Bansilal Ramnath Agarwal Charitable Trust’s
Vishwakarma Institute of Technology

(An Autonomous Institute affiliated to University of Pune)

Structure & Syllabus of

B.E. (Industrial Engineering)


Effective from Academic Year 2011-12

Prepared by: - Board of Studies in Industrial & Production Engineering
Approved by: - Academic Board, Vishwakarma Institute of Technology, Pune

Signed by,

Chairman – BOS     Chairman – Academic Board

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### Academic Information

$ Please Refer Academic Information

! Please Refer F.E. Structure & Syllabi Booklet

@ Please Refer GP-PD-OE Structure & Syllabi Booklet

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Program Educational Objectives (PEO) for B.E. (Industrial Engineering) Program

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<th>PEO No.</th>
<th>Description of the Objective</th>
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<td>I</td>
<td><strong>Preparation:</strong> To prepare students to excel in postgraduate programmes / be successful in industry / technical profession.</td>
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<td>II</td>
<td><strong>Core Competence:</strong> To provide students with a solid foundation in mathematical, scientific and engineering fundamentals required to solve engineering problems and also to pursue higher studies.</td>
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<tr>
<td>III</td>
<td><strong>Breadth:</strong> To train students with good scientific and engineering breadth so as to comprehend, analyze, design, and create novel products and solutions for the real life problems.</td>
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<tr>
<td>IV</td>
<td><strong>Professionalism:</strong> To inculcate in students professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach, and an ability to relate engineering issues to broader social context.</td>
</tr>
<tr>
<td>V</td>
<td><strong>Learning Environment:</strong> To provide students with an academic environment aware of excellence, leadership, written ethical codes and guidelines, and the life-long learning needed for a successful professional career.</td>
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2. Program and Course Outcomes,

Programme Outcomes:

- a. Graduates will demonstrate basic knowledge in mathematics, science and engineering.
- b. Graduate will be familiar with different manufacturing processes.
- c. Graduate will be familiar with different materials used in manufacturing.
- d. Graduates will demonstrate an ability to design simple mechanical components.
- e. Graduates will be familiar with industry and organizational management.
- f. Graduates will have the confidence to apply engineering solutions in global and societal contexts.
- g. Graduates will demonstrate the ability to design and conduct experiments, interpret and analyze data, and report results.
- h. Graduates will demonstrate the ability to design a process that meets desired
Bansilal Ramnath Agarwal Charitable Trust’s  
Vishwakarma Institute of Technology, Pune – 411 037  
Department of Industrial & Production Engineering

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<th>Specifications and Requirements</th>
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<tr>
<td>i. Graduate will demonstrate skills to use modern engineering tools, software and equipment to analyze problems.</td>
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<td>j. Graduates will demonstrate an ability to visualize and work on laboratory and multidisciplinary tasks.</td>
</tr>
<tr>
<td>k. Graduates will be familiar with safety, product quality aspects and quality control.</td>
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<tr>
<td>l. Graduates will be able to communicate effectively in both verbal and written forms.</td>
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<tr>
<td>m. Graduate who can participate and succeed in competitive examinations like GATE, GRE.</td>
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**Under Graduate Program in Industrial Engineering**

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<th>Course Outcomes: Course outcomes are specified in the course syllabus</th>
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<td>n. Graduates will demonstrate an ability to identify, formulate and solve the problems in methods improvement.</td>
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<td>o. Graduate will be familiar with latest management techniques.</td>
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Course Outcomes: Course outcomes are specified in the course syllabus
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<td>Theory of Machines</td>
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<td>S2</td>
<td>IP21103</td>
<td>Mathematics for Engineering Applications</td>
<td>Lect. 3</td>
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<td>S3</td>
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<td>Casting, Welding &amp; Rubber-Plastic Processing</td>
<td>Lect. 3</td>
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<td>S4</td>
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<td>T1</td>
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<td>Theory of Machines</td>
<td>Lect. 0</td>
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<td>T2</td>
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<td>Mathematics for Engineering Applications</td>
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<td>P1</td>
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<td>Manufacturing Practices 1 (Workshop)</td>
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<td>P2</td>
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<td>Material Sciences Lab</td>
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<td>MP3</td>
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<td>SD3</td>
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<td>Machine Drawing &amp; GDT</td>
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<td>Elective –Soft Skills</td>
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<td>CVV1</td>
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IP21101 :: THEORY OF MACHINES

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To make the students understand the concepts & broad principles of contents of the course
- Aim is to provide insight of the subject
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: I, II (a)

Unit I

Introduction

A. Kinematic link, types of link, machine, structure, types of constrained motion, kinematic pair, classification of kinematic pairs, degrees of freedom, kinematic chain, mechanism, inversion, four bar chain and its inversion, single slider crank chain and its inversion and double slider crank chain and its inversions.
B. Steering mechanism - Ackerman steering mechanism, Davis steering mechanism, Hooks joint.

Unit II

Kinematic Analysis of Mechanisms: (Velocity & Acceleration Analysis)

A. Introduction, Motion of a link, velocity of a point on a link by Relative velocity method, velocity in a slider crank mechanism Introduction, acceleration diagram for a link, acceleration of a point on a link by Relative velocity method, acceleration in a slider crank mechanism, Klein’s construction
B. Approximate analytical method for velocity & acceleration of piston.

Unit III

Spur Gear

A. Advantages and disadvantages of gear drive, Classification of Toothed wheel, Terms used in gears, Involute and Cycloidal profile, condition for constant velocity ratio-law of gearing, Length of path of contact, Length of arc of contact, interference in involute gears, minimum number of teeth on the pinion in order to avoid interference, minimum number of teeth on the wheel in order to avoid interference.
B. Types of Gear Trains- Simple Gear Trains, Compound Gear Trains, Reverted Gear Trains, Epicyclic Gear Trains

Unit IV

Cams and Followers

A. Introduction, applications, types of cams and followers, terms used in radial cams, analysis of motion of follower, displacement, velocity, and acceleration diagrams for various types of follower motions: uniform velocity, SHM, uniform acceleration and retardation, cycloidal motion, construction of cam profile for roller, knife edge and flat faced followers. Construction of cam profile for oscillating follower.

B. Introduction to Belt drives types of belts, types of flat belt drive.

Unit V

Governors

A. Introduction, Function, types of governor, centrifugal governor, terms used in governor, different types of centrifugal governors - Watt, Porter, Proell & Hartnell, sensitivities of governor, stability of governor, isochronous of governor, hunting, effort and power of governor

B. Hartung governor, Pickering governor

Text Books


Reference Books

IP21103 :: MATHEMATICS FOR ENGINEERING APPLICATIONS

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To make the students understand the concepts & broad principles of contents of the course
- Develop conceptual framework of the course
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: I, II (a)

Unit I
Linear Differential equations of higher order
B. System of linear differential equations, Examples on Mass Spring System. Revision: Probability and Expected value, classical, relative frequency and subjective approaches to

Unit II
Fourier and Laplace Transform
B. Application of Fourier series to physical systems that are governed by Ode’s and subjected to periodic forcing functions. Application of Laplace transform for solving system of differential equations. Revision: Regression analysis (Linear only), Correlation analysis, Karl Pearson’s correlation coefficient, Spearman’s Rank correlation coefficient

Unit III
Applications of Partial Differential equations
B. d’Alembert’s solution of partial differential equations
Unit IV
Vector Calculus
A. Vector and scalar functions & fields, Derivative, Gradient of a scalar field, Directional derivative, Divergence and curl of a vector field, vector identities, Irrotational and solenoidal vectors and potential functions, line and surface integrals, Green’s, Stoke’s and Gauss theorems and applications to Engineering Problems.
B. Applications to Fluid dynamics

Unit V
Basics Statistics
B. Application to real life problem. Revision: Concept of Random Variable & Probability Distributions, Discrete random variable and its distributions – Binomial, Poisson., Continuous random variable and its distributions - (Mean, Variance of All Distributions)

Text Books

Reference Books
1. Murray R. Spiegel, Advanced Calculus, Schaum’s out line series, --------, --------
IP20101 :: CASTING, WELDING, RUBBERS & PLASTIC PROCESSING

Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To make the students understand the concepts & broad principles of contents of the course
- Aim is to provide insight of the subject
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: I, II (b)

Unit I  
Casting I

A. Introduction of casting process, casting manufacturing steps, applications and advantages of castings, Special casting Processes: Pressure and gravity Die Casting, centrifugal casting, continuous casting, investment casting, their typical applications, merits and limitations. Types of pattern and pattern design. Classification of molding sands, core sands, molding and core additives, Cores-Functions of cores, Core making, core prints, core making machines, core baking, core finishing, assembly & setting of cores, types of Core manufacturing, Core making machines.
B. Types of foundries, Foundry mechanization and automation, Sand preparation and sand reclamation, Pattern materials, types of core boxes

Unit II  
Casting II

A. Types of molds: Green sand, dry sand mould, shell mold, plaster mould, CO2 moulds. Hand moulding equipment, mould ramming methods, steps in mould making boxes, forces on cores and moulds.
Melting & Pouring of Metals - Melting Furnaces-types, Cupola, Induction- furnace construction, operation, zones and chemistry, Shakeout, Cleaning & finishing of castings, Testing and inspection of castings and casting defects, Solidification of casting, Progressive and directional solidification, Gating and Risering of casting
B. Moulding Methods: bench, floor, pit and Machine moulding,
Unit III (8 Hrs)
Welding I

A. Gas Welding – processes and equipment used, types of flame, gas welding technique adjustment of flame, oxy Acetylene welding, gas cutting – merits, limitations and applications of above processes
Brazing, braze welding and soldering processes, merits, limitations and applications of above processes.
B. Filler metals & fluxes used

Unit IV (8 Hrs)
Welding II

B. Welding defects and Remedies

Unit V (8 Hrs)
Processes Related With Plastics And Rubber

Micro and Nano Machining: Concepts, introduction and applications of the process and machines.
B. Plastics & Rubber – Moulding processes

Text Books
1. D.K. Singh, Manufacturing Technology, 2/e, Pearson Education
2. Foundry Technology by O.P. Khanna
2. Principles of Metal casting by P.L. Jain

Reference Books
2. Little, Welding and Welding Technology, Tata Mc Graw Hil
3. R.S.Parmar, Welding and Welding Processes, Khanna Publication
4. Welding Technology by O.P. Kahanna
Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To make the students understand the concepts & broad principles of contents of the course
- Aim is to provide insight of the subject
- Sensitizes the students of the importance of course in real life environment
- Selection of appropriate materials for various types of products
- Mapping with PEOs: I II, III (c, p)

Unit I  
Plastic Deformation  
(6 Hrs)
B. Classification of Engineering Materials. Important properties of each group & some typical applications of each group.

Unit II  
Material Testing  
(9 Hrs)
Non-destructive tests - Visual Inspection, Magna flux test Dye penetrant test, Sonic and Ultrasonic test, Radiography.
B. Examples of selection of NDT & mechanical testing methods for selected components like crankshafts,. gears, razor blades, welded joints, steel and cast iron castings, rolled products, forged products.

Unit III  
Equilibrium diagrams and Pyrometry  
(9 Hrs)

B. Practice of numerical based on equilibrium diagrams

Unit IV

Strengthening Mechanisms and Powder Metallurgy

A. Strengthening Mechanisms: Refinement of grain size, Solid solution hardening, Dispersion hardening, Age hardening, Martensitic transformation, Composite materials etc.

Powder Metallurgy: Process in brief, powder characteristics, powder manufacturing, Production of sintered structural components such as self lubricated bearing, cemented carbide tools.

B. Production of cermets, refractory metals, electrical contact materials, friction materials, Diamond impregnated tools etc

Unit V

Methods of Surface Improvements and Corrosion Prevention

A. Corrosion Prevention Methods: Design and material selection, atmosphere control, electroplating, Inhibitors, Cathodic and anodic protection, Coatings etc. Surface Modification Techniques such as Electro deposition (Conventional electroplating, Electroless plating, Anodising), Diffusion coatings (Plasma nitriding, Aluminizing, Boronising, Chromizing), Vapour deposition (conventional PVD and CVD, Diamond like coating, Electron beam PVD), Thermal Spray Coatings, Ion implantation etc.

B. Corrosion prevention of some typical engineering components. Preparation of substrate for surface engineering.

Text Books


Reference Books

5. Structure and properties of materials II, Willey Eastern (P) Ltd.
IP21201 :: THEORY OF MACHINES

Credits: 01

Teaching Scheme: - Tutorial 1 Hr/Week

Prerequisites: : Nil

Objectives:

- To make the students understand the concepts & broad principles of contents of the course
- Aim is to provide insight of the subject
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: I, II (a)

List of Contents

Term work consist of any following exercises :

1. Graphical solution of problems on velocity in mechanisms by Relative velocity method.
2. Graphical solution of problems on acceleration in mechanisms by Relative acceleration method
3. Graphical solution of problems on velocity and acceleration in mechanisms by Kleins construction method.
4. Determination of moment of inertia of rigid body by bifilar suspension method.
5. Determination of moment of inertia of rigid body by trifilar suspension method.
6. Study of belt drives
7. Study of Gear Trains
8. To draw a conjugate profile for any general shape of gear tooth.
9. To draw a cam profile for specific follower motion.
10. Determination of radius of gyration of a connecting rod using theory of compound pendulum.
11. Study of Hookes joint.
12. Demonstration and explanation of configuration diagram of working models based on four bar chain, single slider crank mechanism, and double slider crank mechanism for various link positions (any two models).
13. Problems solving on governor.

Text Books

Reference Books

IP21203:: MATHEMATICS FOR ENGINEERING APPLICATIONS

Credits: 01  Teaching Scheme: - - Tutorial 1 Hr/Week

Prerequisites: : Nil

Objectives:
1. To make the students understand the concepts & broad principles of the contents of the course
2. Develop conceptual framework of the course
3. Sensitizes the students of the importance of course in real life environment
   - Mapping with PEOs: I, II (a)

List of Assignments
1. Linear Differential Equation – Method of Solution
2. Application of Linear Differential Equation
3. Fourier Series
4. Fourier Transform
5. Laplace Transform
6. Inverse Laplace Transform & Its Applications
7. Vector Calculus – Vector Differentiation
8. Vector Calculus – Vector Integration
9. Statistics – Data Presentation
10. Statistics – Data Analysis

Text Books

Reference Books
IP20301 :: MANUFACTURING PRACTICES 1

Credits: 02 Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Nil

Objectives:
- To give students ‘hands on experience’ of craftsmanship, machining, maintenance and assembly.
- To make students familiar with different Work Trades.
- To develop quality & safety consciousness amongst the students.
- To develop respect towards labour work amongst the student.
- Mapping with PEOs: I II (b, g, j)

List of Practical
1. Turning: Introduction, functions and operations of lathe parts, lathe tools and measuring instruments, demonstration of different lathe operations, safety precautions etc.
   Practical: One job involving few lathe operations.
2. Pattern Making: Introduction, different types of patterns, necessity of draft and allowance, function and operation of wood turning lathe, safety precautions etc.
   Practical: one job of any one type of pattern.
3. Foundry: Introduction, uses of different foundry tools, sand preparation, mould preparation, metal pouring, safety precautions etc.
   Practical: One job of casting.

Demonstrations

Text Books
2. H.P.Garg, Industrial Maintenance, Published by S.Chand Co.Ltd, 1990

Reference Books
1. HMT, Production Technology, Published by Tata McGraw-Hill Publishing Co.Ltd, New Delhi, 1st -1987
FF No. : 654

IP20303 :: MATERIAL SCIENCE

Credits: 02

Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Nil

Objectives:
- To develop skills in the subject
- Verify the principles of the course
- Application of the theory
- Understanding of fundamentals of the subject
- Mapping with PEOs: I, II, III (c,p)

List of Practical
1. Tensile test on mild steel and aluminum test pieces.
2. Compression test on cast iron and brass test pieces.
3. Brinell hardness test on different materials.
4. Poldi hardness test on different materials.
5. Vickers hardness test on different materials.
6. Rockwell test on different materials with different Scales.
7. Rockwell superficial test on different materials with different Scales.
8. Izod and Charpy impact tests.
9. Erichsen cupping test on minimum three different sheet metal samples.
10. Non-destructive testing - Magnaflux testing
11. Non-destructive testing - Dye penetrant test
12. Non-destructive testing - ultrasonic testing

Text Books

Reference Books
5. Structure and properties of materials II, Willey Eastern (P) Ltd.

IP24301 :: MACHINE DRAWING & GDT

Credits: 01  
Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Nil

Objectives:
- To develop skills in the subject
- Verify the principles of the course
- Application of the theory
- Mapping with PEOs: I, II (d, r)

List of Practical
1. Sketches of Conventional Representation of Machine Components as per ‘IS Code SP 46’ of Screw Threads, Tapped Holes, Holes on Circular Pitch, Countersunk and Countersinks
2. Sketches of Conventional Representation of Machine Components as per ‘IS Code SP 46’ of Bearing, Splined Shafts, Tapers, Chamfer, Knurling, Keys
3. Sketches of Conventional Representation of Machine Components as per ‘IS Code SP 46’ of Springs, Gears, Welded Joints, Structural Sections
4. Sketches of Conventional Representation of Machine Components as per ‘IS Code SP 46’ of Types of Screws
5. Sketches of Conventional Representation of Machine Components as per ‘IS Code SP 46’ of Bolts and Nuts
6. Sketches of Conventional Representation of Machine Components as per ‘IS Code SP 46’ of Nut Locking Arrangements
7. Assembly and Details of Machine Components based on ‘Theory of Geometrical Dimensioning & Tolerancing’ (GDT) - Cotter Joint, Knuckle Joint
8. Assembly and Details of Machine Components based on ‘Theory of Geometrical Dimensioning & Tolerancing’ (GDT) - Rigid and Flexible Coupling
9. Assembly and Details of Machine Components based on ‘Theory of Geometrical Dimensioning & Tolerancing’ (GDT) - Stop Valve
10. Assembly and Details of Machine Components based on ‘Theory of Geometrical Dimensioning & Tolerancing’ (GDT) - Non Return Valve
11. Assembly and Details of Machine Components based on ‘Theory of Geometrical Dimensioning & Tolerancing’ (GDT) - Revolving Centers
12. Assembly and Details of Machine Components based on ‘Theory of Geometrical Dimensioning & Tolerancing’ (GDT) - Machine Vice, Tool Holder
Text Books

Reference Books
1. Shah, Rana, Engineering Drawing, 2/e, Pearson Education
4. CMTI Handbook of Machine Tools
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IP21102 :: DESIGN OF MACHINE ELEMENTS

Credits: 03  Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To make the students understand the concepts & broad principles of contents of the Strength of Materials
- Develop conceptual framework of the course
- Mapping with PEOs: I, II, III (a, j, d)

Unit I
Simple Stresses and Strains ; Principal Stresses and Strains

A. Concept of stress and strain (Linear, lateral, shear and volumetric) Hooke’s law. Poissons ratio, modulus of elasticity, modulus of rigidity, stress-strain diagrams for ductile and brittle materials, factor of safety, working stress, generalized Hooke’s law, bulk modulus, inter-relation between elastic constants.

Elementary Treatment of Axial force diagram, stresses, strains and deformations in determinate and indeterminate, homogeneous and composite bars under concentrated loads.

Normal and Shear Stresses on any oblique plane; Concept of principal planes; Derivation of expressions for principal stresses and maximum shear stress, position of principal planes and planes of maximum shear, combined effect of axial force, bending and torsion.

