Text Books

1. Chakrabarty Amlan, "*Energy Engineering and Management*", PHI
2. "*Energy Conservation Act 2001(Act No 52 OF 2001) with short comments*", Alahabad Law Publishers (India) Pvt Ltd, 2003.
3. "*Electricity Act 2003(Act No 36 of 2003) Bare Act with short comments*", Professional Book Publishers, New Delhi, 2003.

Reference Books:

1. Paul W., O'callaghan; "*Energy Management*", McGraw Hill Book Company
2. Steve Doty, Wayne C. Turner; "*Energy Management Handbook*", Fairmont Press Inc., GA 30047
3. Barny L. Capehart, Waaney C. Turner, William J. Kennedy; "*Guide to Energy Management*", Fairmont Press Inc., GA 30047

Subject Code: 411213 – Elective III - I

Industrial Engineering Applications in Service Sector

Teaching Schedule:

[Hours / week]

Lectures: 03

Examination Scheme:

[Maximum Marks]

In Semester Examination - 70

UNIT I - Introduction to Service Sector:

[7]

Various Services: i) Hotel ii) Health Care iii) Bank iv) Retail Marketing / Department Stores v) Urban bodies, vi) Education vii) Construction viii) Transport and Communication ix) Government. Content of Product Vs. Services.

UNIT I - 2. Resources used in Service Sector:

[7]

a) Space b) Manpower c) Capital d) Material, e) Equipment f) Energy g) Transport and Communication h) Information l) Knowledge.

UNIT I - 3. Critical Aspects of Service Sector:

[7]

i) Customer Satisfaction ii) Cost reduction iii) Efficiency iv) Quality & Productivity of Service organisations, Measurement of these characteristics.

UNIT I - 4. Application of Industrial Engineering Techniques to the Service Sector:

[7]

i) Data collection – Various charting techniques, Flow Diagram, work measurement – time study, activity sampling, self recording, etc. ii) Quantitative techniques. iii) Data analysis – Critical Examination / evaluation of data. iv) Work of simplification, form design. v) Computer application to collection, storage and retrieval of information / data.

UNIT I - 5. Use of computers in Service organizations:

[7]

Plant, local area network, wide area network to Collect, store, retrieve, transmit information / data.

UNIT I - 6. Future of Service Sector:

[7]

Increasing role of service sector in National Economy. Management methods in Service Sector. Need for optimizing resources in Service Sector.

Practical:

The term work shall consist of report on minimum two assignments - based on six techniques used for actual work done in service organizations listed in the syllabus.

1. Management Methods
2. Resource Optimization
3. Manpower Planning
4. Materials Planning
5. Cost Reduction
6. Efficiency
7. Charting Techniques
8. Work Simplification
9. Queuing Techniques
10. Project Planning in case of Service Projects

Oral –

The oral will be based upon the term-work.

Text Books:

1. J. Nevan Wright, Peter Race, "*The Management of Service Operations*", Thomson Learning
2. Anderson R. G.; "*Organisation & Methods*", N & E Hand book Series.
3. Cemach H. P.; "*Workstudy in office*"; Ambar Publications.

Reference Books:

1. Gerard Blokdijk, Ivanka Menken, "*Service Level Management Best Practice Handbook*",
2. T. Benley, Holt Rinahan & Winston; "*Management Service Handbook*", Institute of Management Service
3. Fitzsimmons; *Service Management*; Mc Graw Hill Publications.
4. Salvendy Gavriel, "*Handbook of industrial engineering: technology and operations management*", John Willey and Sons Inc.

