Bansilal Ramnath Agarwal Charitable Trust’s

Vishwakarma Institute of Technology
(An Autonomous Institute affiliated to University of Pune)

Structure & Syllabus of
B.Tech. (Industrial Engineering)

Pattern ‘F-11’
Effective for Academic Year 2014-15

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
<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Title</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Program Educational Objectives of B.TECH. (Industrial Engineering)</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Course Structure &amp; Syllabi for Courses - Module I &amp; Module II</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Course Structure - Module III</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>Course Syllabi for Courses - Module III</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.1 IP20101 Casting, Welding &amp; Rubber-Plastic Processing (Theory Course)</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>4.2 IP21105 Theory of Machines (Theory Course)</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>4.3 IP20103 Material Science (Theory Course)</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>4.4 IP21103 Mathematics for Engineering Applications(Theory Course)</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>4.5 IP26103 Strength of Machine Elements(Theory Course)</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>4.6 IP20301 Manufacturing Practices 1 (Workshop) (Laboratory Course)</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>4.7 IP21305 Theory of Machines (Laboratory Course)</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>4.8 IP20303 Material Science(Laboratory Course)</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>4.9 IP24301 Machine Drawing &amp; GDT (Laboratory Course)</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>4.10 IP27401 Mini Project (Project)</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>4.11 IP20401 Comprehensive Viva Voca (Based on IP20301, IP21305, IP20303)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.12 HS20108 Technical Writing</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Course Structure - Module IV</td>
<td>30</td>
</tr>
<tr>
<td>6</td>
<td>Course Syllabi for Courses - Module IV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.1 IP21102 Design of Machine Elements (Theory Course)</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>6.2 IP20106 Metrology &amp; Mechanical Measurements (Theory Course)</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>6.3 IP20104 Metal Cutting &amp; Finishing Processes (Theory Course)</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>6.4 IP21104 Thermal &amp; Fluid Energy Conversion (Theory Course)</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>6.5 IP26101 Electrical &amp; Electronics Engineering (Theory Course)</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>6.6 IP20306 Metrology &amp; Mechanical Measurements (Laboratory Course)</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>6.7 IP20304 Manufacturing Practices 2 (Workshop) (Laboratory Course)</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>6.8 IP21304 Thermal &amp; Fluid Energy Conversion (Laboratory Course)</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>6.9 IP24302 Computer Graphics (Skills Development Laboratory Course)</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>6.10 IP27402 Mini Project</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>6.11 IP20402 Comprehensive Viva Voca (Based on IP20306, IP20304, IP21304)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.12 HS27302 General Seminar-II</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.13 @General Proficiency</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Course Structure - Module V</td>
<td>50</td>
</tr>
<tr>
<td>8</td>
<td>Course Syllabi for Courses - Module V</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8.1 IP30101 Manufacturing Processes &amp; Systems (Theory Course)</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>8.2 IP30111 Facilities Planning (Theory Course)</td>
<td>55</td>
</tr>
<tr>
<td>Course</td>
<td>Code</td>
<td>Title</td>
</tr>
<tr>
<td>---------</td>
<td>--------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>8.3</td>
<td>IP30105</td>
<td>Operations Management (Theory Course)</td>
</tr>
<tr>
<td>8.4</td>
<td>IP30107</td>
<td>Work Study (Theory Course)</td>
</tr>
<tr>
<td>8.5</td>
<td>IP30109</td>
<td>Engineering &amp; Managerial Economics (Theory Course)</td>
</tr>
<tr>
<td>8.6</td>
<td>IP30311</td>
<td>Facilities Planning (Laboratory Course)</td>
</tr>
<tr>
<td>8.7</td>
<td>IP30305</td>
<td>Operations Management (Laboratory Course)</td>
</tr>
<tr>
<td>8.8</td>
<td>IP30307</td>
<td>Work Study (Laboratory Course)</td>
</tr>
<tr>
<td>8.9</td>
<td></td>
<td>@ Professional Development Course (Department Level)</td>
</tr>
<tr>
<td>8.10</td>
<td>IP30401</td>
<td>$ Comprehensive Viva Voce (Based on IP30311, IP30305, IP30307)</td>
</tr>
<tr>
<td>8.11</td>
<td>IP37301</td>
<td>Seminar</td>
</tr>
<tr>
<td>8.12</td>
<td>IP37401</td>
<td>Mini Project</td>
</tr>
</tbody>
</table>

### Course Structure - Module VI

<table>
<thead>
<tr>
<th>Course</th>
<th>Code</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.1</td>
<td>IP30112</td>
<td>Materials Management &amp; Logistics (Theory Course)</td>
<td>73</td>
</tr>
<tr>
<td>10.2</td>
<td>IP30114</td>
<td>Statistical Methods &amp; Research Methodology (Theory Course)</td>
<td>75</td>
</tr>
<tr>
<td>10.3</td>
<td>IP30106</td>
<td>Optimization and Simulation (Theory Course)</td>
<td>78</td>
</tr>
<tr>
<td>10.4</td>
<td>IP30116</td>
<td>Quality Management (Theory Course)</td>
<td>80</td>
</tr>
<tr>
<td>10.5</td>
<td>IP30110</td>
<td>Operations Scheduling (Theory Course)</td>
<td>84</td>
</tr>
<tr>
<td>10.6</td>
<td>IP30312</td>
<td>Materials Management &amp; Logistics (Laboratory Course)</td>
<td>87</td>
</tr>
<tr>
<td>10.7</td>
<td>IP30314</td>
<td>Statistical Methods &amp; Research Methodology (Laboratory Course)</td>
<td>88</td>
</tr>
<tr>
<td>10.8</td>
<td>IP30306</td>
<td>Optimization and Simulation (Laboratory Course)</td>
<td>89</td>
</tr>
<tr>
<td>10.9</td>
<td></td>
<td>@ Professional Development Course (Department Level)</td>
<td>-</td>
</tr>
<tr>
<td>10.10</td>
<td>IP30402</td>
<td>$ Comprehensive Viva Voce (Based on IP30312, IP30314, IP30306)</td>
<td>-</td>
</tr>
<tr>
<td>10.11</td>
<td>IP37302</td>
<td>$ Major Project</td>
<td>90</td>
</tr>
</tbody>
</table>