B. Derivations of Various Formulae, Failure Diagrams indicating Areas/Sections & Stress Levels; Graphical solution using Mohr’s circle of stresses

Unit II
Slope and Deflection of Beams; Axially Loaded Columns


Elementary Treatment of Concept of buckling of columns. Derivation of Euler’s formula for buckling load for column with hinged ends. Concept of equivalent length for various end conditions. Limitations of Euler’s formula. Rankine’s formula; Safe Load
Unit III  (8 Hrs)
Shear Force and Bending Moment Diagrams; Shear stresses

A. Elementary Treatment of Shear force and bending moment in determinate beams due to concentrated loads, uniformly distributed loads, uniformly varying loads and couples. Relation between SF and BM diagrams for cantilevers, simple and compound beams, Construction of loading diagram and BMD from SFD and construction of loading diagram and SFD from BMD.
Elementary Treatment of Concept, derivation of shear stress distribution formula, shear stress distribution diagram for common symmetrical sections, maximum and average shear stress, shear connection between flange and web.

B. Derivations of Various Formulae, Failure Diagrams indicating Areas/Sections & Stress Levels; Bending of curved bars/beams (Winkler & Bach Theory) Stresses in ring, chain link and crane hooks.

Unit IV  (8 Hrs)
Fundamentals of Machine Design; Design of Shaft, Key, and Couplings

A. Fundamentals of machine design: Design philosophy, Engineering Materials, Brief overview of design and manufacturing
Design for Endurance; Stress Concentration, Design for dynamic loading, Low and high cycle fatigue
Design of Shaft: Stresses, strains and deformations in determinate shafts of solid and hollow homogeneous and composite circular cross section subject to twisting moment, Derivation of torsion equation
Concept of strain energy, derivation and use of expressions for deformations of axially loaded members under gradual, sudden and impact loads. Shaft and its design based on strength; -Twisting, -Bending & -Axial Load,
Design of Keys:- Introduction, Types of Keys and Design of Square, Rectangular, Gib head Sunk Keys.
Couplings Introduction, types and uses, Design for Rigid and Protected Flange Coupling

B. Derivations of Various Formulae, Failure Diagrams indicating Areas/Sections & Stress Levels; Design of shaft for variable load and based on stiffness, Design of shaft as per A.S.M.E. Code.
Unit V  
**Design of Springs, Levers, Brakes, Clutches**

**(8 Hrs)**

**A.** Introduction to Design of Helical Springs, Types of Springs, Helical Springs in Parallel and Series, Concentric and Composite Helical Springs, Design of Helical Springs for Variable Load, Elementary Treatment of Lever Design; Design of Bell Crank Levers for Brakes & Clutch Application, Introduction to Brakes, Types, Design of single / double Shoe Brakes, Band Brakes, Block & Band Brakes, Introduction to Clutch, Types, Design of friction plate (Single and Multi plate),

**B.** Derivations of Various Formulae, Failure Diagrams indicating Areas/Sections & Stress Levels; Energy stored in Spring, Safety Valve Lever; Energy Absorbed & Heat Dissipated by brake; Internal Expanding Brake, Centrifugal and Cone clutch.

**Text Books**

1. Timoshenko and Young – Strength of Materials, CBS Publisher  

**Reference Books**

1. U.C. Jindal, Design of Machine Elements, Pearson Education  
5. Mechanical Engineering Design- J.E. Shigley  
IP20102 :: METROLOGY & MECHANICAL MEASUREMENTS

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To make the students understand the concepts & broad principles of contents of the course
- Develop conceptual framework of the course
- Sensitizes the students of the importance of course in real life environment
- Know fundamentals of sensors
- Suggest suitable sensor for given applications.
- Procure and install the sensor.
- Mapping with PEOs: I, II, III (a, h, j, k)

Unit I
Introduction to Metrology

B. Manufacture of slip gauges, Sine Center, Uses of sine bars, angle gauges, Angle Dekkor, vernier bevel protractors

Unit II
Limits Fits and Tolerances

B. Optical. Electrical, Pneumatic Comparators

Unit III
Surface Finish Measurement

A. Surface Texture, Meaning of RMS and CLA values, Tomlison’s Surface Meter Interferometry: Introduction, Flatness testing by interferometry
Recent Trends in Engineering Metrology.
B. Taylor- Hobson Surface Meter, Grades of Roughness, Specifications. NPL Flatness Interferometer. Study of Measuring Machines,

Unit IV

Pressure, Displacement, Velocity Measurement

A. Pressure, Displacement, Velocity Measurement, Pressure measurement- manometers, inductive transducer Measurement of displacement—mechanical method, optical method Velocity measurement—linear velocity transducer, mechanical tachometer, DC and AC tachogenerators
B. PIRANI gauge variable resistance displacement measuring transducers inductive pick up tachometer.

Unit V

Strain, Force, Torque Measurement

A. Strain Measurement: Strain gauge – classification (metallic, semiconductor), gauge factor, properties of gauge wire, , mounting, measurement circuits,
Force Measurement: Basic methods of force measurement, Strain gauges
Torque Measurement, , Inductive, Photoelectric, proximity sensor, Strain gauge, Prony brake, Torsion Bar, Feedback torque sensor, Shaft power Measurement
Absorption Dynamometer (servo control, absorption), Weight Measurement
B. LVDT, Piezoelectric, Vibrating Wire type. Belt, Gear Dynamometer, Instantaneous power measurements, Alternator power measurement. Load Cells – Mechanical

Text Books
7. K.J.Hume, Engineering Metrology, Kalyani publication

Reference Books

IP20104 :: METAL CUTTING & FINISHING PROCESSES

Credits: 03
Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
• To make the students understand the concepts & broad principles of contents of the course
• Aim is to provide insight of the subject
• Sensitizes the students of the importance of course in real life environment
• Mapping with PEOs: I, II (b)

Unit I
Lathe and turning operations:
A. Lathe and its accessories, lathe specifications, lathe cutting tools, speed, feed and depth of cut, various operations on lathe (turning, boring-taper turning, threading etc.)
Geometry of single point cutting tools, tool materials and their properties, coolants and lubricants,
B. Introduction to high speed machining

Unit II
Shaper, planer and slotting machines & Drilling Machines and Related Operations:
A. Basic Introduction to shaping and planing operations: Definition, type of shapers and planers. Quick return mechanism, cutting speed and feeds, machining time.
Drilling operations, boring drills and reamers, cutting speeds and feeds, machining time.
B. Types of drilling machines, equipment, size of drilling machine,

Unit III
Milling Machines and operations
A. Various milling operations and types, accessories and standard and special equipment, Universal dividing head, angular milling attachment, standard index base. Types of indexing (direct simple, differential compound spiral, angular), size, shape and materials of milling cutters, cutting speeds, feed and depth of cut, machining time.
B. Vertical milling attachment, high speed milling attachment, slotting attachment, vice

Unit IV
Grinding and Super Finishing

B. Honing, lapping, super finishing, buffing, burnishing processes.

**Unit V**

**Gear Cutting**

**Thread cutting & Broaching Operations**

A. Forming & generation, gear cutting on milling, gear hobbing, gear shaping, gear shaving, lapping & grinding, various machines use for gear manufacturing. Definitions, types of broaching, machines cutters for broaching, materials for broach, cutting action, chip disposal, broaching speeds, application of broaching, advantages and limitations.

B. Thread cutting - internal and external chasers, dies, thread rolling thread milling, lapping and grinding.

**Text Books**

1. “Workshop Technology : Chapman,

**Reference Books**

3. Manufacturing Processes. Begeman:
IP21104 :: THERMAL & FLUID ENERGY CONVERSION

Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To make the students understand the concepts & broad principles of contents of the course
- Aim is to provide insight of the subject
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: I, II, III (a)

Unit I  
Introduction & Fluid Properties  
(8 Hrs)

A. Definition of fluid, Newton’s law of Viscosity, classification of fluid: Newtonian & Non-Newtonian fluids, Ideal & Real fluids, Fluid properties: viscosity, compressibility, cohesion, adhesion, surface tension, capillarity, vapour pressure, cavitations, Static’s of Fluid-Pressure head, Pascal’s law, continuity equation, total pressure, total Pressure on an immersed surface, Bernoulli’s equation, applications of Bernoulli’s equation, orifice meter, venturimeter, Pitot tube.

B. Measurements of fluid pressure- piezometer tubes, manometers, mechanical gauges, bourdon’s tube, diaphragm pressure gauge, dead weight pressure gauge, types of flow

Unit II  
Fluid Machinery  
(8 Hrs)

A. Construction, working and applications of hydraulic turbines, Construction, working and applications of centrifugal pumps and reciprocating pumps.

Steam generators
Introduction, formation of a steam at a constant pressure, temperature Versus total heat graph during steam formation, steam properties, boiler performance, boiler efficiency, equivalent of evaporation and energy balance, measurement of dryness fraction of steam by throttling calorimeter.

B. Construction and working of Lancashire boiler, Babcock Wilcox boiler

Unit III  
I.C. Engines.  
(8 Hrs)

B. Thermodynamics - zeroth, first and second law of thermodynamics, thermodynamic system and processes.

Unit IV

Air Compressors: (8 Hrs)

A. Introduction, Classifications, working of single stage reciprocating air compressors, work done by a single stage reciprocating air compressors with and without clearance, multistage compression, two stage reciprocating air compressors with intercooler, intercooling of air in a two stage reciprocating air compressors, work done by a two stage reciprocating air compressors Applications of Compressed air.

B. Construction and working of centrifugal compressor and axial Flow air compressors.

Unit V

Refrigeration and Air conditioning: (8 Hrs)

A. Air refrigeration working on Bell Coleman Cycle, Simple Vapour Compression Cycle, Vapour absorption cycle, types and properties of refrigerants, p-h and T-s diagram, window, central, and Industrial Air conditioning Systems.

B. Introduction to heat transfer-conduction, convection, radiation.

Text Books


Reference Books

FF No. : 654

IP21202 :: DESIGN OF MACHINE ELEMENTS

Credits: 01  
Teaching Scheme: - Tutorial 1 Hr/Week

Prerequisites: : Nil

Objectives:
- To make the students understand the concepts & broad principles of contents of the Strength of Materials
- Develop conceptual framework of the course
- Mapping with PEOs: I, II (d)

List of Contents

Problem & Numerical solving and sketching figures for :

1. Simple Stresses and Strains
2. Principal Stresses and Strains
3. Slope and Deflection of Beams
4. Axially Loaded Columns
5. Shear Force and Bending Moment Diagrams; Shear stresses
6. Design for Endurance; Stress Concentration, Design for dynamic loading, Low and high cycle fatigue
7. Design of Springs
8. Design of Key, and Couplings
9. Design of Shaft
10. Design of Levers
11. Design of Brakes
12. Design of Clutches

Text Books

1. Timoshenko and Young – Strength of Materials, CBS Publisher

Reference Books

4. Mechanical Engineering Design- J.E. Shigley


IP20202 : METROLOGY & MECHANICAL MEASUREMENTS

Credits: 01  
Teaching Scheme: - - Tutorial 1 Hr/Week

Prerequisites: : Nil

Objectives:

- To make the students understand the concepts & broad principles of contents of the course
- Develop conceptual framework of the course
- Mapping with PEOs: I, II (a, h, j, k)

List of Contents

1. Problem solving and sketching figures for Selection of slip gauges
2. Problem solving and sketching figures for angle gauges
3. Problem on design of inspection type plug gauge
4. Problem on design of workshop type plug gauge
5. Problem on design of workshop type ring gauge
6. Problem on design of inspection type ring gauge
7. Determination of flatness or surface plate using spirit level or auto collimator
8. Study principles of electronic comparators
9. Problem on design of general type plug gauge
10. Problem on design of general type ring gauge
11. Study principles of pneumatic comparators
12. Study principles of optical comparators

Text Books
2. K.J.Hume, Engineering Metrology, Kalyani publication

Reference Books
IP20304 :: MANUFACTURING PRACTICES 2

Credits: 01

**Teaching Scheme:** - Laboratory 2 Hrs/Week

**Prerequisites:** Nil

**Objectives:**
- To give students ‘hands on experience’ of craftsmanship, machining, maintenance and assembly.
- To make students familiar with different Work Trades.
- To develop quality & safety consciousness amongst the students.
- To develop respect towards labour work amongst the student.
- Mapping with PEOs: I, II (b, g, j)

**List of Practical**

1. **Turning:** Introduction and demonstrations of different lathe operations such as knurling, grooving, drilling, boring, reaming, threading etc., safety precautions
   
   **Practical:** One composite job involving the above mentioned operations..

2. **Milling:** Introduction, demonstration of milling operations such as plain milling, end milling, gear cutting etc., safety precautions
   
   **Practical:** One job.

**Demonstrations**

1. Demonstration on CNC lathe machine and grinding machine.

**Assignment:** Process sheet of machining component.

**Text Books**


**Reference Books**


IP21304 :: THERMAL & FLUID ENERGY CONVERSION

Text Books

Credits: 01

Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Nil

Objectives:
- To make the students understand the concepts & broad principles of the contents of the course
- Aim is to provide insight of the subject
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: I, II (a)

List of Practical
1. Verification of Bernoulli’s equation
2. Determination of losses in various pipe fitting.
3. Problem on boiler to determine boiler efficiency, equivalent evaporation.
4. Study of pumps and turbines.
5. Trial on petrol engine.
6. Trial on diesel engine.
7. Study of Engine system: Air intake, exhaust, cooling, lubrication system
8. Trial on reciprocating air compressor.
9. Study of different Pressure measuring devices.
10. Study of vapour compression refrigeration system
11. Construction detail of IC engines by dismantling and assembly
12. Industrial visit

Reference Books

FF No. : 654
IP24302 :: COMPUTER GRAPHICS

Credits: 01

Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Nil

Objectives:
- Mapping with PEOs: I, II (i)

List of Practical
1) Introduction & use of basic AutoCAD commands to draw basic drawing entities – Part 1
2) Introduction & use of basic AutoCAD commands to draw basic drawing entities – Part 2
3) Introduction to modifying commands (trim, extend, offset, array etc)
4) Simple 2D drafting (orthographic projections)
5) Complex 2D drafting – Part 1 (Assembly and details of any one of Machine Components Cotter Joint, Knuckle Joint, Flange Joint, Rigid and Flexible Coupling, Stop Valve, Non Return Valve, Revolving Centers, Machine Vice, Tool Holder.)
6) Complex 2D drafting – Part 1 (Assembly and details of any one of Machine Components Cotter Joint, Knuckle Joint, Flange Joint, Rigid and Flexible Coupling, Stop Valve, Non Return Valve, Revolving Centers, Machine Vice, Tool Holder.)
7) Introduction to basic isometric commands.
8) Isometric drafting
9) Introduction to 3D commands (extrude, polyline, etc.)
10) Introduction to 3D commands (subtract, union, etc.)
11) Simple 3D drafting of simple mechanical components
12) Complex 3D drafting

Text Books
1. Pohit/Ghosh, Machine Drawings with AutoCAD, Pearson Education

Reference Books
1. Junnarkar, Machine Drawing, 2/e, Pearson Education
3. CMTI Handbook of Machine Tools
4. Engineering drawing N.D.Bhatt, V.M.Panchal
5. Engineering Drawing N. H. Dubey

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FF No. : 654

IP30101:: MANUFACTURING PROCESSES & SYSTEMS

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To make the students understand the concepts & broad principles of the contents of the course
- Develop conceptual framework of the course
- Aim is to provide insight of the subject
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: II, III (b, j)

Unit I (8 Hrs)

Hot and Cold Working Processes

B. Forging equipment- Hammers and presses, construction working capacities and selection of equipment. Tube drawing: Methods, force calculation.

Unit II (8 Hrs)

Sheet Metal Working

A. Studying of various processes such as shearing, blanking, punching, notching, bending, forming, drawing, – crank presses, toggle press, screw press.
B. single and double acting press, press brake coining, piercing, squeezing, Spinning, Drawing, Equipment used for sheet metal working

Unit III (8 Hrs)

Rolling of Metals

B. Lubrication in rolling Automatic gauge control flattening, Roll camber - its effect on rolling process, mill spring.

Unit IV (8 Hrs)

Non-Conventional Machining Processes

A. Comparison with conventional machining, classification, principle, working advantages, disadvantages and applications of ECM, EDM, AJM, LBM.
B. IBM, EBM

Unit V

NC/CNC/DNC Systems

A. Introduction to NC, CNC, DNC Machines, basic components of NC, NC coordinate system, NC motion control system-point to point, straight cut, contouring, open loop, closed loop. Comparison between NC and Conventional Machine Tools, Basic Principles of NC Machines, its Advantages, NC words, G&M codes, Introduction to Machining Centres-funtions, types, advantages, disadvantages & applications.

B. Tooling Requirements, Introduction to CNC&, DNC-functions, advantage &disadvantage.

Text Books
3. Computer aided design & manufacturing by Zimmer & Groover
4. CAD Principles & Applications by PAUL C Bave

Reference Books
7. Numerical control & computer aided by T.K. Kundra
8. CNC Machines by Pabla
9. Manufacturing science by Ghosh malik
10. Production technology – HMT
Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To make the students understand the concepts & broad principles of the course
- Develop conceptual framework of the course
- Aim is to provide insight of the subject
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: III (f, g, h, n)

Unit I  
Introduction to Facilities Planning

B. Urban Location versus Rural Location. Case Study in Location Decisions, Location Pattern In India

Unit II  
Systematic Layout Planning 1

A. Systematic Layout Planning, P-Q Analysis, Flow of Materials Analysis – Charting & Diagram Techniques, Activity Relationship Analysis – REL Diagram, Space Requirements & Availability, Techniques of Space Determination
B. Need And Advantages Of Planned Material Flow, Factors For Consideration, Types of Flow Patterns, Flow Patterns For Production Lines And Assembly Lines. Case Study in REL Chart

Unit III  
Systematic Layout Planning 2

B. Criteria For Computerized Facility Layout, Concept Of Computerized Layout Programs Like CRAFT & PLANET

Unit IV (8 Hrs)
Material Handling


Unit V (8 Hrs)
SHA, Maintenance & Safety


Text Books

1. Practical Plant layout .. Richard Muther
2. Systematic Layout Planning .. Richard Muther
3. Systematic Handling Anaylsis .. Richard Muther
4. Clark, Facility Planning, Pearson Education
5. Plant layout and design By James More
Reference Books

1. Plant Layout and Material Handling ..By James M Apple
2. Plant Layout By Immer
3. Plant Layout By Shubin
4. Material handling By Allexander
5. Material Handling Equipment By N Rudenko
6. Maintenance Engineering Handbook By Lindley Higgins
IP30105: OPERATIONS MANAGEMENT

Credits: 03  Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To make the students understand the concepts & broad principles of contents of the course
- Develop conceptual framework of the course
- Mapping with PEOs: I, III (f, g, n, o)

Unit I  (8 Hrs)
Scope of Operations Management


Unit II  (8 Hrs)
OPC and Material Requirement Planning (MRP I)


Unit III  (8 Hrs)
MRP II (Manufacturing Resource Planning)

B. Documentation - Production Work Order. Techniques of scheduling, dispatching and expediting. Nature of production control in different types of production systems.