Subject Code: 411213 – Elective III - II

Supply Chain Management

Teaching Schedule:

[Hours / week]

Lectures: 03

Examination Scheme:

[Maximum Marks]

In Semester Examination - 70

End Semester Examination - 30

- UNIT 1 - Concept of SCM:** [7]
Concept of Logistics Mgmt, Supply Chain, Types of Supply Chain; Functions in SCM, Transportation Mgmt, Warehousing Mgmt; Warehouse Management Systems
- UNIT 2 - Designing the Supply Chain Network:** [7]
Designing the Distribution Network; Network Design; Network Design in an Uncertain Environment
- UNIT 3 - Planning Demand & Supply in a Supply Chain:** [7]
Demand Forecasting; Aggregate Planning; Planning Supply & Demand
- UNIT 4 - Planning & Managing Inventories in a Supply Chain:** [7]
Managing Economies of scale: Cycle Inventory; Managing Uncertainty: Safety Inventory; Optimal Level of Product Availability
- UNIT 5 - Sourcing, Transporting & Pricing products:** [7]
Sourcing Decisions; Transportation; Pricing & Revenue Management
- UNIT 6 - Co-ordination & Technology in the Supply Chains:** [7]
Co-ordination in Supply Chain; Information Technology and Supply Chain; E-business & Supply Chain

Practical: To be based upon each of the units.

Text Books

1. Dobler Donald W. , David N. Burt, “*Purchasing & Supply Management Text and Cases*”, ISBN 10: 0070370893 / 0-07-037089-3, McGraw-Hill College
2. Chitale A. K., Gupta R. C., “*Materials Management – Text and Cases*”, PHI Learning Private Limited.
3. Janath Shah, “*Supply Chain Management – Text and Cases*”, Pearson Education.

Reference Books:

1. James Stock, Douglas Lambert, “*Strategic Logistics Management*”, McGraw-Hill,
2. Bowersox, “*Logistical Management - The Integrated Supply Chain Process*” McGraw-Hill / Irwin Series,
3. Mentzer John T., “*Supply Chain Management*”, Sage Publications Inc.
4. Birgit Dam Jespersen, Tage Skjott-Larsen, “*Supply Chain Management in Theory and Practice*”, Copenhagen Business School Press.

Subject Code: 411213 – Elective III - III

Manufacturing Automation

Teaching Schedule:

[Hours / week]

Lectures: 03

Examination Scheme:

[Maximum Marks]

In Semester Examination - 70

Unit I - Basics of Automation and Industrial Hydraulics: [7]

Basic concepts of automated system, Advanced automated functions, levels of automation, Principles of hydraulics, hydraulic fluids, filtration technology, hydraulic pumps, hydraulic valves, and hydraulic actuators.

Unit II - Design of Hydraulic Circuits: [7]

Basic hydraulic circuits such as regenerative circuits, sequencing circuit, meter in and meter out circuit, standards in circuit diagram representation, power pack design layout, design of pumps, reservoir, accumulators and intensifiers, selection of standard components, hydraulic servo mechanism, proportional valves.

Unit III - Pneumatic Systems: [7]

Operational principles and application, air compressors, pneumatic cylinders and air motors, pneumatic valves, Design of pneumatic circuits, hydro-pneumatic, control in pneumatic system.

Unit IV - Programmable Automation: [7]

Microprocessor, microprocessor instrumentation system for process control, logic gate and control, programmable logic control, computer process controls.

Unit V - Control System: [7]

Electric control: - features and design principles of electrical circuits in drives, PLC, data conversion (ADC/DAC), interfacing circuits, actuating signals, relays, contactors, types of control systems, linear feedback control system, optimal control system.

Unit VI - Factory Automation: [7]

Transfer systems-Continuous, intermittent, Indexing mechanisms, vibratory bowl feeders, non-vibratory feeders, hopper feeders, rotary disc feeder, centrifugal, revolving feeder, assembly systems, automated assembly, design for automated assembly, synchronous and non synchronous material transfer, industrial robots, Automated Guided Vehicles and FMS, automated warehouse.

Term Work:

The term work shall consist of record of any eight assignments on following topics.