Unit IV

Demand Forecasting

B. Qualitative Techniques of Forecasting – Experts Opinion, Delphi Method, Market Survey

Unit V

Aggregate Planning (S & OP) & Quantitative Techniques in Scheduling

A. Pure Strategies – Chase, Level, Mixed Strategies, Master Production Schedule, Detailed Capacity Requirement Planning, Johnsons Algorithm - Sequencing n jobs on m machines, Assignment Models.
B. Numerical & Cases in Aggregate Planning

Text Books


Reference Books

IP30107:: WORK STUDY

Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites:

Objectives:
- To make the students understand the concepts & broad principles of contents of the course
- Aim is to provide insight of the subject
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: III, IV (f, k, n)

Unit I
Introduction to Work Study
(8 Hrs)
A. Introduction to Industrial Engineering, Historical background, Contribution of Taylor and Gilbreth, Productivity – Definition, Types, Improvement, Work Content Analysis, Definition and Scope of Work Study
B. Numerical and Cases on Productivity

Unit II
Method Study I
(8 Hrs)
B. Numerical and Cases on Recording Techniques

Unit III
Method Study II
(8 Hrs)
B. Standard Operating Procedures – Developing SOPs, Responsibility Matrix, Standard Work Combination Charts
Unit IV  
Work Measurement I – Time Study  
(8 Hrs)  
A. Time Study – Definition, Steps, Concept of Observed Time, Basic/Normal Time, Standard Time, Rating – Concept, Types, Allowances – Concept, Types, Application, Calculation of Standard Time  
B. Video Time Study – Elemental breakdown of tasks, Rating  

Unit V  
Work Measurement II  
(8 Hrs)  
B. Video Time Study – Elemental breakdown of tasks, Estimation of Standard Time using MTM  

Text Books  
1. Introduction to Work Study by ILO  
2. Job Evaluation – ILO  

Reference Books  
1) Yoga M., Job Evaluation, NPC, New Delhi  
2) Zandin K.B. - Most Work Measurement Systems  
3) Hand Book of Industrial Engineering By H.B. Maynard
IP30201:: MANUFACTURING PROCESSES & SYSTEMS

Credits: 01

Teaching Scheme: - - Laboratory 1 Hr/Week

Prerequisites: : Nil

Objectives:
- Aim is to provide insight of the subject
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: II, III (b, j)

List of Contents
A TERM-WORK containing the record of the following:

Assignments:
1. Study of Forging and Forging Equipment
2. Determination of Force in Tube Drawing.
4. Study of Equipment used for Sheet Metal Working
5. Problem on Scrap Strip Lay-Out and Sheet Utilization.
7. Problem on Roll-Pass Design.
8. Comparison of ECM, EDM
9. Comparison of AJM, LBM.
10. Comparison of IBM, EBM
11. Introduction to NC,CNC,DNC Machines,

Text Books
3. Computer Aided Design & Manufacturing by Zimmer & Groover
4. CAD Principles & Applications by PAUL C Bave

Reference Books
8. Production technology – HMT

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IP30203:: FACILITIES PLANNING

Credits: 01  

**Teaching Scheme:** - Tutorial 1 Hr/Week

**Prerequisites:** Nil

**Objectives:**
- To develop skills in the subject
- Verify the principles of the course
- Mapping with PEOs: III (f, g, h, n)

**List of Assignments**

1. Single facility location problems – Quantitative Techniques
2. Multiple facility location problems - Quantitative Techniques
3. Case on – Facility Location
4. Assignment on Process Layout - REL Charts
5. Assignment on Product Layout - Line Balancing
6. Computerized Layout Planning
7. Assignment on Layout Evaluation Techniques
8. Comprehensive Case on – Layout Improvement 1
9. Comprehensive Case on – Layout Improvement 2
10. Comprehensive Case – Material Handling Systems Design 1
11. Comprehensive Case – Material Handling Systems Design 2
12. Industrial Visit

**Text Books**

1. Introduction to Work Study by ILO
Reference Books

1. Yoga M., Job Evaluation, NPC, New Delhi

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IP 30305:: OPERATIONS MANAGEMENT

Credits: 01  
Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Nil

Objectives:
- To develop skills in the subject
- Verify the principles of the course
- Understanding of fundamentals of the subject
- Mapping with PEOs: I, III (f, g, n, o)

List of Practical

1. Assignment on Production Systems
2. Case on Operations Strategy & Process Choice
3. Assignment on MRP 1 – BOM Explosion
4. Assignment on MRP 1 – Netting Requirements
5. Assignment on Demand Forecasting – Quantitative Model
6. Assignment on Demand Forecasting – Forecast Demand & Measure Error
7. Assignment on Demand Forecasting – Qualitative Techniques
8. Assignment on Capacity Planning
9. Assignment / Case on Aggregate Planning
10. Assignment on Job Shop Scheduling
11. Assignment on Assignment Models, Johnson’s Rule
12. Comprehensive Case Study on any three of the above topics
Text Books

Reference Books
1. Operations Management, 5th Ed. - Krajewski
IP30307:: WORK STUDY

Credits: 01

Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Nil

Objectives:
- To develop skills in the subject
- Verify the principles of the course
- Mapping with PEOs: III, IV (f, k, n)

List of Practical
1. Numerical on Productivity
2. Assignment on Recording Tools & Techniques - Charts
3. Assignment on Recording Tools & Techniques - Diagrams
4. Case – Bagging Exercise – Method Study 1 (Record, Examine)
5. Case – Bagging Exercise – Method Study 2 (Develop, Evaluate. Define)
6. Case – Toy Assembly – Earth Mover (Method Study)
7. Training in Rating - Dealing Cards
8. Training in Rating – Walking
9. Setting Time Standards using Time Study – Video Analysis
10. Setting Time Standards using MTM – Video Analysis
11. Work Sampling Exercise
12. Work Place Design

Text Books
1. Introduction to Work Study by ILO
2. International Labour Organisation, Geneva; Job Evaluation

Reference Books
1. Kjell Zandin , Marcel Dekker ; Introduction to MOST; Inc. New York & Basel
2. Salvendy G. ; Handbook of Industrial Engineering.
3. Yoga M., Job Evaluation, NPC, New Delhi

MODULE VI
### FF No. 653 Issue No.1, Rev No.1 dated 2/4/2011


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**IP 30102:: MATERIALS MANAGEMENT & LOGISTICS**

**Credits:** 03

**Teaching Scheme:** - Theory 3 Hrs/Week

**Prerequisites:** Nil

**Objectives:**
- To make the students understand the concepts & broad principles of contents of the course
- Develop conceptual framework of the course
- Aim is to provide insight of the subject
- Mapping with PEOs: IV (f, i, n)

**Unit I**

**(8 Hrs)**

**Introduction to Materials Management**

A. Functions of Materials Management – Sourcing/Procurement, Inventory, Stores, Vendor Development etc.

Classification and Costs of Inventories: Types, Objective of holding inventories, Different types of Inventories, Costs Associated with Inventory - Carrying cost, Procurement cost. EOQ - Concept, Assumptions of EOQ Model, Practical Constraints – Numerical Analysis, Quantity Discounts. EMQ Model - Carrying cost, Set up cost. EOQ Special Considerations – Spares, Bought-outs, etc.

B. Organization of Materials Management Function

**Unit II**

**(8 Hrs)**

**Replenishment Systems and Inventory Management**

A. Replenishment Systems: Introduction, Concept of lead time and its effects on Inventory, Components of Lead Time - Internal and External. Variability in demand and lead time. Safety Stock Evaluation and ways to minimize lead time, Different types of replenishment systems like Fixed order quantity system, Fixed order interval system, Combination of fixed order interval and quantity system, Two Bin System.

Inventory Management Inventories –Objectives of an Inventory Control, Symptoms of Poor Inventory management, Selective Inventory Control: Concept of Selective Inventory Control, ABC analysis

B. Probabilistic Replenishment System. Selective Inventory Control - VED analysis, HML analysis, SDE analysis, SOS analysis, FSN analysis, GOLF analysis.
Unit III  (8 Hrs)
Procurement Management

A. Procurement Management: Responsibilities of Purchase Department. Procurement Procedure, Documents in Procurement, Types of Buying, Methods of Buying, Legal Aspects of Buying, Vendor Selection, Vendor Development, Vendor Rating. Import-Export Procedure – Imports & Exports


Unit IV  (8 Hrs)
Logistics Management

A. Definition, Logistics Function: Transportation – Significance, Modes of Transportation, Warehousing – Objectives, Warehousing Functions, Types of Warehouses, Inventory Management, Order Processing – Role of IT, Material Handling

Transportation: Modes of Transportation – Rail, Road, Pipelines, Water Air – Advantages & Disadvantages, Concept of TL, LTL, FTL. Selections of Appropriate Modes of Transportation

B. Modes of Transportation – Rail, Road, Pipelines, Water Air – Advantages & Disadvantages

Unit V  (8 Hrs)
Stores Management and Warehouse Management


B. Stores Documentation – Bin Cards, Stores Ledger. WMS Systems in Practice

Text Books

1. Materials Management, Tony Arnold, Pearson Publication
2. Inventory Management, L.C. Jhamb, Everest Publishing House
3. Christopher, Logistics Management, Pearson Education
4. Ronald Ballou, Logistics & Supply Chain Management, Pearson Education
Reference Books

1. Material Management by Dobler Burt
2. Inventory Management, Silver and Peterson, John Willey and sons
3. Manufacturing Planning & Control, Vollman, Pearson Publication
IP30104 :: STATISTICAL METHODS & RESEARCH METHODOLOGY

Credits: 03  Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Mathematics for Engineering Applications

Objectives:
- To make the students understand the concepts & broad principles of statistical techniques used in managerial decision making
- Sensitize the students of the importance of statistics in real life environment
- Mapping with PEOs: I, IV (a, g, i, n)

Unit I
Concept of random variable & probability distributions

A. Discrete random variable and its distributions – Binomial, Poisson, Hyper-geometric. Continuous random variable and its distributions - Uniform, Normal, Exponential (Mean, Variance of All Distributions)
B. Calculation of probabilities for the above probability distributions in MS EXCEL and developing probability curves

Unit II
Sampling Theory & Statistical Inferences

B. Developing sampling distribution and its analysis for the specified data using MS EXCEL , Various methods of probability and Non-probability sampling

Unit III
Hypothesis Testing for Variances and ANOVA
B. Analysis of cases and numerical problems on DOE and Taguchi method using net-based study

Unit IV
Foundations of Research
A. Meaning, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method - Understanding the language of research - Concept, Construct, Definition, Variable. Research Process
B. Designing a questionnaire for e-mail survey for the specified objective, studying cases on questionnaire design and field surveys

Unit V
Research Design
A. Concept and Importance of Research - Features of a good research design – Exploratory Research Design – concept, types and uses, Descriptive Research Designs - concept, types and uses. Experimental Design: Causal relationships, Concept of Independent & Dependent variables, concomitant variable, extraneous variable, Treatment, Control group.
Types of Data: Secondary Data - Definition, Sources, Characteristics. Primary Data - Definition, Advantages and disadvantages over secondary data, Observation method, Questionnaire Construction, Personal Interviews, Telephonic Interview, Mail Survey, Email/Internet survey.
B. Collection and analysis of two questionnaires from real life field surveys

Text Books
Reference Books

4. Taguchi Methods Explained: Practical steps to robust design- Tapan Bagchi, Prentice Hall of India,1993

**IP30106:: OPTIMIZATION & SIMULATION**

**Credits: 03**

**Teaching Scheme:** - Theory 3 Hrs/Week

**Prerequisites:** Nil

**Objectives:**
- To make the students understand the concepts & broad principles of contents of the course
- Aim is to provide insight of the subject
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: IV (a, f, i, n)

**Unit I**

**Linear Programming**


B. Solution of LPP using TORA & Solver in Excel

**Unit II**

**Integer Programming & Dynamic Programming**


B. Case studies based on Integer Programming & Dynamic Programming

**Unit III**

**Goal Programming & Decision Making Tools**


B. Case studies based on Goal Programming & Decision Making Tools

**Unit IV**

**Replacement Model & Theory of Games**
A. Replacement Model: Replacement of capital equipments that deteriorates with time, time value of money (a) remains same (b) changes with constant rates during period. Equipment renewal policy, group and individual replacement. Individual Replacement, Group Replacement Policies, Problems. Game Theory: Game theory Introduction, Terminology, Two -person zero sum game, minimax and maximin principle, Saddle Point, Games with pure and mixed strategies, Dominance property, Solutions with Graphical methods.

B. Case studies on Replacement Models & Game Theory: L.P. method, approximation method.

Unit V (8 Hrs)
Queuing Theory & Simulation

A. Queuing Theory: Introduction, terminology, Poisson single and multi channel queuing system models: M/M/1 Model, M/M/C Model, M/Ek/1 Model. Simulation: Definition, Introduction, Application, Monte Carlo Simulation. Applications of Simulation, Generation of Random Numbers.

B. Simulation software, Building Model on Simulation Software, Running the simulation, Understanding the results

Text Books
1. Taha H A Operation Research and Introduction, McMillian, 8/e, Pearson Education
3. Paneerselvam Operations Research, Prentice Hall of India

Reference Books
2. S.D. Sharma – Operations Research, Kedarnath, Ramnath &Co
4. Kanthi Swarup & others – Operations Research, Sultan chand and Sons
Credits: 03  Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To make the students understand the concepts & broad principles of contents of the course
- Develop conceptual framework of the course
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: II (h, j, k)

Prerequisites (If any):

Objectives:
- To make the students understand the concepts & broad principles of contents of the course
- Develop conceptual framework of the course
- Sensitizes the students of the importance of course in real life environment

Unit I
Introduction to Quality
(08 Hrs)

B: Contribution of Quality Gurus, Juran, Crosby, Deming’s Principles of Management. Concept of TQM – Quality Circles

Unit II
Acceptance Sampling
(08 Hrs)

B. Home assignment: Case on designing of sampling plan using MIL, ASQ standards.

Unit III
(08 Hrs)
Statistical Process Control


B. Applications of Control Charts in Mass Production, Process Production

Unit IV

Quality Improvement Tools

A. Introduction to TQM & Quality Circles, Quality Improvement Tools: 7 QC Tools – Check Sheet, Histogram, Pareto Chart, Fishbone Diagram, Run Charts, Scatter Diagram, Process Flow Chart. 7 QM Tools – Program Decision Process Chart, Tree Diagram, Affinity Diagram, Prioritization Matrix, etc. Bench Marking

Quality Improvement Tools: Why-Why Analysis, Root Cause Analysis, Poka Yoke (Mistake Proofing)

B. Bench Marking: Types – Process, Product. Cases on application of 7above concepts from reference books and web sources

Unit V

Six Sigma & Quality Management Systems


Text Books

1. Amitav Mitra, Fundamentals of Quality Control & Improvement, Pearson Education
2. Phadke, Quality Engineering using Robust Design, Pearson Education

Reference Books

1. J.M. Juran & F.M.Gryna, Quality Planning and Analysis.
IP 30202: MATERIALS MANAGEMENT & LOGISTICS

Credits: 01

Teaching Scheme: - Tutorial 1 Hr/Week

Prerequisites: Nil

Objectives:
- To develop skills in the subject
- Application of the theory
- Understanding of fundamentals of the subject
- Mapping with PEOs: IV (f, i, n)

List of Practical
1. Assignment on Costs of Inventories, Assignment on EOQ
2. Assignment on EOQ – Practical Constraints – Quantity Discounts, Shelf Life, Packing Constraints
3. Assignment on Replenishment Systems – Deterministic Model
4. Assignment on Replenishment Systems – Probabilistic Model
5. Assignment on Selective Inventory Control
6. Assignment on Disposal of Surplus and Obsolescent stocks
7. Documentation in Materials Management
8. Case – Purchase Management
9. Case – Vendor Selection, Vendor Rating
10. Case – Warehouse Layout Planning
11. Comprehensive Case on Warehousing
12. Study of Inbound & Outbound Logistics Channels of a Any Industry

Text Books
1. Inventory management by L.C. Jhamb, Everest Publishing House

Reference Books
1. Material Management by Dobler Burt
2. Inventory management, Silver and Peterson, John Willey and sons
IP30204 :: STATISTICAL METHODS & RESEARCH METHODOLOGY

Credits: 01  Teaching Scheme: - - Laboratory 1 Hr/Week

Prerequisites: : Mathematics for Engineering Applications

Objectives:
- To make the students understand the concepts & broad principles of statistical techniques used in managerial decision making
- Sensitize the students of the importance of statistics in real life environment
- Mapping with PEOs: I, IV (a, g, i, n)

List of Contents

A TERM-WORK containing the record of the following:

1) Numerical Problems on discrete probability distributions
2) Numerical Problems on continuous probability distributions
3) Numerical problems on statistical estimation
4) Determination of sample size
5) Characteristics of sampling distributions
6) Degrees of Freedom (DOF)
7) Hypothesis Testing for means
8) Hypothesis Testing for proportions
9) Hypothesis Testing for variances
10) ANOVA
11) Questionnaire Design
12) Taguchi Method of Design

Text Books

Reference Books
4. Taguchi Methods Explained: Practical steps to robust design- Tapan Bagchi, Prentice Hall of India,1993
IP30306: OPTIMIZATION & SIMULATION

Credits: 01

Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Nil

Objectives:
- To develop skills in the subject
- Application of the theory
- Understanding of fundamentals of the subject
- Mapping with PEOs: IV (a, f, i, n)

List of Practical (minimum 6 assignments from the following)

1. Assignment on Linear Programming Problem
2. Assignment on integer programming.
3. Assignment on dynamic programming.
4. Assignment on goal programming.
5. Assignment on decision making tools.
6. Assignment on replacement models.
7. Assignment on theory of games.
8. Assignment on queuing theory.
9. Assignment on simulation.

Text Books
1. Hira Gupta, Operations Research

Reference Books
2. H. Taha, Operation Research
IP30308 :: METROLOGY & QUALITY MANAGEMENT

Credits: 01

Teaching Scheme: - - Laboratory 2 Hr/Week

Prerequisites: : Nil

Objectives:
• To develop skills in the subject
• Application of the theory
• Understanding of fundamentals of the subject
• Mapping with PEOs: II (h, j, k)

List of Practical

The Term work should be in the form of Journal consisting of following Two sections:

Experiments: (Any seven of the following)
1. Measurement of straightness, flatness, roundness.
7. Study and Experiment on Profile Projector.
8. Study and Experiment on any type Comparator.
10. Alignment Test on Lathe / Drilling / Milling Machine

Assignments: (Any five of the following)
1. Design of Sampling Plan
2. Design of Control Charts
3. Assignment on Process Capability
4. Case Study on 7 QC Tools
5. Case on Constructing House of Quality for any Product

Text Books
2. K.J.Hume, Engineering Metrology, Kalyani publication
Reference Books

2. J.M. Juran & F.M. Gryna, Quality Planning and Analysis.
IP37302 :: PROJECT STAGE I

Credits: 2  
Teaching Scheme: - Practical 1Hr/Week

Prerequisite : Nil

Objectives:
- To train the students to apply their engineering knowledge to real life problem solving.
- Mapping with PEOs: IV (e, f, g, i, n)

Also refer Page No. (Academic Information)
The project work could be of the following nature:
1. Manufacturing / Fabrication of a prototype machine' including selection, concept, design, material, manufacturing the components, assembly of components, testing and performance evaluation.
2. Improvement of existing machine / equipment / process.
3. Design and fabrication of Jigs and Fixtures, dies, tools, special purpose equipment, inspection gauges, measuring instruments for machine tools.
4. Computer aided design, analysis of components such as stress analysis.
5. Problems related to Productivity improvements.
6. Problems related to value engineering.
7. Problems relating to material handling system.
10. Product design and development.
11. Analysis, evaluation and experimental verification of any engineering problem encountered.
13. Quality improvements, In-process Inspection, Online gauging.
15. Time and Motion study, Job evaluation.
16. Ergonomics and safety aspects under industrial environment
17. Management Information System.
18. Market Analysis in conjunction with Production Planning and Control.