1. Study of control valves, actuators, accumulators and pumps.
2. Study of hydraulic circuits: - hydraulic press, machine tools, automobile systems, etc
3. Performance analysis of positive displacement pumps.
4. Comparative studies on hydraulic circuit design for suitable industrial applications.
5. Study of pneumatic circuits.
6. Study of automation in material handling system.
7. Use of microprocessors: applications in manufacturing engineering.
8. Study and experiments in programmable logic controllers: ladder logic programming
9. Study of displacement, level and pressure controls
10. Measurement and design circuits for speed and temperature measurement.

Note: Oral shall be based on the above term work and practical.

Text Books:

1. Kuo B.C., "*Automatic control systems*", Prentice Hall India Pvt. Ltd., ISBN 0-87692-480-1
2. Peter Rohner, "*Industrial hydraulic control*", Wiley
3. Mikell P Groover, "*Automation, Production System and Computer Integrated Manufacturing*", Prentice Hall Publications, ISBN 81-203-0618-X.
4. Mujumdar S.R., "*Pneumatic System*", Tata McGraw Hill.
5. Gopal, "*Control Systems Engineering*", Willey Eastern Ltd., ISBN 0-85226-605-7.

Reference Books:

1. Doebelin E.O., "*Measurement System, Application and Design*", Tata McGraw Hill Publications Ltd., New Delhi, ISBN 0-07—17338-9.
2. Bolton W., "*Mechatronics Electronic Control Systems in Mechanical and Electrical Engineering*", Pearson Education (Singapore) Pvt Ltd., ISBN 81-7808-339-6.
3. Rangan C.S., Sharma G.R., Mani V.S., "*Instrumentation - Devices and Systems*", Tata McGraw Hill Publications Ltd., New Delhi, ISBN 0-07-463350-3.
4. Histan B.H., Alciatore D.G., "*Introduction to Mechatronics and Measurement Systems*", ISBN 0-07-052910-8.
5. Johnson C.D., "*Process Control Instrumentation Technology*", Prentice Hall of India Pvt. Ltd., New Delhi, ISBN 81-203-0987-1.
6. HMT *Mechatronics*, HMT, ISBN 0-07-462147-5..
7. Vickers manual on hydraulics

Subject Code: 411213 – Elective III - IV

Process Planning and Manufacturing Engineering

Teaching Schedule:

[Hours / week]

Lectures: 03

Examination Scheme:

[Maximum Marks]

In Semester Examination - 70

End Semester Examination - 30

UNIT I – Introduction:

[7]

Types of Production - Standardization, Simplification - Production design and selection - Process planning, selection and analysis - Process planning, selection and analysis - Steps involved in manual experience based planning and computer aided process planning - Retrieval, generative - Selection of processes analysis - Breakeven analysis.

UNIT II – Resource Planning:

[7]

Resource Planning & Production Control: Overview of production control, Forecasting, Master production schedule, Materials requirements planning, Evolution from MRP to MRP II, Evaluation of MRP approach, Order release, Shop floor control.

Job Sequencing and Operations Scheduling: Introduction- Job sequencing-n jobs, One machine-n jobs, Two machine-n jobs, Three machines-n jobs- two jobs, M machines –n jobs, M machines-sequencing jobs on parallel machines, Minimization of setup costs.

UNIT III - Production smoothing:

[7]

Production planning, Production smoothing, Adaptability to demand fluctuations, Sequencing method for the mixed model assembly line to realize smoothed production of goal. Plant Configurations: Introduction-Ultimate plant configuration, Job shop fabrication, Dedicated production lines, Overlapped production, Daily schedule, Forward linkage by means of Kanban, Physical merger of processes, Adjacency, Mixed models, Automated production lines, Pseudo robots, Robots, CAD and manufacturing, Conveyers and stacker cranes, Automatic Quality monitoring.

UNIT IV - Product Engineering:

[7]

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.

UNIT V - Selection of Equipment:

[7]

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.

UNIT VI - Process Sheet design:

[7]

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

Practicals:

One assignment each on every unit mentioned above.