OR
Fabrication of models, machines, prototypes based on new ideas, robots and machine based on hitech systems and automation, experimental set-up, fabrication of testing equipment, renovation of machines, etc. Computer based design / analysis or modeling / simulation of product(s), mechanism(s) or system (s) and its validation or comparison with available
benchmarks / results. Modelling/simulation of product(s), mechanism(s) or system(s) and its validation or comparison with available benchmarks / results. Design/development and Fabrication of models, machines, and prototypes based on new ideas, robotic and automation systems, Experimental set ups, test rigs/ equipments.

The project work shall be taken up individually or in a group consisting of not more than 4 students.

A report containing maximum 30 pages shall be submitted based on the background, need and scope of the project, project specifications, activities involved in the project and activity plan, study of literature and basic theory, and work completed (if any).

Guidelines:

- Report shall be typed or printed.
- Figures and tables shall be on separate pages and attached at respective positions.
- Project title and approval sheets shall be attached at the beginning of the report followed by index and synopsis of the project.
- References shall be mentioned at the end followed by appendices (if any).
- When a group of students is doing a project, names of all the students shall be included on every certified report copy.

Each group of students shall submit two copies of reports to the institute and one copy shall be prepared for each individual student.

<table>
<thead>
<tr>
<th>Subject No.</th>
<th>Subject Code</th>
<th>Subject Name</th>
<th>Teaching Scheme (Hrs/week)</th>
<th>Credits</th>
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</thead>
</table>
| S<sub>1</sub> | IP40101, IP40103, IP40105 | *Elective Group I  
- Costing & Cost Control  
- Reliability Engineering  
- Industrial Engineering Applications in Service Sector | 3 0 0 | 3 |
| S<sub>2</sub> | IP40107, IP40109, IP40111 | *Elective Group II  
- Energy Management  
- Industrial & Commercial Laws  
- Entrepreneurship Development | 3 0 0 | 3 |
| S<sub>3</sub> | IP40113 | Human Factors Engineering | 3 0 0 | 3 |
| S<sub>4</sub> | IP40115 | World Class Manufacturing | 3 0 0 | 3 |
| T<sub>1</sub> | IP40201, IP40203, IP40205 | *Elective Group I  
- Costing & Cost Control  
- Reliability Engineering  
- Industrial Engineering Applications in Service Sector | 0 1 0 | 1 |
| T<sub>2</sub> | IP40207, IP40209, IP40211 | *Elective Group II  
- Energy Management  
- Industrial & Commercial Laws  
- Entrepreneurship Development | 0 1 0 | 1 |
| P<sub>1</sub> | IP40313 | Human Factors Engineering | 0 0 2 | 1 |
| P<sub>2</sub> | IP40315 | World Class Manufacturing | 0 0 2 | 1 |
| PS<sub>2</sub> | IP47301 | Project Stage II | 0 0 6 | 4 |
| **Total** | | | 12 2 10 | 20 |
IP40101:: COSTING & COST CONTROL

Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To learn and understand applications of costing in engineering
- To learn and understand cost estimation, cost analysis
- Mapping with PEOs: IV (f, g)

Unit I
(8 Hrs)
Cost
B. Accounting for Prime Cost.

Unit II
(8 Hrs)
Overheads
B. Accounting for Overheads. Preparation of Cost Sheet & Cost Statement

Unit III
(8 Hrs)
Costing Methods

B. Variance – Variance Analysis. Material variance, Labour Variance, Overhead Variance

**Unit IV**

*Marginal Costing:*


B. Concept of Break-Even, P/V Ratio, Margin of Safety.

**Unit V**

*Activity Based Costing*

A. Concept, Concept of Cost Drivers. Transfer Pricing: Objective, Methods – Cost Based, Market Prices Based, Negotiated Prices. Recommended procedure for Transfer Pricing.

B. Limitations of Traditional Costing

**Text Books**


**Reference Books**


IP40103:: RELIABILITY ENGINEERING

Credits: 03  Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To make the students understand the concepts & broad principles of contents of the course
- Develop conceptual framework of the course
- Aim is to provide insight of the subject
- Mapping with PEOs: III (g, h)

Unit I  (8 Hrs)
Introduction to Reliability

A. Importance of reliability, tradeoff between cost, quality and reliability, quality and safety, bathtub concept, MTBF, MTTR, hazard rate, failure rate

B. Probability and sampling, cumulative probability distribution function, data and distributions

Unit II  (8 Hrs)
System safety analysis

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

Unit III  (8 Hrs)
System reliability and redundancy

A. Active and Passive Redundancy, redundancy allocation and limitations, Evaluation of overall system reliability, allocation of reliability.

B. Conditional probability
Unit IV  
*Loads, capacity, maintainability and availability* (8 Hrs)

A. Preventive maintenance, Testing and repair, reliability centered maintenance, system availability and maintainability.

B. Reliability and safety factors, Repetitive loading

Unit V  
*Reliability testing and Failure Interactions* (8 Hrs)

A. Accelerated life testing, Markov analysis of two independent components, reliability with standby system, multicomponent systems.

B. Reliability growth models, grouped and ungrouped data, censored data, DTMC and CTMS models

**Text Books**


**Reference Books**


IP40105:: INDUSTRIAL ENGINEERING APPLICATIONS TO SERVICE SECTOR

Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Basic Techniques of Industrial Engineering

Objectives:
- To make the students understand the concepts & broad principles of the course
- Develop conceptual framework of the course
- Aim is to provide insight of the subject
- Mapping with PEOs: V (h, n)

Unit I  (8 Hrs)
The Role Of Services In Economy
A. Introduction to the service sector such as hotel, health care, bank, retail marketing/department stores, transport and communication, Increasing role of service sector in National economy, management methods in the service sector, need for optimizing resources in the service sector
B. Service benchmark: In the 1990’s the new jobs are in services and many are high paying – A Case study

Unit II  (8 Hrs)
The nature of services and service strategy
A: Service classification, the service package, Nature of Demand and supply, Resources used in the service sector such as space, manpower, capital, material, equipment, energy, Critical aspects of the service sector such as customer satisfaction, cost reduction, efficiency, quality and productivity of service sector organizations
B: Service Benchmark: To compete better, look far afield, Case study: Village Volvo, America west Airlines.

Unit III  (8 Hrs)
The service delivery system and information technology
A. Service Delivery system, Application of Industrial Engineering techniques to the service sector- Data collection, various charting techniques, flow diagram, work measurement, time study, activity sampling, facility location, production line approach, vehicle routing

B. Case studies: Firto Lay puts handheld computers in field, PacBell’s experiment, 100

Unit IV
Service Quality
A. Data analysis, critical examination, evaluation of data, work of simplification, form design, computer application for collection, storage and retrieval of data, customer as a co producer, Dimensions of service quality, tools for service quality improvement
B. Case studies: The best little cookie house around, The Daley monthly car pool airport services, Software, peripherals take a back seat to big iron

Unit V
Queuing models in services
A. Managing Queues, queuing system models, role of inventory in services, Use of computers in service organizations, local area network, wide area network to collect, store, retrieve, transmit data
B. Case studies: Athol Furniture, Inc., Whittier County Hospital, County general Hospital, Amy’s Ice cream, Clean Sweep, Inc, The complaint letter, Service winners of the Baldrige National Quality Award, Thrifty car rental – Eye’ll be seeing you, Elysian Cycles

Text Books
2. Kamdampully, Service Management, Pearson Education

Reference Books
1. Johnston, Service Operations Management, Improving Service Delivery, 2/e, Pearson Education
2. H P Cemach; Workstudy in office; Ambar Publications
4. Robert Johnston; The Management and Service operations, IFS Publications NY
5. T Benley, Holt Rinahan and Winston; Management service handbook
Credits: 03  

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To get an idea about the Energy Sector, which is expected to be the fastest growing sector in the country.
- To maximize the efficiency from generation to distribution and ensure effective recovery of bills.
- Mapping with PEOs: III (e, f)

Unit I (8 Hrs)
Introduction
Energy Scenario – global, sub continental and Indian, Energy economy relation, Integrated energy planning with particular reference to Industrial Sector in India, Captive power units and others – demand v/s supply.

B. Future energy demand and supply scenario

Unit II (8 Hrs)
Types of Energy
B. Renewable and non-renewable energy, Conventional and unconventional energy.

Unit III (8 Hrs)
Legal Provisions
B. National Electricity Policy. Rural Electrification.
Unit IV (8 Hrs)
Demand Side Management

A. 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

Unit V (8 Hrs)
Energy Audit and Energy Saving


Text Books

Reference Books
IP40109::INDUSTRIAL AND COMMERCIAL LAWS

Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- Develop conceptual framework of the course
- Aim is to provide insight of the subject
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: V (k, o)

Unit I  (8 Hrs)
The Industrial Disputes Act, 1947
A. The Industrial Disputes Act, 1947. 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
B. Unfair labour practices, Penalties, Case Laws

Unit II  (8 Hrs)
The Trade Union Act 1926
B: Appeals, Register of Standing Orders. Temporary application of model standing orders

Unit III  (8 Hrs)
The Factories Act, 1948 and The Employees Provident Fund and Miscellaneous Provisions Act, 1952:
Unit IV (8 Hrs)

The Competition Act, 2000

A. Objective, Competition Commission, Dominant Position, Anti-Competitive Agreements, Relevant Markets, Cartel, Abuse of Dominant Position, Regulation of Combinations
B. Case studies and penalties.

Unit V (8 Hrs)

The Sale of Goods Act, 1930 (3 of 1930)

B. Case studies and penalties.

Text Books


Reference Books

1. Taxman, Commercial Laws.
3. Bare Acts and Bare Acts with Cases for each of these acts
Prerequisites:
GENERAL ENTREPRENEURSHIP TENDENCY TEST.
Students need to exhibit and possess the will to develop entrepreneurship tendencies. Students who are keen on starting their own business alone may take this course. All branch students should be permitted to take this course. 15% seats reserved for the industrial and production engineering department.

Students will be required to choose a line of business and try to implement those ideas during the course of the semester as though they were actually doing business.

Objectives:
• To provide the motivational inputs to students to become entrepreneurs
• To enable students to understand the importance of national wealth generation
• To teach students the legal formalities of starting a business with a few assignments
• To teach students to make efficient business cases identify opportunities and apply for loans to become independent business persons.
• To sensitizes the students with the importance of being self employed professionals on the planet instead of slavishly working under someone else.
• Major objective is to ensure that they become entrepreneurs and actually start a business and not just become bookworms of an entrepreneurship academic subject
• Mapping with PEOs: V (j, i)

Unit I
Introduction Motivation Inputs To Entrepreneurship
A. Motivational input : Charms of being an entrepreneur. Reasons for being an entrepreneur. Study of the wealth creators of an economy. Myths of entrepreneurship. Case studies of successful entrepreneurs. qualities necessary to be a successful entrepreneur, developing entrepreneurship qualities, Entrepreneurship tendency test. Achievement oriented work environment. Psychological tendencies in budding entrepreneurs. Entry barriers to entrepreneurship and how to overcome them. Overcoming family and social barriers, overcoming and understanding barriers to
business development.

B. Administration inputs to entrepreneurship – planning scheduling, time management

**Unit II**

**Legal Inputs To Entrepreneurship**

**(8 Hrs)**


B: Shop ACT Business cards, venue Ambience,

**Unit III**

**Business Opportunity Identification Inputs To Entrepreneurship**

**(8 Hrs)**


B. How to formulate a business and project plan. Project counseling to students

**Unit IV**

**Marketing Inputs To Entrepreneurship**

**(8 Hrs)**

A. What to sell and how to sell?: Market research and survey, overview on methods of forecasting, launching and marketing the products and services, sales and distribution, project feasibility study – market feasibility, technical feasibility, sources of finance, financial feasibility – project costing and budgeting, product costing. Where to find finance and how to get project finance for a business; Legal input to a business Marketing inputs to entrepreneurship: How to prepare a business plan and strategise. How to identify the right strategy for market development. Exploiting an attractive market. Creating competitive advantages for the market. Creating the right strategy. Inputs for strategy development.

B. Vision and Strategy planning, Product / Process evaluation assignment for chosen business.
Unit V

Problem Solving Inputs To Entrepreneurship

B. Tax and relativity of moral ethics in adverse business (corrupt) environments.

Text Books
2. Class notes on entrepreneurship

Reference Books
1. Dr J. S. Juneja, Small and Medium Enterprise: Challenges and opportunities
2. Kondalah, chukka; Enterprise in the new millennium, McGraw-Hill publication
4. Gopal & Ramamurthy; Project management Handbook, Macmilan.
5. Prassanna Chandra; Preparation, Appraisal, Budgeting and Implementation.
IP40113:: HUMAN FACTORS ENGINEERING

Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To develop skills in the subject
- Application of the theory
- Understanding of fundamentals of the subject
- Mapping with PEOs: IV (f, i, k, n)

Unit I  
Introduction to Human Factors  
(8 Hrs)

A. Human criteria’s, human physical activities, features of the human body, Measures of physiological functions such as: energy expenditure, gross body activity, local muscular activity, work load, work efficiency, work and rest. Type of movements of body members. manual material handling (MMH)

B. Performance criteria for physical activity such as: Strength & endurance, speed of movements, accuracy of movements

Unit II  
Applied Anthropometry and Work Space  
(8 Hrs)

A: Introduction to anthropometry, use & principles of anthropometry data, work spaces, work space envelopes for seated persons, design of work spaces such as: work surface height, seated & standing, principles of seat design, workplace design.

Design and Displays: Information input & processing, visual displays of static & dynamic information. Auditory, textual & olfactory displays, general location of controls & displays within workspace, concept of visibility

B: Physical space & arrangement, principles of arrangement of component, Functions of controls, types of controls, factors in control design, design of specific hand operated controls, foot controls and special control devices.

Unit III  
Working Conditions  
(8 Hrs)
Illumination: Color systems, energy consideration,
Atmospheric conditions: Measurement of thermal variables, wet-bulb globe temperature, Botsball, heat stress index, heat index, wind chill index,
Noise: Physiological effect of noise on performance, noise exposure limits,

**Unit IV**

**(8 Hrs)**

**Energy Expenditure**

A. Muscle mechanism, BMR, Heart Rate variations, Oxygen consumption, Rest allowances, Rate of energy expenditure, Manual Material Handling Capacity determination
B. Effect of environmental conditions and work design on Energy Expenditure

**Unit V**

**(8 Hrs)**

**Ergonomics and Work Organization**

A. Human factors applications in system design, characteristics of system design, human factors data for interface design, ergonomic safety & health management
B. Case studies of ergonomically designed product.

**Text Books**

2. E. Grad jean, “Fitting Task to the Man” Taylor and Francis.

**Reference Books**

1. ILO, “Introduction to Work study”.
3. R. S. Bridger, “Introduction to Ergonomics”, Taylor and Francis
IP40115:: WORLD CLASS MANUFACTURING

Credits: 03  

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To apply the concepts of lean manufacturing in industrial situations to improve productivity and eliminate the wastes
- Mapping with PEOs: IV (f, o)

Unit I  (8 Hrs)
WCM & Lean Manufacturing
B. Hall’s, Schonberger,s framework of World Class Manufacturing, Various models of world class manufacturing

Unit II  (8 Hrs)
Lean Manufacturing Tools & Techniques 2
A: Design of JIT-Pull System, Kanban – Types, Calculations of Kanban
Set-up Time Reduction: SMED Methodology for Set-up reduction, Set-up Reduction Projects.
Concept of Standard Work – Standardization, Standard Operating Procedures
Group Technology Approaches, Characteristics Of A Group/ Cell Families Of Parts, Production Flow Analysis And Choice Of Family , Benefits And Applications Of Group Technology. Cellular Manufacturing: Work cell concepts and applications, Work cell design, work cell staffing and equipment issues

Unit III  (8 Hrs)
Total Productive Maintenance
Unit IV

Business Process Reengineering

A.

B. Tools in BPR

Unit V

Theory of Constraints

A.
Introduction to TOC, Concept, Constraints – Types, Concept of Throughput, Inventory & Operating Expenses, Throughput Accounting, TOC Methodology, Numerical & Cases in TOC. Application of TOC in industry


Text Books

1. Cause and Effect Lean – The essentials of Lean Manufacturing by John Bicheno
2. Learning to See, James Womack & Daniel Jones

Reference Books

1. World Class Manufacturing -A strategic perspective by B.S. Sahay, Saxena, Macmillan, India
2. World Class Manufacturing – Richard Schonberger
3. Introduction to TPM: Total Productive Maintenance by Nakajima Seiichi
4. Total Productive Maintenance by Terry Wireman (Industrial Press)
5. TPM material/ books published by JIPM (Japanese Institute of Plant Maintenance)
6. Lean Thinking by James Womack & Daniel Jones
IP 40201:: COSTING & COST CONTROL

Credits: 01

Teaching Scheme: Tutorial 1 Hr/Week

Prerequisites: Nil

Objectives:
- To give an idea about the application of Costing for an Industrial Engineer
- Mapping with PEOs: IV (f, g)

List of Contents

Tutorials containing the record of the following:

1. Numerical on Cost Sheet / Cost Statements
3. Accounting of Prime Cost
4. Primary & Secondary Distribution of Overheads
5. Absorption of Overheads
6. Standard Costing
7. Variance Analysis
8. Numerical on Break Even Analysis
9. Numerical on Applications of Marginal Costing
10. Activity Based Costing

Text Books

Reference Books
IP 40203:: RELIABILITY ENGINEERING

Credits: 01 Teaching Scheme: - - Laboratory 2 Hr/Week

Prerequisites: : Knowledge about basic machining processes and tooling

Objectives:
• To develop the Process planning skill for the manufacturing
• Mapping with PEOs: III (g, h)

List of Contents

A TERM-WORK containing the record of the following:

Assignments :(Minimum 5)
1. Definitions of CDF and PDF. Comment with examples on trade off bet. Cost, quality and reliability.
2. Case study on FMECA
3. Problem on allocation of reliability.
4. Problem on improvement of reliability due to preventive maintenance.
5. Note on reliability centered maintenance
6. Note on life testing methods
7. Problems on Series, Parallel and Stand by systems
8. Probability concepts-problems

Text Books


Reference Books
IP40205:: INDUSTRIAL ENGINEERING APPLICATIONS IN SERVICE SECTOR

Credits: 01  Teaching Scheme: - - Laboratory 2 Hr/Week

Prerequisites: : Nil

Objectives:
• To clearly understand the application of Industrial Engineering techniques in service sector.
• Mapping with PEOs: V (h, n)

List of Contents

A TERM-WORK containing the record of the following:

Assignments:
1. Service benchmark: In the 1990’s the new jobs are in services and many are high paying – A Case study – through read the case study and suggest the solution.
2. Case study: America West Airlines - To compete better look far afield
3. Case study: Village Volvo – Understand the given case and answer the questions given at the end of the case study.
4. Case study: Frito Lay puts handheld computers in field – Get the solution
5. Case study: PacBell’s experiment, 100 yen Sushi house - Get the solution
6. Case study: The best little cookie house around – Solve
7. Case study: The Daley monthly car pool airport services – Solve
8. Case studies: Athol Furniture, Inc., Whittier County Hospital, County General Hospital – Read and solve
9. Case study: Amy’s Ice cream, Clean sweep, Inc, Service winners of the Baldrige National Quality award. – Read and give the solution
10. Case study: Thrifty car rental – Eye’ll be seeing you, Elysian Cycles - Solve

Text Books
Reference Books

1. H P Cemach; Workstudy in office; Ambar Publications
2. R G Anderson, Organisation and methods, N&E Handbook series
3. Robert Johnston; The Management and Service operations, IFS Publications NY
4. T Benley, Holt Rinahan and Winston; Management service handbook
IP 40207:: ENERGY MANAGEMENT

Credits: 01  Teaching Scheme: - - Tutorial 1 Hr/Week

Prerequisites: : Nil

Objectives:
- To give an idea about the scope of Industrial Engineering in the field of Energy Management
- Mapping with PEOs: IV (f, o)

List of Contents

Tutorials containing the record of the following:

Assignments:
1. Indian Energy Situation
2. Global Energy Situation
3. Types of Energy
4. Classification of Energy sources
5. Important provisions in The Energy Conservation Act, 2003,
6. Important provisions in The Electricity Act, 2003,
7. Important provisions in The Prevention and Control of Pollution Act, 1974,
8. Important provisions in The Environmental Protection Act, 1986
9. Demand Side Management
10. Energy Audit
11. Energy Saving

Any six assignments from the above should be completed.