Text Books:

1. Hajara, Chaudhary S. K. "*Elements of Workshop Technology*" Vol-I &II, Asia Publishing House.
2. R.K Jain, "*Production Technology*", Khanna Publication.
3. O.P. Khanna, "*Production Technology*", Dhanpat Rai Publication.
4. D. F. Eary, G. E Johnson, "*Process Engineering for Manufacturing*", Prentice Hall of India Pvt. Ltd.
5. Joseph G. Monks, "*Operations Management, Theory & Problems*", McGraw Hill Book Company, 1982.

Reference Books:

1. G. Halevi, R.D. Weill, "*Principles of Process Planning*", Chapman and Hall
2. Yasuhiro Monden, "*Toyota production System-An Integrated Approach to Just in Time*", Engineering and Management Press
3. Groover Mikell P., "*Fundamental of Modern Manufacturing*" Wiley India Edition

Subject Code: 411214 – Elective IV - II

Plastics Engineering

Teaching Schedule:

[Hours / week]

Lectures: 03

Examination Scheme:

[Maximum Marks]

In Semester Examination - 70

End Semester Examination - 30

Unit I – Basics:

[7]

Basic chemistry for plastic material, Structure, Organic structure, polymerisation, addition, condensation, Classification of plastic, additives of the plastic, common alloys & blends, colouring of plastics,

Unit II – Injection Moulding:

[7]

Injection moulding: equipment, mould ability features, injection moulding cycle, effect of processing on mechanical properties, Injection mould designs considerations, functions of register ring, sprue bush, cavity & core inserts, ejection of mold & cooling of Injection moulds.

Unit III – Extrusion:

[7]

Extrusion: twin screw extruders, blown film, coextruded multilayer films, dwell lip air ring, typical extruded dimensions, special features of extrusion dies, extrusion coating & lamination, extruder maintenance & safety, extrusion problems.

Unit IV – Blow Moulding:

[7]

Blow moulding: classification of blow molding processes, comparison of injection blow & extrusion blow molding processes, basic design considerations in blow molding, bottle design concept, surface treatment of container, rotary injection blow molding, stretch blow molding.

Unit V – Thermoforming:

[7]

Thermoforming: major thermoforming processes, process factors in thermoforming, straight vacuum forming technique, plug assist-forming thermoforming of PP sheets, problems in thermoforming, twin sheet thermoforming, and maintenance.

Unit VI – Finishing:

[7]

Finishing and machining of Plastic: Filing, tumbling, ashing, buffing and polishing of thermosetting and thermoplastic. Machining of plastic- principle considerations, guidelines for tool geometry, drilling and reaming, tapping and trading, turning and milling, sawing, piercing, trimming and routing of thermosetting and thermoplastic.

Text Books:

1. A. S. Athlye, "Plastic processing handbook", Multitech Publication.
2. Date P. P., "Introduction to Manufacturing Technology, Principles and Practices", , Jayco Publishers, Mumbai

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3. Balasubramanyam R., Callister's "*Material Science and Engineering*", Wiley Student Edition.

Reference Books:

1. W. S. Allen, P. N. Baker, "*Handbook of plastic technology Vol I & II*", CBS Publishers.
2. William J. Patton, "*Plastic Technology*", Tarapurwala and Sons.
3. Akira Kobayeshi, "*Machining of plastics*", Robert A Khenger Publication.
4. William Frados, Plastic Handbook.
5. Plunkett W. John, Plunkett's Chemicals, "*Coatings & Plastics Industry Almanac*", Plunkett Research Limited.

Subject Code: 411214 – Elective IV - III

Manufacturing Strategies

Teaching Schedule:

[Hours / week]

Lectures: 03

Examination Scheme:

[Maximum Marks]

In Semester Examination - 70

End Semester Examination - 30

UNIT I - Product Design and Development:

[7]

Product development verses design, modern product development theories and methodologist in design. Product development teams. Product development planning, technical and business concerns. Understanding customer needs, Establishing product functions. Functional decomposition, modeling process, Function trees system functionality, augmentation. Aggregation, common basis, functional modeling methods.