Text Books

Reference Books
IP_40209:: INDUSTRIAL AND COMMERCIAL LAWS

Credits: 01  
Teaching Scheme: - - Tutorial 1 Hr/Week

Prerequisites: : Nil

Objectives:
- To give an idea about the application of Legal provisions as an Industrial Engineer
- Mapping with PEOs: V (k, o)

List of Contents

Tutorials containing the record of the following:

Assignments:
1. Various Committees under the Industrial Disputes Act, 1947
2. Legality of strikes, lock outs, layoff, retrenchment, etc.
3. Important provisions of the Trade Union Act, 1926
4. Important provisions of the Standing Order Act, 1946
5. Health and Safety aspects under the Factories Act, 1948
6. Working Conditions provisions under the Factories Act, 1948
7. The Competition Act, 2000
8. The Sale of Goods Act, 1923

Any six assignments from the above should be completed.

Text Books
3. Taxman, Commercial Laws.

Reference Books
1. Bare Acts and Bare Acts with Cases for each of the act.
IP40211: ENTREPRENEURSHIP DEVELOPMENT

Credits: 01

Teaching Scheme: - - Laboratory 1 Hr/Week

Prerequisites: Nil

Objectives:
- To provide the motivational inputs to students to become entrepreneurs
- To enable students to understand the importance of national wealth generation
- To teach students the legal formalities of starting a business with a few assignments
- To teach students to make efficient business cases identify opportunities and apply for loans to become independent business persons.
- To sensitizes the students with the importance of being self employed professionals on the planet instead of slavishly working under someone else.
- **Major objective is to ensure that they become entrepreneurs and actually start a business and not just become bookworms of an entrepreneurship academic subject**
- Mapping with PEOs: V (j, i)

List of Contents

A TERM-WORK containing the record of the following:

1. Administration inputs to entrepreneurship – planning scheduling, time management
2. Preparation of Business cards
3. Formulate Business Plan – Part 1
4. Formulate Business Plan – Part 2
5. Formulate Business Plan – Part 3
6. Formulate Business Plan – Part 4
7. Formulate Business Plan – Part 5
10. Tax and relativity of moral ethics in adverse business (corrupt) environments.
11. Study of Shop ACT
12. Business Crisis

**Text Books**

2. Class notes on entrepreneurship

**Reference Books**

1. Dr J. S. Juneja, Small and Medium Enterprise: Challenges and opportunities
2. Kondalah, chukka; Enterprise in the new millennium, McGraw-Hill publication
4. Gopal & Ramamurthy; Project management Handbook, Macmilan.
5. Prassanna Chandra; Preparation, Appraisal, Budgeting and Implementation.
IP40313 :: HUMAN FACTORS ENGINEERING

Credits: 01

Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Nil

Objectives:
- To develop skills in the subject
- Application of the theory
- Understanding of fundamentals of the subject
- Mapping with PEOs: IV (f, i, k, n)

List of Practical
1. Anthropometric Data Collection – sample, equipment, analysis.
2. Applied Anthropometry – Product Design
3. Applied Anthropometry – Work Place Design (Seating / Standing)
5. Analysis of energy consumption for different activities performed in controlled conditions
6. Analysis of energy consumption for different activities performed in uncontrolled conditions
7. Analyze effectiveness of work environment considering illumination level
8. Analyze effectiveness of work environment considering air velocity using anemometer
9. Analyze effectiveness of work environment considering sound level using sound meter
10. Legal and Safety Aspects.

Text Books
2. E. Grad jean, “Fitting Task to the Man” Taylor and Francis.
Reference Books

1. ILO, “Introduction to Work study”.
3. R. S. Bridger, “Introduction to Ergonomics”, Taylor and Francis
IP40315:: WORLD CLASS MANUFACTURING

Credits: 01

Teaching Scheme: - Laboratory 2 Hrs/Week

Prerequisites: Nil

Objectives:
- To develop skills in the subject
- To verify the principal of course
- Mapping with PEOs: IV (f, o)

List of Practical

Assignments on the following
1. Value Stream Mapping – Current State
2. Value Stream Mapping – Future State
3. Case – Design of JIT / Kanban System
4. Case – Cellular Manufacturing
5. Case – Setup Time Reduction (SMED Philosophy)
7. Assignment on TPM Performance Measures
8. Assignment on 5S: Implementation of 1S
9. Assignment on 5S: Implementation of 2S
10. Case on BPR
11. Numerical on TOC
12. Case Study on Application of TOC

Text Books

1. Operations Management for Competitive Advantage - Chase
2. Making Common Sense Common Practice – Mooref
Reference Books

1. Managing Technology & Innovation for Competitive Advantage - Narayanan
2. Just In Time Manufacturing - M.G.Korgaonkar
3. World Class Manufacturing - B.S.Sahay
4. World Class Manufacturing - Schonberger
IP47301 :: PROJECT STAGE II

Credits: 2  
Teaching Scheme: - Practical 1Hr/Week

Prerequisite : Nil

Objectives:
- To train the students to apply their engineering knowledge to real life problem solving.
- Mapping with PEOs: IV (e, f, g, i, n)

The project work could be of the following nature:
1. Manufacturing / Fabrication of a prototype machine' including selection, concept, design, material, manufacturing the components, assembly of components, testing and performance evaluation.
2. Improvement of existing machine / equipment / process.
3. Design and fabrication of Jigs and Fixtures, dies, tools, special purpose equipment, inspection gauges, measuring instruments for machine tools.
4. Computer aided design, analysis of components such as stress analysis.
5. Problems related to Productivity improvements.
6. Problems related to value engineering.
7. Problems relating to material handling system.
10. Product design and development.
11. Analysis, evaluation and experimental verification of any engineering problem encountered.
13. Quality improvements, In-process Inspection, Online gauging.
15. Time and Motion study, Job evaluation.
16. Ergonomics and safety aspects under industrial environment
17. Management Information System.
18. Market Analysis in conjunction with Production Planning and Control.

OR

Fabrication of models, machines, prototypes based on new ideas, robots and machine based on hitech systems and automation, experimental set-up, fabrication of testing equipment, renovation of machines, etc. Computer based design / analysis or modeling / simulation of product(s), mechanism(s) or system (s) and its validation or comparison with available
benchmarks / results. Modelling/simulation of product(s), mechanism(s) or system(s) and its validation or comparison with available benchmarks / results. Design/development and Fabrication of models, machines, and prototypes based on new ideas, robotic and automation systems, Experimental set ups, test rigs/equipments.

The project work shall be taken up individually or in a group consisting of not more than 4 students.

A report containing maximum 30 pages shall be submitted based on the background, need and scope of the project, project specifications, activities involved in the project and activity plan, study of literature and basic theory, and work completed (if any).

Guidelines:

- Report shall be typed or printed.
- Figures and tables shall be on separate pages and attached at respective positions.
- Project title and approval sheets shall be attached at the beginning of the report followed by index and synopsis of the project.
- References shall be mentioned at the end followed by appendices (if any).
- When a group of students is doing a project, names of all the students shall be included on every certified report copy.

Each group of students shall submit two copies of reports to the institute and one copy shall be prepared for each individual student.
MODULE VIII
<table>
<thead>
<tr>
<th>Subject No.</th>
<th>Subject Code</th>
<th>Subject Name</th>
<th>Teaching Scheme (Hrs/week)</th>
<th>Credits</th>
</tr>
</thead>
</table>
| S\textsubscript{5} | IP40102, IP40104, IP40106 | *Elective Group III  
  • Financial Management & Management Accounting  
  • Organization Behavior  
  • Marketing Management | 3 0 0 | 3 |
| S\textsubscript{6} | IP40108, IP40110, IP40112 | *Elective Group II  
  • Supply Chain Management  
  • Product Design & New Product Development  
  • Computer Integrated Manufacturing Systems | 3 0 0 | 3 |
| S\textsubscript{7} | IP40114 | Work Systems Analysis & Design | 3 0 0 | 3 |
| S\textsubscript{8} | IP40116 | Project Management | 3 0 0 | 3 |
| T\textsubscript{3} | IP40202, IP40204, IP40206 | *Elective Group III  
  • Financial Management & Management Accounting  
  • Organization Behavior  
  • Marketing Management | 0 1 0 | 1 |
| T\textsubscript{4} | IP40208, IP40210, IP40212 | *Elective Group II  
  • Supply Chain Management  
  • Product Design & New Product Development  
  • Computer Integrated Manufacturing Systems | 0 1 0 | 1 |
| P\textsubscript{3} | IP40314 | Work Systems Analysis & Design | 0 0 2 | 1 |
| P\textsubscript{4} | IP40316 | Project Management | 0 0 2 | 1 |
| PS\textsubscript{3} | IP47302 | Project Stage III | 0 0 8 | 6 |
IP40102 :: FINANCIAL MANAGEMENT & MANAGEMENT ACCOUNTING

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To develop skills in the subject
- Application of the theory
- Understanding of fundamentals of the subject
- Mapping with PEOs: IV (f, g)

Unit I
Financial Management
(8 Hrs)
A. Nature and Scope of Finance Function; Financial goal - profit vs. wealth Maximization; Finance functions – investment,
Ratio Analysis Classification, Ratio Analysis and its limitations. Types of Ratios – Activity Turnover, Profitability, Liquidity, etc

Unit II
Capital Budgeting
(8 Hrs)
A: Nature of investment decisions; Investment evaluation criteria – net present value, internal rate of return, profitability index, payback period, accounting rate of return;
B: NPV and IRR comparison; Capital rationing.

Unit III
Working Capital Management
(8 Hrs)
Meaning, significance and types of working capital; calculating operating cycle period and estimation of working capital requirements; Financing of working capital and norms of bank finance; Sources of working capital; Commercial paper; Factoring services

B. Various committee reports on bank finance; Dimensions of working capital management.

Unit IV (8 Hrs)
Management Accounting

A. Single Entry and Double Entry Book Keeping: Concept of books of account, journal, ledger, debit, credit.
Types of Accounts: Real, Fictitious, Personal, Impersonal
Rules for Debit and Credit.
B. Simple sums for account writing. Computerized accounting.

Unit V (8 Hrs)
Trial Balance, Profit and Loss Account and Balance Sheet

A. Accounting - General Ledger, Balance Sheet / Profit & Loss Account / Schedules
Trial Balance, Journals / Day Books, Ratio / Expenses Analysis, Accounts Receivables, Accounts Payables, Preparation of the final books of accounts
B. Interpretation of company results published.

Text Books

Reference Books
IP40104 :: ORGANIZATIONAL BEHAVIOR

Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To make the students understand the concepts & broad principles of contents of the course
- Develop conceptual framework of the course
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: III (n, o)

Unit I  
Introduction to Organizational Behaviour  
(8 Hrs)

A. Definition, Importance, Scope, Fundamental Concepts of OB, Different models of OB - autocratic, custodial, supportive, collegial and SOBC.
B. Concept of personality perception, values attitudes & learning. Learning Behaviour Emotional Intelligence in organization.

Unit II  
Necessity of organizational changes  
(8 Hrs)

A: Types of changes: force field analysis, Managing changes in order to make the organization competitive, organizational change, dilemma of change, pressure for change
B: Change process, resistance to change, overcoming the resistance to change, and theories of change.

Unit III  
Motivation  
(8 Hrs)

Definition, Importance, Motives – Characteristics, Classification of motives - Primary & Secondary motives. Theories of Motivation - Maslow’s Theory of need hierarchy - Herzberg’s theory
B. Morale - Definition and relationship with productivity - Morale Indicators.

Unit IV  
Group Dynamics and Team building  
(8 Hrs)

A. Concept of Group & Team. Theories of Group Formation - Formal and Informal
Groups. Importance of Team building.

B. Group decision making Leadership theory.

Unit V (8 Hrs)
MBO Techniques

A. Concept of MBO technique and details, phases, system 4 – management, Process consultation, case studies
B. Home assignment on MBO technique

Text Books

Reference Books
1. Organisational Behavior – Hellrigel, Solcum, Woodman, South Western Publication
3. Organisational Development and Change – Cummings and Worley, South Western Publication
4. Organisational Development – W.L. French, Pearson Education
IP40106 :: MARKETING MANAGEMENT

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To make the students understand the concepts & broad principles of contents of the course
- Develop conceptual framework of the course
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: IV (e, f)

Unit I
Introduction
A Historical development of marketing management, Definition of Marketing, Core marketing concepts, Marketing Management philosophies, Micro and Macro Environment, Characteristics affecting Consumer behaviour, Types of buying decisions, buying decision process, Classification of consumer products, Market Segmentation.
B. Concept of Marketing Myopia. Importance of marketing in the Indian Socio economic system.

Unit II
Marketing Information Systems And Research
A: Components of marketing information system–benefits & uses marketing research system, marketing research procedure, Demand Estimation research, Test marketing, Segmentation Research - Cluster analysis, Discriminate analysis. Sales forecasting: objective and subjective methods.
B: Home assignment on Questionnaire design for collecting primary data

Unit III
Marketing Of Industrial Goods
Nature and importance of the Industrial market, classification of industrial products, participants in the industrial buying process, major factors influencing industrial buying behavior, characteristics of industrial market demand. Determinants of industrial market demand Buying power of Industrial users, buying motives of Industrials users, the industrial buying process, buying patterns of industrial users.

B Home assignment on industrial buying process. Negotiation process in industrial buying process.

**Unit IV**

**Product Management And Branding**


B. Labeling: Types, functions advantages and disadvantages, Packaging: Meaning, growth of packaging, function of packaging, kinds of packaging.

**Unit V**

**Pricing And Product Promotion**


B. Personal Selling : Objectives of personal selling, qualities of good salesman, types of salesman, major steps in effective selling

**Text Books**


**Reference Books**

2. R.S.N. Pillai and Mrs. Bagavathi “Marketing” S. Chand & Co. Ltd
Credits: 03  

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To make the students understand the concepts & broad principles of contents of the course
- Develop conceptual framework of the course
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: IV (f, o)

Unit I  (8 Hrs)
Concept of SCM
B. Importance of Supply Chain, Examples of Supply Chain

Unit II  (8 Hrs)
Network Design in Supply Chain
B: Factors Influencing Network Design Decisions – Strategic, Technological, Macroeconomic, Political, Infrastructure, Competitive

Unit III  (8 Hrs)
Planning Demand & Supply in a Supply Chain

IP40108:: SUPPLY CHAIN MANAGEMENT
A. Managing Supply: Managing Capacity – time flexibility of workforce, seasonal workforce, subcontracting, use of dual facilities, design product flexibility into production processes. Managing Inventory – use common components across multiple products, build inventory of high demand of predictable demand products
Managing Demand: Variable pricing, Forward buying.

B Basic Approach to Demand Forecasting, Role of Aggregate Planning in Supply Chain.

Unit IV (8 Hrs)
Planning & Managing Inventories in a Supply Chain

A. Managing Economies of Scale: Cycle Inventory- Role in SC - Lot sizing for single product, multiple products or customers, Aggregating multiple products in single order
Managing Uncertainty: Safety Inventory – Role in SC – Determine appropriate level of safety inventory
Transportation & Inventory Cost Trade-off: Choice of Transportation Mode, Inventory Aggregation. Transportation cost and customer-responsiveness trade-off
Pricing & Revenue Management in Supply Chain: Role, Revenue Management for Multiple Customer Segments, Seasonal Demand, Bulk & Spot Customers

B.: Economies of scale to exploit quantity discounts. Procurement Process. Sourcing Planning & Analysis

Unit V (8 Hrs)
Co-ordination & Technology in the Supply Chains

A. Co-ordination in Supply Chain: Lack of SC Coordination & Bullwhip Effect. Effect on Performance. Obstacles to SC Coordination. Manager Levers to Achieve Coordination. Information Technology and Supply Chain: Role of IT in SC Supply Chain
IT Framework. E-business & Supply Chain

B. Building Strategic Partnerships and Trust within a Supply Chain. Future of IT in Supply Chain. Cases on E-business and supply chains

Text Books
1. Sunil Chopra & Peter Meindl, Supply Chain Management - Strategy, Planning & Operation –Pearson Education

Reference Books
1. Bowersox , Logistical Management - The Integrated Supply Chain Process
2. Christopher, Logistics & Supply Chain Management, Pearson Education
3. Logistics & Supply Chain Management – Raghuram
IP40110 :: PRODUCT DESIGN & NEW PRODUCT DEVELOPMENT

Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To make the students understand the concepts & broad principles of contents of the course
- Develop conceptual framework of the course
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: I (d, h)

Unit I (8 Hrs)
Product development verses design


B. Function trees system functionality, augmentation, Aggregation, common basis, functional modeling methods.

Unit II (8Hrs)
Product tear down and experimentation

A: 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.

B: Portfolio architecture, types, platform, functional architecting, optimization selection. Product modularity, modular design

Unit III (8 Hrs)
Concepts and Modeling, Generation of concepts
A. 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,

B. Selection of model by performance specifications, physical prototyping, informal and formal models.

Unit IV (8 Hrs)
Design materials & human factors in product design

A. 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.

B. Case study based upon Economic analysis, break even analysis, profit & competitiveness, Economic of a new product design.

Unit V (8 Hrs)
Value engineering in product design & Modern Approaches to Product Design


B. Techniques to reduce environmental impact like minimum material usage, disassembly, recycle ability, remanufacturing, high impact material reduction, energy efficiency, regulation and standards, Value analysis tests with examples in the form of case studies.

Text Books
1. Otto, Product Design, Pearson Education
4. Trott, Innovation Management & New Product Development, 4/e, Pearson Education
Reference Books

1. Product design & Manufacture- Jhon R Lindbeck
5. Product Design for manufacturing and Assembly Geoffry Boothroyd, peter dewhurst, Winstrn Knight Marcel Dekker Inc., USA.
IP40112:: COMPUTER INTEGRATED MANUFACTURING SYSTEMS

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To make the students understand the concepts & broad principles of contents of the course
- Develop conceptual framework of the course
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: III (h, i, j)

Unit I
Introduction to CIM & MRP-II


B Major modules of MRP – II software – Manufacturing, engineering, financial, marketing and misc. applications.