UNIT II – Benchmarking:

[7]

Product tear down and experimentation, benchmarking and establishing engineering specification. Product portfolios and portfolio architecture.

Tear down process, tear down methods, post teardown reporting, benchmarking approach, support tools, setting specifications, portfolio architecture, types, platform, functional architecting, optimization selection. Product modularity, modular design.

UNIT III - Concepts and Modeling:

[7]

Generation of concepts, information gathering and brain storming, directed search, morphological analysis, combining solutions. Decision making, estimation of technical feasibility, concept selection process, selection charts, measurement theory, numerical concept scoring, design evaluation scheme, concept embodiment, geometry and layout, system modeling, modeling of product metrics, selection of model by performance specifications, physical prototyping, informal and formal models.

UNIT IV - Design materials & human factors in product design:

[7]

Material properties, metals, plastics, rubber, woods & factors considered while designing for metals, plastics, rubber, woods etc, Anthropometry factors, physiological factors, psychology factors, anatomy factors.

Economic factors influencing design, product value, safety, reliability & environmental considerations, economic analysis, break even analysis, profit & competitiveness, economic of a new product design.

UNIT V:- Value engineering in product design:

[7]

Introduction, historical perspective, nature & measurement of value, importance of value, value analysis job plan, creativity, steps for solving & value analysis, value analysis tests

Principal stress trajectories(force flow lines), balanced design, criteria & objective of design, material toughness, resilience, designing for uniform strength.

UNIT VI:- Modern Approaches to Product Design:

[7]

Concept of Product Life Cycle Management. Features of PLM Software. Concurrent Design, Quality Function Development (QFD), Rapid Prototyping. Design for manufacturing and assembly. Design for the environment, design for assembly, piece part production, cost analysis, environmental objectives, life cycle assessments, techniques to reduce environmental impact like minimum material usage, disassembly, recycle ability, remanufacturing, high impact material reduction, energy efficiency, regulation and standards.

TEXT BOOKS:

1. Chitale A. K., Gupta R. C., "*Product Design & Manufacturing*", Prentice Hall India Ltd., ISBN: 978-81-203-4282-8
2. Roozenburg N.F.M., Eekels J., "*Product Design : Fundamentals & Methods*", IFS (Publications) Ltd and Springer-Verlag London UK

REFERENCE BOOKS:

1. Dale Huchingson R "*New Horizons for Human Factors in Design*" McGraw Hill Company 19811.Industrial Design-Mayall
2. Roozenburg NFM and J. Eekels, "*Product Design: Fundamentals and Methods A Wiley Series in Product Development*", John Wiley and Sons.

Subject Code: 411214 – Elective IV - IV

Quality Management

Teaching Schedule:

[Hours / week]

Lectures: 03

Examination Scheme:

[Maximum Marks]

In Semester Examination - 70

End Semester Examination - 30

UNIT I – TQM Principles:

[7]

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Daily Work Management, Policy Management, PDCA [Plan Do Check Act] & SDCA Standardise Do Check Act] Cycles; Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDCA Cycle, 5S, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure.

UNIT II – Introduction:

[7]

Total Quality Management, Methods of Quality Management – Acceptable Quality Level, Arrow Diagram, Cost Benefit Analysis, Deming Wheel [PDCA], Error Proofing [Poka Yoke], Gantt Chart, Pareto Analysis, Quality Circle, Team Work, TPM, Zero Defect, etc.

UNIT III – Analytical Methods & Idea Generation:

[7]

Cause and Effect Analysis, Critical Path Analysis, Failure Mode Effect Analysis, Fault Tree Analysis, Force Field Analysis, Minute Analysis, Paired Comparison, Solution Effect Analysis, System Design, Taguchi Method, Tolerance Design, Geometric Dimensioning and Tolerance [GD&T]; Brainstorming, Brain-writing, Breaking Sets, Imagineering, Lateral Thinking, List Reduction, Nominal Group Technique, Opportunity analysis, Suggestion schemes.

UNIT IV - TQM Tools:

[7]

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA.

UNIT IV – Statistical Quality Control:

[7]

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

UNIT V – Other Aspects of Quality:

[7]

Quality of Service, Cost of Quality, Value of Quality, Difference between Inspection, Quality

Control and Quality Assurance, Role of Quality in Present day environment. Meaning of quality Control, 100% Inspection and Selective Inspection, Statistics in Selective inspection. Control Charts, X, R, P and C Charts, Sampling inspection, OC Curves and Sampling Plan, Process Capability Index (PCI), Concept, Methods of determining PCI and uses of PCI.

UNIT VI – Quality Standards:

[7]

ISO 9001-2000 Series of Standards- History and Evolution of ISO 9000 Series , importance and overview of ISO 9000- 1998 Series standards, structure of ISO 9000-2000 Series standards, clauses of ISO 9000 series standards and their interpretation and implementation, quality system documentation and audit.

ISO 14000:- environmental management concepts, and requirement of ISO 14001 , benefits of environmental management Systems

Malcom Baldrige national quality Award and other quality awards

Text Books:

1. Kanji Gopal K., Ashar Mike, “*100 Methods of Total Quality Management*”, SAGE Publications Ltd., 6, Bonhill Street, London.
2. Dale H. Besterfield, et al., “*Total Quality Management*”, Pearson Education, Inc. ISBN 81-297-0260-6
3. K.J.Hume, “*Engineering Metrology*”, Kalyani publication
4. Kaoru Ishikawa, “*Guide to Quality Control*”, Asian Productivity Organisation, Tokyo.
5. Subburaj Ramasamy, “*Total Quality Management*”, Tata McGraw-Hill Publishing Company Limited
6. ISO 9000 Quality System – S.Dalela.

Reference Books:

1. Juran Joseph M., A. Blanten Godfrey, “*Juran’s Quality Control Handbook*”, McGraw Hill Publishers
2. “*ISO 9000 Quality Management System*”, International Trade Center, Geneva
3. James R.Evans & William M.Lindsay, “*The Management and Control of Quality*”, (5th Edition), South-Western (Thomson Learning), 2002 (ISBN 0-324-06680-5).

Subject Code: 411215

Reliability Engineering

Teaching Schedule:

[Hours / week]

Practical: 02

Examination Scheme:

[Maximum Marks]

Oral – 50

During the practical students should be asked to solve real life 8 cases on the topics. On each of the following topics at least one assignment should be there.

1. Introduction to Reliability
2. System safety analysis
3. Reliability in design and Life Cycle costing
4. System reliability and redundancy
5. Loads, capacity, maintainability and availability
6. Reliability testing and Failure Interactions

Subject Code: 411216

Energy Management

Teaching Schedule:

[Hours / week]

Practical: 02

Examination Scheme:

[Maximum Marks]

Oral – 50

During the practical students should be asked to solve real life 8 cases on the topics. On each of the following topics at least one assignment should be there.

1. Basics of Energy Management
2. Physical Aspects of Energy
3. Legal Provisions
4. Demand Side Management
5. Energy Audit and Energy Saving
6. Energy Audit
7. Legal Provisions relating to Conservation of Energy

Subject Code: 411217

Elective III

Teaching Schedule:

[Hours / week]

Practical: 02

Examination Scheme:

[Maximum Marks]

Oral – 50

During the practical students should be asked to solve real life cases on each of the Unit in the syllabus for the related subject and have 8 assignments in total.

Subject Code: 411218

Elective IV

Teaching Schedule:

[Hours / week]

Practical: 02

Examination Scheme:

[Maximum Marks]

Oral – 50

During the practical students should be asked to solve real life cases on each of the Unit in the syllabus for the related subject and have 8 assignments in total.