Unit II
NC & CNC Machine tools Basic.

A:
Principle of Numerical Control – Types of CNC machine tools – Features and programming of CNC machine tools – CNC programming based on CAD – Applications and economics of usage of CNC machine – Capabilities of a typical NC.

B CAM software – Integration of computers in CIM environment

Unit III
Computer Communications

(8 Hrs)

(8 Hrs)

(8 Hrs)

B Case Study on Networking in manufacturing company.

**Unit IV**

Flexible Manufacturing System. (8 Hrs)


B. Conceptual understanding of Lean manufacturing, Agile manufacturing

**Unit V**

Artificial Intelligence (8 Hrs)


B. AI in vision system and scheduling

**Text Books**


**Reference Books**

IP40114:: WORK SYSTEMS ANALYSIS & DESIGN

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To make the students understand the concepts & broad principles of contents of the course
- Develop conceptual framework of the course
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: I, IV (f, k, n)

Unit I
Wage Payment & Incentive Schemes


B. Performance Measurement Systems – Introduction to Balanced Scorecard. Four Performance Measurement Perspectives

Unit II
Process & Equipment Design

B: Case studies on the above mentioned topics

Unit III
Value Engineering

A Concept of Value, Definition of value, its types like esteem value, use value, etc. Definition, introduction to value enhancement techniques, Basic steps in VE / VA, FAST Diagram. Tools & techniques used like functional analysis, paired comparison method, analytical hierarchical process O & M (Organization & Methods): Definition, introduction, use of analytical and non- analytical techniques like Check sheets, flow charts, control charts. Analysis of Key Result Areas (KRA) & Identification of Key Indices (KI’s).

B Case study on real life product, work system.

Unit IV
Standardized Work, Work Simplification & Standard Operating Procedures

A. Work Standards: Work Instructions, Operation Drawings, Operation Instruction Sheets, Process Conditions Sheets, Quality Control Sheets, Tooling Layout Drawings
Standardized Work: Process Capacity Sheet, Standardized Work Combination Sheet, Standardized Work Chart
Standard Operating Procedures: Significance & Concept, Developing SOPs

B. Case studies on the above mentioned topics

Unit V
Industrial Safety

A. Importance of safety in industrialised society. Check list – identification of unsafe acts of workers and unsafe conditions in the shop floor. Safe practices in the operation of various machines and equipment. Role of human operator in safety. Use of safety equipment while working on hazardous machines / equipment. Precautions and training. Safety programmes, general awareness and improvements.


Text Books

1. Introduction to Work Study”, ILO, Oxford and IBH Publishing company, Bombay,

Reference Books
1. Kjell Zandin, Marcel Dekker; Introduction to MOST; Inc. New York & Basel
2. The Factory Act, 1948
4. Yoga M., Job Evaluation, NPC, New Delhi
IP40116:: PROJECT MANAGEMENT

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To make the students understand the concepts & broad principles of contents of the course
- Develop conceptual framework of the course
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: IV (f, o)

Unit I

Introduction:
B. Role & Functions of Project Manager

Unit II

Project Life Cycle Phases
B: Project Organization & Management. Project Organization Structure
Unit III

Important Aspects of Project Feasibility


B Socio-Economic: Socio-Cost Benefit Analysis. Effective Rate of Protection, Domestic Resource Cost

Unit IV

Project Planning & Scheduling


B. Time Management: effective time management, management pitfalls, project communications, project management bottlenecks.

Unit V

Project Cost Management


B. Project Management Information system and control

Text Books

1. Narendra Singh; Project Management & Control; Himalaya Publishing House, Mumbai.
2. S.Choudary, Project Management, Tata McGraw Hill
3. Prasanna Chandra; Project: Preparation, Appraisal, Budgeting & Implementation
4. Pinto, Project Management – Achieving Competitive Advantage & MS Projects, Pearson
Reference Books

1. Maylor, Project Management, Pearson Education,
2. Gopal & Ramamurthy; Project Management Handbook; Macmilan.
3. Project Management Body of Knowledge
IP40202: FINANCIAL MANAGEMENT & MANAGEMENT ACCOUNTING

Credits: 01

Teaching Scheme: - - Tutorial 1 Hr/Week

<table>
<thead>
<tr>
<th>Prerequisites:</th>
<th>Nil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objectives:</td>
<td>To give an idea about the scope of Financial Management</td>
</tr>
<tr>
<td></td>
<td>Mapping with PEOs: IV (f, g)</td>
</tr>
</tbody>
</table>

List of Contents

Tutorials containing the record of the following:

1. Goals of Financial Management
2. Ratio Analysis – Calculation of ratios
3. Ratio Analysis – Interpretation of ratios
4. Investment Evaluation Criteria – Non-discounted cash flow techniques
5. Investment Evaluation Criteria – Discounted cash flow techniques
6. Sources of Capital
8. Working Capital Management – Cash Management
9. Single Entry and Double Entry Book Keeping – Part 1
10. Single Entry and Double Entry Book Keeping – Part 2
11. Preparation of Final Accounts
12. Analysis of Company Results

Text Books


Reference Books


**IP40204::ORGANIZATIONAL BEHAVIOR**

Credits: 01  
Teaching Scheme: Tutorial 1 Hr/Week

**Prerequisites:** Nil

**Objectives:**
- To make the students understand the concepts & broad principles of contents of the course
- Develop conceptual framework of the course
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: III (n, o)

**List of Contents**

**TERM-WORK containing the record of the following:**

1. Assignment on Concept of personality perception, values attitudes & learning
2. Assignment on Importance, Scope and Fundamental Concepts of OB
3. Assignment on Emotional Intelligence in organization.
4. Case study on Change process in organization.
5. Assignment on theories of change.
6. Assignment on Different models of OB.
7. Assignment on Maslow’s Theory of need hierarchy
9. Assignment on. Group decision making Leadership theory
10. Case study Analysis on Theories of Group Formation
11. Case study Analysis on MBO Techniques
12. Assignment on Importance of Team building.

**Text Books**

**Reference Books**
1. Organisational Behavior – Hellrigel, Solcum, Woodman, South Western Publication
IP40206::MARKETING MANAGEMENT

Credits: 01  Teaching Scheme: - - Laboratory 2 Hr/Week

Prerequisites: : Nil

Objectives:
- To make the students understand the concepts & broad principles of contents of the course
- Develop conceptual framework of the course
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: IV (e, f)

List of Contents

TERM-WORK containing the record of the following:

1. Importance of marketing in the Indian Socio economic system.
2. Questionnaire design for collecting primary data.
3. Case study Analysis on Marketing Of Industrial Goods
4. Case study Analysis on Product Management
5. Case study Analysis on Branding.
7. Product Promotion analysis.
8. Analysis on various pricing policies.
9. Assignment on Personal Selling
10. Case study Analysis on Application of 7P’s in service sector.

Text Books

1. Philip Kotler “Principles of Marketing”, 13/e, Pearson Education
2. Philip Kotler “Framework of Marketing”, Pearson Education

Reference Books

2. R.S.N. Pillai and Mrs. Bagavathi “Marketing” S. Chand & Co. Ltd
IP40208:: SUPPLY CHAIN MANAGEMENT

Credits: 01

Teaching Scheme: - - Laboratory 2 Hr/Week

Prerequisites: Nil

Objectives:
- To develop skills in the subject
- Application of the theory
- Understanding of fundamentals of the subject
- Mapping with PEOs: IV (f, o)

List of Contents

A TERM-WORK containing the record of the following:

Assignments
1. Detailed Study of Supply Chain of any one company in an Industry of your choice
2. Study of Industry Based on ETIG SCM CD
3. Numerical & Cases on Facility Location Models- Single and Multiple Facility Location & Location - Allocation Models
4. Numericals & Caselet on Demand Forecasting
5. Case let on Aggregate Planning
6. Case let on Inventory Management
7. Numerical and Cases on Travelling Salesman Problem
8. Numerical and Cases on Vehicle Routing Problem
9. Comprehensive Case Study on Supply Chain Management
10. Computerized Simulation Game
11. Case Study on Logistics Modeling
12. Industrial Visit

Text Books

1. Supply Chain Management - Strategy, Planning & Operation – Sunil Chopra & Peter Meindl, Pearson Education

Reference Books

1. Logistical Management - The Integrated Supply Chain Process – Bowersox
2. Logistics & Supply Chain Management – Christopher
3. Logistics & Supply Chain Management – Raghuram


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IP40210:: PRODUCT DESIGN & NEW PRODUCT DEVELOPMENT

Credits: 01

Teaching Scheme: - - Laboratory 2 Hr/Week

Prerequisites: : Nil

Objectives:

- To make the students understand the concepts & broad principles of contents of the course
- Develop conceptual framework of the course
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: I (d, h)

List of Contents

A TERM-WORK containing the record of the following:

Assignments
1) Assignment On Product Development Process
2) Assignment on Modeling process
3) Assignment on product tear down
4) Assignment on Optimization Selection
5) Assignment on Numerical concept scoring & System modeling
6) Assignment on physical prototyping.
7) Assignment on Break Even Analysis
8) Assignment on Profit & Competitiveness,
9) Assignment on Economic of a new product design
10) Assignment on Quality Function Development (QFD)
11) Assignment on value analysis job plan
12) Assignment on Product Life Cycle Management

Text Books
1 Product Design & Manufacturing- A.K.Chitale, R.C Gupta
Reference Books
1. Product design & Manufacture- Jhon R Lindbeck
5. Product Design for manufacturing and Assembly Geoffry Boothroyd, peter dewhurst, Winstrn Knight Marcel Dekker Inc., USA.
IP40212:: COMPUTER INTEGRATED MANUFACTURING SYSTEMS

Credits: 01

Teaching Scheme: - - Laboratory 2 Hr/Week

Prerequisites: : Nil

Objectives:
- To make the students understand the concepts & broad principles of the course
- Develop conceptual framework of the course
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: III (h, i, j)

List of Contents

A TERM-WORK containing the record of the following:

1. Assignment on Methods of CAPP - Process planning systems.
2. Assignment on Major modules of MRP – II software
3. CNC programming Practical Application
4. Assignment on CNC programming-I
5. Assignment on CNC programming-II
7. Assignment on Flexible manufacturing system.
8. Assignment on Artificial Intelligence Application.
9. Assignment on DSS in CIM environment.
10. Assignment on Features and architecture of a DBMS.
11. Assignment on Robot programming methods.
12. Assignment on Lean manufacturing Building Block.

Text Books


Reference Books

FF No. : 654

IP40314:: WORK SYSTEMS ANALYSIS & DESIGN

Credits: 01

Teaching Scheme: - Laboratory  2 Hrs/Week

Prerequisites: Nil

Objectives:
- To develop skills in the subject
- Application of the theory
- Understanding of fundamentals of the subject
- Mapping with PEOs: I, IV (f, k, n)

List of Practical

1. Case on Ergonomics Applications in Productivity Improvement
2. Case on Value Analysis / Value Engineering
3. Exercise on Job Evaluation – Part 1
4. Exercise on Job Evaluation – Part 2
5. Exercise on Merit Rating/Performance Appraisal – Part 1
6. Exercise on Merit Rating/Performance Appraisal – Part 2
7. Development of Time Standards using PMTS: MTM (Video Based Analysis)
8. Development of Time Standards using PMTS: MOST (Video Based Analysis)
10. Exercise on Development of Standard Operating Procedures
11. Exercise on Development of Standard Work Instructions
12. Case Study – Field Visit

Text Books
1. Introduction to Work Study by ILO
2. International Labour Organisation, Geneva; Job Evaluation

Reference Books
1. Kjell Zandin , Marcel Dekker ; Introduction to MOST; Inc. New York & Basel
2. Salvendy G. ; Handbook of Industrial Engineering.
3. Yoga M., Job Evaluation, NPC, New Delhi
IP40316:: PROJECT MANAGEMENT

Credits: 01  

Teaching Scheme: - Laboratory  2 Hrs/Week

Prerequisites: Nil

Objectives:  
- To develop skills in the subject  
- Application of the theory  
- Understanding of fundamentals of the subject  
- Mapping with PEOs: IV (f, o)

List of Practical

Assignments On following
1. Preparation of Project Feasibility Report  
   a. Project Identification, Definition  
   b. Project Feasibility – Managerial/Organizational Perspective  
   c. Project Feasibility – Marketing, Exit Plan  
   d. Project Feasibility – Operational  
   e. Project Feasibility – Financial, Financial Projections  
2. Assignment on Capital Budgeting – PBP, Discounted PBP, NPV, IRR, Annual Worth  
3. Numerical on PERT/CPM – Calculation of Floats, Determination of Critical Path & Project Duration  
4. Case let - Project Crashing  
5. Case let - Resource Leveling & Resource Smoothening  
6. Project Planning & Scheduling (Using MS Projects) 1 – Preparation of Statement of Works, WBS  
7. Project Planning & Scheduling (Using MS Projects) 2 – Network Diagram, Gantt Charts, Project Monitoring

Text Books
1. Narendra Singh; Project Management & Control (1998 ); Himalaya Publishing House, Mumbai.  
2. S.Choudary, Project Management

Reference Books
1. Gopal & Ramamurthy; Project Management Handbook; Macmilan.  
2. Prasanna Chandra; Preparation, Appraisal, Budgeting & Implementation
3. Project Management Body of Knowledge
IP 47302:: PROJECT STAGE III

Credits: 4  
Teaching Scheme: - Practical 2 Hrs/Week

Prerequisite : Nil

Objectives:
- To train the students to apply their engineering knowledge to real life problem solving.
- Mapping with PEOs: IV (c, f, g, i, n)

The project work could be of the following nature:
1. Manufacturing / Fabrication of a prototype machine' including selection, concept, design, material, manufacturing the components, assembly of components, testing and performance evaluation.
2. Improvement of existing machine / equipment / process.
3. Design and fabrication of Jigs and Fixtures, dies, tools, special purpose equipment, inspection gauges, measuring instruments for machine tools.
4. Computer aided design, analysis of components such as stress analysis.
5. Problems related to Productivity improvements.
6. Problems related to value engineering.
7. Problems relating to material handling system.
10. Product design and development.
11. Analysis, evaluation and experimental verification of any engineering problem encountered.
13. Quality improvements, In-process Inspection, Online gauging.
15. Time and Motion study, Job evaluation.
16. Ergonomics and safety aspects under industrial environment
17. Management Information System.
18. Market Analysis in conjunction with Production Planning and Control.

OR

Fabrication of models, machines, prototypes based on new ideas, robots and machine based on hitech systems and automation, experimental set-up, fabrication of testing equipment, renovation of machines, etc. Computer based design / analysis or modeling / simulation of product(s), mechanism(s) or system (s) and its validation or comparison with available benchmarks / results. Modelling/simulation of product(s), mechanism(s) or system(s) and its
validation or comparison with available bench marks / results. Design/development and Fabrication of models, machines, and prototypes based on new ideas, robotic and automation systems, Experimental set ups, test rigs/ equipments.

The project work shall be taken up individually or in a group consisting of not more than 4 students.
A report containing maximum 30 pages shall be submitted based on the background, need and scope of the project, project specifications, activities involved in the project and activity plan, study of literature and basic theory, and work completed (if any).

Guidelines:

- Report shall be typed or printed.
- Figures and tables shall be on separate pages and attached at respective positions.
- Project title and approval sheets shall be attached at the beginning of the report followed by index and synopsis of the project.
- References shall be mentioned at the end followed by appendices (if any).
- When a group of students is doing a project, names of all the students shall be included on every certified report copy.
- Each group of students shall submit two copies of reports to the institute and one copy shall be prepared for each individual student.
Honors In
Industrial Engineering
### Structure for Honors (Industrial Engineering)

**Eligible Students:** Industrial Engineering

<table>
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<th>Subject No.</th>
<th>Subject Code</th>
<th>Subject Name</th>
<th>Teaching Scheme (Hrs/week)</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>IP28101</td>
<td>Industrial Maintenance &amp; Safety Engineering</td>
<td>3  0  0  3</td>
<td></td>
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IP28101:: INDUSTRIAL MAINTENANCE & SAFETY ENGINEERING

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites (If Any):

Objectives:

- To make the students understand the concepts & broad principles of contents of the course
- Aim is to provide insight of the subject
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: III (a, k, l)

Unit I
Principles and practices of Maintenance planning

A. Basic Principles of maintenance planning – Objectives and principles of planned maintenance activity – Importance and benefits of sound Maintenance systems – Reliability and machine availability – MTBF, MTTR and MWT
B. Factors of availability – Maintenance organization – Maintenance economics.

Unit II
Maintenance policies and preventive maintenance

A. Maintenance categories – Comparative merits of each category – Preventive maintenance
B. Maintenance schedules – Repair cycle – Principles and methods of lubrication – TPM.

Unit III
Condition Monitoring

A. Condition Monitoring – Cost comparison with and without CM – On-load testing and off load.
B. Methods and instruments for CM – Temperature sensitive tapes – Pistol thermometers – wear-debris analysis

Unit IV
Introduction to the development of industrial safety and management

A. History and development of Industrial safety – Implementation of factories act – Formation of various councils – Safety and productivity – Safety organizations –
B. Safety committees – safety committee structure – Roll of management and roll of Govt. in industrial safety – Safety analysis.

Unit V
Accident preventions, protective equipments and the Acts


Text Books

Reference Books
IP38101:: OPERATIONS SCHEDULING

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites (If Any):

Objectives:

- To make the students understand the concepts & broad principles of contents of the course
- Aim is to provide insight of the subject
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: II, III (a, f, g, i, n)

Unit I

Single Machine Models

- Sequencing and scheduling – Objectives and constraints – Pure sequencing models sequencing model – Basic theorems performance measures – mean flow time, mean tardiness etc. - SPT, ED order – Hodgson’s algorithm – Smith’s rule – WI algorithm
- Hybrid algorithm – Neighborhood search – Dynamic programming approach – Branch and Bound – dependent jobs – Sequence dependent set up times.

Unit II

Parallel machine models

- Make span minimization of independent and dependent jobs – Mc Naughton’s algorithms
- Weighted mean flow time minimization – Hu’s algorithm – Muntg coffmann algorithm.

Unit III

Flow shop models

- Palmer’s method – Milten’s algorithm.

Unit IV

Job Shop Models

A. Graphical representation – Feasible, semi-active and active schedules – Single pass approach – Non-delay schedule generation.

Unit V (08 Hrs)

Other Models

A. Scheduling of intermittent production – Giffler Thomson algorithm – Branch and Bound Scheduling of continuous production – RPW, Inverse RPW methods – Tree search – Largest candidate methods
B. COMSOAL – KANBAN/FMS system scheduling

Text Books

Reference Books
FF No. : 654

IP38102 :: SYSTEMS AND SIMULATION

Credits: 03  Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Mathematics for Engineering Applications

Objectives:
- To make the students understand the concepts & broad principles of statistical techniques used in managerial decision making
- Sensitize the students of the importance of statistics in real life environment
- Mapping with PEOs: II, III (a, f, g, i, n)

Unit I
Introduction to systems and simulation
(08 Hrs)
A. Basic concepts of systems – General systems – Elements of systems – theory – concept of simulation
B. Simulation as a decision making tool – types of simulation – System modeling and types of modeling – desk and bench mark simulation.

Unit II
Random Numbers
(08 Hrs)
A. Probability and statistical concepts of simulation – Pseudo random numbers – Methods of generating random variables

Unit III
Design of simulation experiments
(08 Hrs)
A. Problem formulation – Data collection and reduction time flow mechanism – Key variables – Logic flowchart starting condition – Run size – Experimental design
B. Analysis interpretation and validation – Application of simulation in Industries, Engineering and scientific organisations.

Unit IV
Simulation Language
(08 Hrs)
A. Use of digital computer in simulated sampling – Comparison and selection of simulated languages – Analysis
B. Study of any simulation language – Modification of simulation models using simulation language.

Unit V
Case Studies

A Development of simulation models using the simulation language studied for systems like: Queuing systems – Production Systems – Inventory systems – Maintenance and replacement systems

B. Investment analysis and network.

Text Books

Reference Books
IP48101: ADVANCED OPTIMIZATION TECHNIQUES

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- Develop conceptual framework of the course
- Aim is to provide insight of the subject
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: II, III (a, f, g, i, n)

Unit I
Introduction
(8 Hrs)
A. Classification of optimization problems – Applications of optimization – Concepts of design vector
B. Design constraints – Constraints surface - Objective function surfaces and multi-level

Unit II
Optimization I
(8 Hrs)
A. Karmakars method of solving L.P. problem – Quadratic programming – Non-linear programming – Unconstrained optimization techniques
B. Basics of constrained optimization

Unit III
Optimization II
(8 Hrs)
A. Integer linear programming methods and application – Introduction to integer non-linear programming
B. Basics of geometric programming.

Unit IV
Optimization III
(8 Hrs)
A. Multi-objective optimization methods and application – Formulation of problems ;
B Separable programming and stochastic programming.

Unit V
Optimization IV
(8 Hrs)

A. Introduction to Genetic algorithms – Simulated Annealing – Neural network based

B. Optimization and optimization of fuzzy systems.

Text Books

Reference Books
Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- Develop conceptual framework of the course
- Aim is to provide insight of the subject
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: II, III (a, f, g, i, n)

Unit I  
Introduction  
(8 Hrs)

A. Planning of experiments – Terminology – ANOVA rationale – Basics of quality by design – Loss function – Tolerance design

B. Single factor experiments – Tests on means

Unit II  
Factorial Experiments  
(8 Hrs)

A: Multi factor experiments - EMS rules – 2 & 3 factors – 2K design – Confounding

B. Fractional – Nested designs – Response Surface Methodology

Unit III  
Orthogonal Experiments  
(8 Hrs)

A. Selection and application of orthogonal arrays for design – Conduct of experiments

B Collection and analysis of simple experiments – Modifying orthogonal arrays.

Unit IV  
Robust design process  
(8 Hrs)

A. Comparison of classical and Taguchi’s approach – Variability due to noise factors –
Classification of quality characteristics and parameters

B Objective functions in robust design – S/N ratios.

Unit V (8 Hrs)
Product/process improvement

A. Inner and outer OA experiments – Optimization using S/N ratios – Attribute data analysis
A critique of robust design – Multi response optimization

B. Case studies on above topic.

Text Books

Reference Books
Composition for Selection of 5 Credits for Honors / Minor Course

(A) Comprehensive Viva Voce – Compulsory at the end of Semester VIII – 1 Credit

(B) Elective Component

a. Laboratory courses – Maximum Credits - 2
   (for award of 1 Credit the lab course would have a teaching scheme of 2 Hrs. / week and a plan of 12 practicals). The credit to be awarded as per the ISA and ESA guidelines for the compulsory lab courses.

b. Research publication – Maximum Credits – 1
   (Research Publication in a Magazine / Transaction / Journal as decided by the honors / minor co-ordinator)

c. Seminar - Maximum Credits – 1
   (Seminar to be given on a topic consistent with the scope of the Honors or Minor. The topic Selection is to be approved by the honors / minor co-ordinator. The assessment and evaluation scheme would as per the guidelines used for Technical Seminar at UG level by respective Dept.)

d. Honors / Minors Project – Maximum Credits – 2
   (Project Topic and Scope, its progress and final assessment consistent with the scope of the Honors or Minor. The topic Selection is to be approved by the honors / minor co-ordinator. The assessment would as per the guidelines and evaluation scheme used for Project Work at UG level by respective Dept.)

e. Industrial Training – Maximum credits – 4
   (An Industrial Training in an Industry identified by the student, approved by the honors / minor co-ordinator & Head of Department. The assessment would as per the guidelines and evaluation scheme used for Industrial Training at UG level by respective Dept.)

Note:

a. 4 Credits would be awarded to the students for a complete 12 Week Industrial Training and meeting with the assessment and evaluation requirements

b. Provision can be made for the students unable to procure a 12 week Industrial Training. A 4 week or 8 week Industrial Training may also be offered. 2 credits will be awarded for 8 week Industrial Training and 1 Credit would be awarded to the students for a 4 Week Industrial Training, meeting with the assessment and evaluation requirements

c. No Industrial Training less than 4 weeks be considered for award of 1 Credit

d. No cumulative addition of Industrial Training period would be considered for award of credits
The student is expected to earn 1 Credit from Part (A) and remaining 4 Credits from Part (B)
Minor In Industrial Engineering
## Structure for Minor (Industrial Engineering)

**Eligible Students:** Production/Mechanical Engineering

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<th>Subject No.</th>
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</table>
IP29101:: ENGINEERING ECONOMICS & COSTING

Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites (If Any):

Objectives:

- To make the students understand the concepts & broad principles of contents of the course
- Aim is to provide insight of the subject
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: I (e, o)

Unit I  
Oebgining Economic Analysis

(08 Hrs)

A. Principles, Techniques and their applications in engineering / managerial decision making. Concept of Money – Its Functions & worth. Inflation – Concept, Causes, Remedies to control inflation, Value of Currency, Factors governing exchange rates. Time Value of Money – Basis for comparison of alternatives, Present Worth, Future Worth, Annual Worth, Annuity, Perpetuity,

B. Significance of above concept in real life decision making

Unit II  
Concept of Interest

(08 Hrs)

A. Significance, Types. Depreciation, Methods of Depreciation, Significance in EEA, Concept of Tax, Types of Taxes – Direct & Indirect, Significance in EEA,

B. Case Study on Replacements Decisions

Unit III  
Concept of Demand and Supply

(08 Hrs)

A. Law of Demand and Supply, Elasticity of Demand, Giffen’s Paradox, Utility – Concept, Law of Diminishing Marginal Utility Price Determination, Competition – Concept, Types (Monopoly, Oligopoly, etc.), Benefits to Buyer & Seller, Economies of Scales, Law of Variable Proportions

B. Case Study on demand Analysis

Unit IV  
Cost

(08 Hrs)

B. Accounting for Prime Cost.

Unit V

Overheads


B. Accounting for Overheads. Preparation of Cost Sheet & Cost Statement

Text Books
1. Theusen H.G., Engineering Economic Analysis, Prentice Hall of India

Reference Books
2. S.M. Mahajan, Engineering Economics, Everest Publishing House, Pune
IP39101 :: WORK STUDY AND ERGONOMICS

Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites (If Any):

Objectives:
- To make the students understand the concepts & broad principles of contents of the course
- Aim is to provide insight of the subject
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: III, IV (f, k, n)

Unit I
Introduction to Work Study

(08 Hrs)

A. Historical background, Contribution of Taylor and Gilbreth, Definition and Scope of Work Study
Introduction to Industrial Engineering, Historical background, Contribution of Taylor and Gilbreth,
Productivity – Definition, Types, Improvement, Work Content Analysis, Definition and Scope of Work Study
B. Work study historical initiatives in India, Recent developments and applications in the country. Numerical and Cases on Productivity

Unit II
Method Study I

(08 Hrs)

B. Various Considerations in Select Job for Method Study. Relationship between Motion Economy and Work Simplification.

Unit III
Method Study II

(08 Hrs)

B. Review of Cases in Method Study
Unit IV  
Predetermined Motion Time Standards (08 Hrs)


B. Comparison between Time Study, Work Sampling & MTM

Unit V  
Ergonomics (08 Hrs)

A. Ergonomics: Definition, Scope, Historical background, Human- machine system interfaces, Basic Ergonomics, Work Physiology, Applied Anthropometry: Definition and scope, use and principles of anthropometric data, statistical analysis, Product design and work station design using anthropometric data, Work Space design - work spaces, work space envelopes for seated persons, design of work spaces such as: work surface height, seated & standing, principles of seat design, workplace design. Physical space & arrangement, principles of arrangement of components

B. Work Efficiency and Ergonomics, Effect of Light, Noise, Temperature on Human Performance

Text Books
1. ILO, “Introduction to Work study”.
3. E. Grad jean, “Fitting Task to the Man” Taylor and Francis.

Reference Books
2. R. S. Bridger, “Introduction to Ergonomics”, Taylor and Francis
5. Waldemar Karwowski, William Steven Marras, “Occupational ergonomics: design and management of work systems”, CRC Press,
Prerequisites: Mathematics for Engineering Applications

Objectives:

- To make the students understand the concepts & broad principles of statistical techniques used in managerial decision making
- Sensitize the students of the importance of statistics in real life environment
- Mapping with PEOs: I (c, o)

Unit I
Concept of random variable & probability distributions
(08 Hrs)
A. Discrete random variable and its distributions – Binomial, Poisson, Hyper-geometric.
Continuous random variable and its distributions - Uniform, Normal, Exponential (Mean, Variance of All Distributions)
B. Calculation of probabilities for the above probability distributions in MS EXCEL and developing probability curves

Unit II
Sampling Theory & Statistical Inferences
(08 Hrs)
A. Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Non Response. Characteristics of a good sample, sampling methods, Point estimate, Interval estimate, Chebyshev’s Theorem, Sample size determination. Practical considerations in sampling and sample size
Principles of Statistical inferences – Testing hypotheses and Inferences concerning means and proportions. Sampling distributions – Test based on Normal, t-distribution , Chi-square distribution, Hypothesis Testing - Logic & Importance
B. Developing sampling distribution and its analysis for the specified data using MS EXCEL , Various methods of probability and Non-probability sampling

Unit III
Hypothesis Testing for Variances and ANOVA
(08 Hrs)
B. Analysis of cases and numerical problems on DOE and Taguchi method using net-based study

Unit IV
Foundations of Research

A. Meaning, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method - Understanding the language of research - Concept, Construct, Definition, Variable. Research Process


B. Designing a questionnaire for e-mail survey for the specified objective, studying cases on questionnaire design and field surveys

Unit V
Research Design

A. Concept and Importance of Research - Features of a good research design – Exploratory Research Design – concept, types and uses, Descriptive Research Designs - concept, types and uses. Experimental Design: Causal relationships, Concept of Independent & Dependent variables, concomitant variable, extraneous variable, Treatment, Control group.

Types of Data: Secondary Data - Definition, Sources, Characteristics. Primary Data - Definition, Advantages and disadvantages over secondary data, Observation method, Questionnaire Construction, Personal Interviews, Telephonic Interview, Mail Survey, Email/Internet survey.

B. Collection and analysis of two questionnaires from real life field surveys

Text Books
3. Krishnaswamy, Management Research Methodology – Integration of Methods & Techniques, Pearson Education

Reference Books
4. Taguchi Methods Explained: Practical steps to robust design- Tapan Bagchi, Prentice Hall of India,1993
Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- Develop conceptual framework of the course
- Aim is to provide insight of the subject
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: IV (a, f, i, n)

Unit I  (8 Hrs)
Linear Programming:
B. Solution of LPP using TORA & Solver in Excel

Unit II  (8 Hrs)
Integer Programming & Dynamic Programming
A) Case studies based on Integer Programming & Dynamic Programming

Unit III  (8 Hrs)
Goal Programming & Decision Making Tools
B) Case studies based on Goal Programming & Decision Making Tools

Unit IV  (8 Hrs)
Replacement Model & Theory of Games

A. Replacement Model: Replacement of capital equipments that deteriorates with time, time value of money (a) remains same (b) changes with constant rates during period. Equipment renewal policy, group and individual replacement. Individual Replacement, Group Replacement Policies, Problems. Game Theory: Game theory Introduction, Terminology, Two -person zero sum game, minimax and maximin principle, Saddle Point, Games with pure and mixed strategies, Dominance property, Solutions with Graphical methods

B. Case studies on Replacement Models & Game Theory: L.P. method, approximation method.

Unit V (8 Hrs)

Queuing Theory & Simulation

A. Queuing Theory: Introduction, terminology, Poisson single and multi channel queuing system models: M/M/1 Model, M/M/C Model, M/Ek/1 Model. Simulation: Definition, Introduction, Application, Monte Carlo Simulation. Applications of Simulation, Generation of Random Numbers.

B. Simulation software, Building Model on Simulation Software, Running the simulation, Understanding the results

Text Books
2. Paneerselvam Operations Research, Prentice Hall of India

Reference Books
IP49102:: INDUSTRIAL AND COMMERCIAL LAWS

Credits: 03  Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- Develop conceptual framework of the course
- Aim is to provide insight of the subject
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: V (k, o)

Unit I
The Industrial Disputes Act, 1947 (8 Hrs)
A. The Industrial Disputes Act, 1947. 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
B. Unfair labour practices, Penalties, Case Laws

Unit II
The Trade Union Act 1926 (8 Hrs)
B: Appeals, Register of Standing Orders. Temporary application of model standing orders

Unit III
The Factories Act, 1948 and The Employees Provident Fund and Miscellaneous Provisions Act, 1952: (8 Hrs)
B. Central Board, Employee’s Pension Scheme, Employee’s Deposit Linked Insurance Scheme, Contributions.
Unit IV (8 Hrs)
The Competition Act, 2000
A. Objective, Competition Commission, Dominant Position, Anti-Competitive Agreements, Relevant Markets, Cartel, Abuse of Dominant Position, Regulation of Combinations
B. Case studies and penalties.

Unit V (8 Hrs)
The Sale of Goods Act, 1930 (3 of 1930)
B. Case studies and penalties.

Text Books

Reference Books
1. Taxman, Commercial Laws.
3. Bare Acts and Bare Acts with Cases for each of these acts
Composition for Selection of 5 Credits for Honors / Minor Course

(A) Comprehensive Viva Voce – Compulsory at the end of Semester VIII – 1 Credit

(B) Elective Component
   a. Laboratory courses – Maximum Credits - 2
      (for award of 1 Credit the lab course would have a teaching scheme of 2 Hrs. / week and a plan of 12 practicals). The credit to be awarded as per the ISA and ESA guidelines for the compulsory lab courses.
   b. Research publication – Maximum Credits – 1
      (Research Publication in a Magazine / Transaction / Journal as decided by the honors / minor co-ordinator)
   c. Seminar - Maximum Credits – 1
      (Seminar to be given on a topic consistent with the scope of the Honors or Minor. The topic Selection is to be approved by the honors / minor co-ordinator. The assessment and evaluation scheme would as per the guidelines used for Technical Seminar at UG level by respective Dept.)
   d. Honors / Minors Project – Maximum Credits – 2
      (Project Topic and Scope, its progress and final assessment consistent with the scope of the Honors or Minor. The topic Selection is to be approved by the honors / minor co-ordinator. The assessment would as per the guidelines and evaluation scheme used for Project Work at UG level by respective Dept.)
   e. Industrial Training – Maximum credits – 4
      (An Industrial Training in an Industry identified by the student, approved by the honors / minor co-ordinator & Head of Department. The assessment would as per the guidelines and evaluation scheme used for Industrial Training at UG level by respective Dept.)

Note:
   a. 4 Credits would be awarded to the students for a complete 12 Week Industrial Training and meeting with the assessment and evaluation requirements
   b. Provision can be made for the students unable to procure a 12 week Industrial Training. A 4 week or 8 week Industrial Training may also be offered. 2 credits will be awarded for 8 week Industrial Training and 1 Credit would be awarded to the students for a 4 Week Industrial Training, meeting with the assessment and evaluation requirements
   c. No Industrial Training less than 4 weeks be considered for award of 1 Credit
   d. No cumulative addition of Industrial Training period would be considered for award of credits

The student is expected to earn 1 Credit from Part (A) and remaining 4 Credits from Part (B)
Minor In Industrial Management
### Structure for Minor (Industrial Management)

**Eligible Students:**
- Production/Mechanical/Chemical/Instrumentation/Electronics/Computers Engg./Information Technology

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<th>Credits</th>
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IP29111 :: ORGANIZATIONAL BEHAVIOUR & PRINCIPLES & PRACTICE OF MANAGEMENT

Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites (If Any):

Objectives:

- To make the students understand the concepts & broad principles of the course
- Aim is to provide insight of the subject
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: III (n, o)

Unit I  
Basic Concepts of Management  
(08 Hrs)

A. Definition – Need and Scope – Different schools of management thought -Behavioral, Scientific, Systems, and Contingency  
B. Contribution of Management Thinkers: Taylor – Scientific Management, Fayol – 14 Principles, Elton Mayo

Unit II  
Functions of Management  
(08 Hrs)


B. Leadership: Concept, Nature, Importance, Attributes of a leader, developing leaders across the organization, Leadership Grid.  

Unit III  
Introduction to Organizational Behavior  
(08 Hrs)
A. Definition, Importance, Scope, Fundamental Concepts of OB, Different models of OB - autocratic, custodial, supportive, collegial and SOBC.

B. Personality & Attitudes: Meaning of personality, attitude - Development of personality – Attributes of personality- Transactional Analysis – Ego states – Johari window - Nature and dimensions of attitude – Developing the right attitude

Unit IV (08 Hrs)
Motivation, Group Dynamics and Team building


B. Formal and Informal Groups. Importance of Team building.

Unit V (08 Hrs)
Conflict & Change management


B. Stress management: Definition, Causes, Managing stress, Stress as a motivator. Work life balance.

Text Books
1. Organizational Behaviour, 9th Ed. - Stephen Robbins

Reference Books
1. Human Behaviour at work - Davis and Newstorm
2. Organizational Behaviour - Uma Sekaran
IP39111 :: FINANCIAL MANAGEMENT & COSTING

Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To develop skills in the subject
- Application of the theory
- To learn and understand applications of costing in engineering
- To learn and understand cost estimation, cost analysis
- Mapping with PEOs: IV (f, g)

Unit I  
Financial Management  (8 Hrs)

A. Nature and Scope of Finance Function; Financial goal - profit vs. wealth Maximization; Finance functions – investment, Ratio Analysis Classification, Ratio Analysis and its limitations. Types of Ratios – Activity Turnover, Profitability, Liquidity, etc


Unit II  
Capital Budgeting & Working Capital Management  (8 Hrs)

A: Nature of investment decisions; Investment evaluation criteria – net present value, internal rate of return, profitability index, payback period, accounting rate of return; Meaning, significance and types of working capital; calculating operating cycle period and estimation of working capital requirements; Financing of working capital and norms of bank finance; Sources of working capital; Commercial paper; Factoring services
B: NPV and IRR comparison; Capital rationing. B. Various committee reports on bank finance; Dimensions of working capital management.

Unit III  
Cost  (8 Hrs)

B. Accounting for Prime Cost.

Unit IV
Overheads


B. Accounting for Overheads. Preparation of Cost Sheet & Cost Statement

Unit V
Marginal Costing:


B.. Concept of Break-Even, P/V Ratio, Margin of Safety.

Text Books


Reference Books

IP39112 :: MATERIALS & LOGISTICS MANAGEMENT

Credits: 03
Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To make the students understand the concepts & broad principles of contents of the course
- Develop conceptual framework of the course
- Aim is to provide insight of the subject
- Mapping with PEOs: IV (f, i, n)

Unit I
Introduction to Materials Management

A. Functions of Materials Management – Sourcing/Procurement, Inventory, Stores, Vendor Development etc.
Classification and Costs of Inventories: Types, Objective of holding inventories, Different types of Inventories, Costs Associated with Inventory - Carrying cost, Procurement cost. EOQ - Concept, Assumptions of EOQ Model, Practical Constraints – Numerical Analysis, Quantity Discounts. EMQ Model - Carrying cost, Set up cost. EOQ Special Considerations – Spares, Bought-outs, etc.
B. Organization of Materials Management Function

Unit II
Replenishment Systems and Inventory Management

A. Replenishment Systems: Introduction, Concept of lead time and its effects on Inventory, Components of Lead Time - Internal and External. Variability in demand and lead time. Safety Stock Evaluation and ways to minimize lead time, Different types of replenishment systems like Fixed order quantity system, Fixed order interval system, Combination of fixed order interval and quantity system, Two Bin System.
Inventory Management Inventories –Objectives of an Inventory Control, Symptoms of Poor Inventory management, Selective Inventory Control: Concept of Selective Inventory Control, ABC analysis
B. Probabilistic Replenishment System. Selective Inventory Control - VED analysis, HML analysis, SDE analysis, SOS analysis, FSN analysis, GOLF analysis.
Unit III
(8 Hrs)
Procurement Management
A. Procurement Management: Responsibilities of Purchase Department. Procurement Procedure, Documents in Procurement, Types of Buying, Methods of Buying, Legal Aspects of Buying, Vendor Selection, Vendor Development, Vendor Rating. Import-Export Procedure – Imports & Exports

Unit IV
(8 Hrs)
Logistics Management
A. Definition, Logistics Function: Transportation – Significance, Modes of Transportation, Warehousing – Objectives, Warehousing Functions, Types of Warehouses, Inventory Management, Order Processing – Role of IT, Material Handling Transportation: Modes of Transportation – Rail, Road, Pipelines, Water Air – Advantages & Disadvantages, Concept of TL, LTL, FTL. Selections of Appropriate Modes of Transportation
B. Modes of Transportation – Rail, Road, Pipelines, Water Air – Advantages & Disadvantages

Unit V
(8 Hrs)
Stores Management and Warehouse Management
B. Stores Documentation – Bin Cards, Stores Ledger. WMS Systems in Practice

Text Books
1. Materials Management, Tony Arnold, Pearson Publication
2. Inventory Management, L.C. Jhamb, Everest Publishing House
3. Logistics & Supply Chain Management, Ronald Ballou, Pearson Education
Reference Books
1. Material Management by Dobler Burt
2. Inventory Management, Silver and Peterson, John Willey and sons
3. Manufacturing Planning & Control, Vollman, Pearson Publication

FF No. 654

IP49111:: PROJECT& OPERATIONS MANAGEMENT

Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To make the students understand the concepts & broad principles of contents of the course
- Develop conceptual framework of the course
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: I, III (f, g, n, o)

Unit I  
Introduction:  
B. Role & Functions of Project Manager

Unit II  
Project Life Cycle Phases

B: Project Organization & Management. Project Organization Structure

Unit III (8 Hrs)
Important Aspects of Project Feasibility


B Socio-Economic: Socio-Cost Benefit Analysis. Effective Rate of Protection, Domestic Resource Cost

Unit IV (8 Hrs)
Scope of Operations Management


Unit V (8 Hrs)
OPC and Material Requirement Planning (MRP I)


Text Books
1. Narendra Singh; Project Management & Control; Himalaya Publishing House, Mumbai.
2. S.Choudary, Project Management, Tata McGraw Hill
3. Prasanna Chandra; Preparation, Appraisal, Budgeting & Implementation
6. Chapman, Fundamentals of Production Planning & Control, Pearson Education

Reference Books
2. Gopal & Ramamurthy; Project Management Handbook;
3. Macmillan. Project Management Body of Knowledge
6. Operations Management, 5th Ed. - Krajewski
IP49112 :: MARKETING MANAGEMENT

Credits: 03  
Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:
- To make the students understand the concepts & broad principles of the contents of the course
- Develop conceptual framework of the course
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: IV (e, f)

Unit I  
Introduction (8Hrs)

A Historical development of marketing management, Definition of Marketing, Core marketing concepts, Marketing Management philosophies, Micro and Macro Environment, Characteristics affecting Consumer behaviour, Types of buying decisions, buying decision process, Classification of consumer products, Market Segmentation.

B. Concept of Marketing Myopia. Importance of marketing in the Indian Socio economic system.

Unit II  
Marketing Information Systems And Research (8 Hrs)

A: Components of marketing information system–benefits & uses marketing research system, marketing research procedure, Demand Estimation research, Test marketing, Segmentation Research - Cluster analysis, Discriminate analysis. Sales forecasting: objective and subjective methods.
B: Home assignment on Questionnaire design for collecting primary data

Unit III  
Marketing Of Industrial Goods (8 Hrs)
Nature and importance of the Industrial market, classification of industrial products, participants in the industrial buying process, major factors influencing industrial buying behavior, characteristics of industrial market demand. Determinants of industrial market demand Buying power of Industrial users, buying motives of Industrials users, the industrial buying process, buying patterns of industrial users.
B Home assignment on industrial buying process. Negotiation process in industrial buying.

Unit IV
Product Management And Branding

B. Labeling: Types, functions advantages and disadvantages, Packaging: Meaning, growth of packaging, function of packaging, kinds of packaging.

Unit V
Pricing And Product Promotion

B. Personal Selling : Objectives of personal selling, qualities of good salesman, types of salesman, major steps in effective selling

Text Books

Reference Books
2. R.S.N. Pillai and Mrs. Bagavathi “Marketing” S. Chand & Co. Ltd
IP49311:: CREDITS FOR LAB COURSES

<table>
<thead>
<tr>
<th>Composition for Selection of 5 Credits for Honors / Minor Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) Comprehensive Viva Voce – Compulsory at the end of Semester VIII – 1 Credit</td>
</tr>
<tr>
<td>(B) Elective Component</td>
</tr>
<tr>
<td>a. Laboratory courses – Maximum Credits - 2</td>
</tr>
<tr>
<td>(for award of 1 Credit the lab course would have a teaching scheme of 2 Hrs. / week and a plan of 12 practicals). The credit to be awarded as per the ISA and ESA guidelines for the compulsory lab courses.</td>
</tr>
<tr>
<td>b. Research publication – Maximum Credits – 1</td>
</tr>
<tr>
<td>(Research Publication in a Magazine / Transaction / Journal as decided by the honors / minor co-ordinator)</td>
</tr>
<tr>
<td>c. Seminar - Maximum Credits – 1</td>
</tr>
<tr>
<td>(Seminar to be given on a topic consistent with the scope of the Honors or Minor. The topic Selection is to be approved by the honors / minor co-ordinator. The assessment and evaluation scheme would as per the guidelines used for Technical Seminar at UG level by respective Dept.)</td>
</tr>
<tr>
<td>d. Honors / Minors Project – Maximum Credits – 2</td>
</tr>
<tr>
<td>(Project Topic and Scope, its progress and final assessment consistent with the scope of the Honors or Minor. The topic Selection is to be approved by the honors / minor co-ordinator. The assessment would as per the guidelines and evaluation scheme used for Project Work at UG level by respective Dept.)</td>
</tr>
<tr>
<td>e. Industrial Training – Maximum credits – 4</td>
</tr>
<tr>
<td>(An Industrial Training in an Industry identified by the student, approved by the honors / minor co-ordinator &amp; Head of Department. The assessment would as per the guidelines and evaluation scheme used for Industrial Training at UG level by respective Dept.)</td>
</tr>
</tbody>
</table>

Note:

a. 4 Credits would be awarded to the students for a complete 12 Week Industrial Training and meeting with the assessment and evaluation requirements.
b. Provision can be made for the students unable to procure a 12 week Industrial Training. A 4 week or 8 week Industrial Training may also be offered. 2 credits will be awarded for 8 week Industrial Training and 1 Credit would be awarded to the students for a 4 Week Industrial Training, meeting with the assessment and evaluation requirements.
c. No Industrial Training less than 4 weeks be considered for award of 1 Credit.
d. No cumulative addition of Industrial Training period would be considered for award of credits.

The student is expected to earn 1 Credit from Part (A) and remaining 4 Credits from Part (B).
A) **Mid Semester Examination**

1. Students reporting in morning slot will have examination in morning slot. Those in evening slot will have examination in evening slot.

2. 20 multiple choice based questions to be attempted in 30 minutes x no. of theory courses i.e. 100 questions in 150 minutes for F.E., 80 questions in 120 minutes for S.E., T.E., B.E., M.E., 20 questions in 30 minutes for Honors, Minor, Fast Track, etc.

3. A scrambled mix of questions will be generated through software.

4. Mid Semester Examination will be based on Unit II & Unit III.

5. There will be one mark for each correct answer and (-) 0.25 marks for every wrong answer.

6. For a typical 3 hour Mid Semester Examination, first 15 minutes would be used for student attendance, record keeping, seat allocation, log in procedure if any, etc. Next 150 minutes for actual examination. A timer indicating time remaining to be provided by ERP. 15 minutes for processing & results.

7. A visual alarm / flash would be given 10 minutes before completion of 150 minutes as a warning. For auto generation of every theory course result out of 20 and dispatch of the marks on student mobile and mail ID as well as parent mail ID.

8. No repeat examination under any circumstances.
B) Seminar – Conduct, Evaluation, etc.

Seminar – (T.E.- Semester I)

1. Review – I: during Mid Semester Examination (Compulsory) as per the Academic Calendar.
2. Review – II: The last week of November (Optional)
3. For poor performing students identified by the examination panel, a second review to be taken. Review II optional for other students. For Review II, deduction of 10 marks will take place.
4. Seminar is an individual activity with separate topic and presentation.
5. Duration of presentation – 20 minutes
   Question and answer session – 10 minutes

Seminar Evaluation Scheme:

1. Attendance during Semester – 10 marks
2. Attendance during Seminar presentation self & peer – 10 marks
3. Relevance of Seminar topic – 10 marks
4. Timely Abstract submission – 10 marks
5. Literature review – 10 marks
6. Technical contents – 10 marks
7. Presentation – 25 marks
8. Question & answer Session – 15 marks

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100 marks
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C) **Equivalence**

For the courses belonging to 2008 structure counseling sessions for failure students will be arranged. The Head of Department will appoint faculty identified as subject experts as counselors. The previous examination scheme i.e.

Class Test – 10 marks  
T.A. through Home assignment – 10 marks  
A written paper MSE – 30 marks  
A written paper ESE – 50 marks

Will be followed. The entire processing based on 2008 structure related coding scheme will be followed. Counseling + Administration + Examination charges will be the basis for fees considered for such students.
D) **Extra Credits**

A student planning to take extra credits may be considered under following categories:

(a) A student carrying a backlog and re-registering for the previous course – Re-registration charges as applicable. Consideration of all courses registered for during that Semester of Academic Year for SPI calculation.

(b) Student planning to take extra courses as a fast track opportunity – Administration, processing and examination charges will be considered. In any case the student has to pay the college fees for four years. This fast track facility would enable the student to undergo an industrial training, an exchange programme, research contribution in I.I.T. under scheme such as KVPY without any academic compromises for credit transfer. The phasewise development and completion of project activity cannot be considered at an accelerated pace under fast track scheme. The registration under fast track is subject to having a CPI 8.0 or above and no backlog for consideration of registration to an additional course.

(c) Students opting for earning extra credits by selection of courses in addition to the courses prescribed by respective BOS which are single Semester activities and not the part of Honors / Minor scheme. Such students will be expected to pay charges equivalent to re-registration (proportionate credit based payment). The registration for such courses is subject to permission given by the Chairman BOS of the Board in the purview of which the subject is identified. Such permissions will be given based on meeting with prerequisite subject.

1. In any case (a), (b) or (c) the candidate cannot register for more than 8 credits.

2. A suitable reflection of completion of the said course will be made in the candidate’s Grade statement.
   
   For part (c) a separate grade & GPA will be calculated. That GPA will not be clubbed with the other regular courses for SPI, CPI calculation.
E) **Home Assignment**

A Home Assignment Calendar for Semester is prepared as under:

<table>
<thead>
<tr>
<th>Week No.</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No Home Assignments</td>
</tr>
<tr>
<td>2</td>
<td>No Home Assignments</td>
</tr>
<tr>
<td>3</td>
<td>No Home Assignments</td>
</tr>
<tr>
<td>4</td>
<td>S1 / S2 – HA1</td>
</tr>
<tr>
<td>5</td>
<td>S3 / S4 / S5* - HA1</td>
</tr>
<tr>
<td>6</td>
<td>S1 / S2 – HA2</td>
</tr>
<tr>
<td>7</td>
<td>S3 / S4 / S5* - HA2</td>
</tr>
<tr>
<td>8</td>
<td>S1 / S2 – HA3</td>
</tr>
<tr>
<td>9</td>
<td>S3 / S4 / S5* - HA3</td>
</tr>
<tr>
<td>10</td>
<td>S1 / S2 – HA4</td>
</tr>
<tr>
<td>11</td>
<td>S3 / S4 / S5* - HA4</td>
</tr>
<tr>
<td>12</td>
<td>S1 / S2 – HA5</td>
</tr>
<tr>
<td>13</td>
<td>S3 / S4 / S5* - HA5</td>
</tr>
<tr>
<td>14</td>
<td>No Home Assignments</td>
</tr>
<tr>
<td>15</td>
<td>No Home Assignments</td>
</tr>
<tr>
<td>16</td>
<td>No Home Assignments</td>
</tr>
</tbody>
</table>

The Home Assignments will be based on the self study component i.e. part B of every theory course syllabus. The Saturday or last working day will be the default deadline for submission of Home Assignment of that week. For example by the Saturday ending Week No. 9, Home Assignment No. 3 for subject S3/ S4/ S5 (if applicable) must be submitted.

1. *S5 can be OE1 / OE2 / OE3 / Honors/ Minor / Re-registration category (a) / Category (b) / Category (c).
2. For subjects S1, S2, S3, S4 & S5 (if any), the composition of the Teacher Assessment marks will be as follows:
<table>
<thead>
<tr>
<th></th>
<th>S1,S2 with Tutorial</th>
<th>S3,S4,S5 without Tutorial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home Assignment</td>
<td>30 marks</td>
<td>30 marks</td>
</tr>
<tr>
<td>Tutorial</td>
<td>30 marks</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>30 marks</td>
<td>30 marks</td>
</tr>
<tr>
<td>Attendance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) &gt; 90%</td>
<td>10 marks</td>
<td>10 marks</td>
</tr>
<tr>
<td>(b) 75% to 90%</td>
<td>5 marks</td>
<td>5 marks</td>
</tr>
<tr>
<td>(c) &lt;75%</td>
<td>0 marks</td>
<td>0 marks</td>
</tr>
<tr>
<td></td>
<td>100 marks converted to 15 marks</td>
<td>70 marks converted to 15 marks</td>
</tr>
</tbody>
</table>

**Explanation:**

1. Tutorials to be conducted with continuous assessment throughout the Semester. Final assessment out of 30 marks for Tutorial.
2. Class Test to be conducted during a regular theory class within the time period mentioned in the Academic Calendar.
3. Class Test marks are to be entered immediately as mentioned in Academic Calendar.
4. Attendance percentage to be calculated at the end of Semester after completing all lectures as per the lesson plan.
F) **Mini Project**

Teaching Scheme: Theory – 0 ; Tutorial – 0 ; Laboratory – 2 Hrs / week

For F.E., S.E. & T.E. students in every Semester a Mini Project be carried out. The objectives behind the Mini Project are:

1. Scope for creativity
2. Hands on experience
3. Academic occupancy

Mini Project will be based on all subjects of that Semester except GP.

1. The Semester Mini Project will be for a group of 3 to 5 students. Head of Department to appoint Mini Project Guides. 2 credits will be awarded to the candidate after the viva voce and project demonstration at the End of Semester.
2. Group formation, discussion with faculty advisor, formation of the Semester Mini Project statement, resource requirement, if any should be carried out in the earlier part of the Semester. The students are expected to utilize the laboratory resources before or after their contact hours as per the prescribed module.

The Assessment Scheme will be:

(a) Continuous Assessment 50 marks
(b) End Semester 50 marks

---------------
100 marks
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G) **Project Stage I Evaluation**

The project activity is broken in 3 stages:

The Project Stage I will be in T.E Semester II irrespective of student module. The evaluation of Project Stage I will be as follows:

<table>
<thead>
<tr>
<th>Group formation &amp; attendance / reporting to guide</th>
<th>20 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topic finalization / Statement</td>
<td>20 marks</td>
</tr>
<tr>
<td>Literature Survey</td>
<td>20 marks</td>
</tr>
<tr>
<td>Abstract</td>
<td>20 marks</td>
</tr>
<tr>
<td>Presentation</td>
<td>20 marks</td>
</tr>
</tbody>
</table>

Project Stage II and Project Stage III evaluations will be based on Department specific norms.
H) Composition for Selection of 5 Credits for Honors / Minor Course
(Applicable for B11 and A11 Patterns)

(A) Comprehensive Viva Voce – Compulsory at the end of Semester VIII – 1 Credit

(B) Elective Component
   a. Laboratory courses – Maximum Credits - 2
      (for award of 1 Credit the lab course would have a teaching scheme of 2 Hrs. / week
      and a plan of 12 practicals). The credit to be awarded as per the ISA and ESA
      guidelines for the compulsory lab courses.

   b. Research publication – Maximum Credits – 1
      (Research Publication in a Magazine / Transaction / Journal as decided by the honors
      / minor co-ordinator)

   c. Seminar - Maximum Credits – 1
      (Seminar to be given on a topic consistent with the scope of the Honors or Minor. The
      topic Selection is to be approved by the honors / minor co-ordinator. The assessment
      and evaluation scheme would as per the guidelines used for Technical Seminar at UG
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   d. Honors / Minors Project – Maximum Credits – 2
      (Project Topic and Scope, its progress and final assessment consistent with the scope
      of the Honors or Minor. The topic Selection is to be approved by the honors / minor
      co-ordinator. The assessment would as per the guidelines and evaluation scheme used
      for Project Work at UG level by respective Dept.)

   e. Industrial Training – Maximum credits – 4
      (An Industrial Training in an Industry identified by the student, approved by the
      honors / minor co-ordinator & Head of Department. The assessment would as per the
      guidelines and evaluation scheme used for Industrial Training at UG level by
      respective Dept.)
Note:

a. 4 Credits would be awarded to the students for a complete 12 Week Industrial Training and meeting with the assessment and evaluation requirements

b. Provision can be made for the students unable to procure a 12 week Industrial Training. A 4 week or 8 week Industrial Training may also be offered. 2 credits will be awarded for 8 week Industrial Training and 1 Credit would be awarded to the students for a 4 Week Industrial Training, meeting with the assessment and evaluation requirements

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