### Course Structure - Module VII

<table>
<thead>
<tr>
<th>Course</th>
<th>Code</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.1</td>
<td></td>
<td>*Elective Group I (Theory Course)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IP42101</td>
<td>Costing &amp; Cost Control</td>
<td>94</td>
</tr>
<tr>
<td></td>
<td>IP42103</td>
<td>Reliability Engineering</td>
<td>97</td>
</tr>
<tr>
<td>12.2</td>
<td></td>
<td>*Elective Group II (Theory Course)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IP42107</td>
<td>Energy Management</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>IP42109</td>
<td>Industrial &amp; Commercial Laws</td>
<td>103</td>
</tr>
<tr>
<td></td>
<td>IP42111</td>
<td>Entrepreneurship Development</td>
<td>106</td>
</tr>
<tr>
<td>12.3</td>
<td>IP40113</td>
<td>Human Factors Engineering (Theory Course)</td>
<td>110</td>
</tr>
<tr>
<td>12.4</td>
<td>IP40115</td>
<td>World Class Manufacturing (Theory Course)</td>
<td>112</td>
</tr>
<tr>
<td>12.5</td>
<td>IP40313</td>
<td>Human Factors Engineering (Laboratory Course)</td>
<td>115</td>
</tr>
<tr>
<td>12.6</td>
<td>IP40315</td>
<td>World Class Manufacturing (Laboratory Course)</td>
<td>117</td>
</tr>
<tr>
<td>12.7</td>
<td>IP47301</td>
<td>Major Project</td>
<td>118</td>
</tr>
</tbody>
</table>

### Course Structure - Module VIII

<table>
<thead>
<tr>
<th>Course</th>
<th>Code</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td>Course Syllabi for Courses - Module VIII</td>
<td>12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>14.1</th>
<th>*Elective Group I (Theory Course)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP42102</td>
<td>Financial Management &amp; Management Accounting</td>
</tr>
<tr>
<td>IP42104</td>
<td>Organization Behavior</td>
</tr>
<tr>
<td>IP42106</td>
<td>Marketing Management</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>14.2</th>
<th>*Elective Group II (Theory Course)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP42108</td>
<td>Supply Chain Management</td>
</tr>
<tr>
<td>IP42110</td>
<td>Product Design &amp; New Product Development</td>
</tr>
<tr>
<td>IP42112</td>
<td>Computer Integrated Manufacturing Systems</td>
</tr>
</tbody>
</table>

| 14.3 | IP40114 | Work Systems Analysis & Design (Theory Course) | 142 |
| 14.4 | IP40116 | Project Management (Theory Course) | 145 |
| 14.5 | IP40314 | Work Systems Analysis & Design (Laboratory Course) | 148 |
| 14.6 | IP40316 | Project Management (Laboratory Course) | 149 |
| 14.7 | IP47302 | Major Project | 150 |

$Please Refer Academic Information Booklet$

!Please Refer F.Y. B.TECH. Structure & Syllabi Booklet

@Please Refer GP-PD-OE Structure & Syllabi Booklet
Program Educational Objectives (PEO) for  
B.TECH. (Industrial Engineering) Program

<table>
<thead>
<tr>
<th>PEO No.</th>
<th>Description of the Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Preparation: To prepare students to excel in postgraduate programmes/be successful in industry/technical profession.</td>
</tr>
<tr>
<td>II</td>
<td>Core Competence: 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>
</tr>
<tr>
<td>III</td>
<td>Breadth: 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>
</tr>
<tr>
<td>IV</td>
<td>Professionalism: 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>Learning Environment: To provide student 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>
</tr>
</tbody>
</table>

Course Objectives: Course objectives are specified in the course syllabus

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 specifications and requirements.
i. Graduate will demonstrate skills to use modern engineering tools, software and equipment to analyze problems.

j. Graduates will demonstrate an ability to visualize and work on laboratory and multidisciplinary tasks.

k. Graduates will be familiar with safety, product quality aspects and quality control.

l. Graduates will be able to communicate effectively in both verbal and written forms.

m. Graduate who can participate and succeed in competitive examinations like GATE, GRE.

**Under Graduate Program in Industrial Engineering**

n. Graduates will demonstrate an ability to identify, formulate and solve the problems in methods improvement.

o. Graduate will be familiar with latest management techniques.

**Course Outcomes: Course outcomes are specified in the course syllabus**
### S.Y. B.TECH. (Module III): B.TECH. Industrial Engineering

**Structure: Pattern A11**

<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>
<tbody>
<tr>
<td>S₁</td>
<td>IP20101</td>
<td>Casting, Welding &amp; Rubber-Plastic Processing</td>
<td>3 0 0</td>
<td>3</td>
</tr>
<tr>
<td>S₂</td>
<td>IP21105</td>
<td>Theory of Machines</td>
<td>3 0 0</td>
<td>3</td>
</tr>
<tr>
<td>S₃</td>
<td>IP20103</td>
<td>Material Science</td>
<td>3 0 0</td>
<td>3</td>
</tr>
<tr>
<td>S₄</td>
<td>IP21103</td>
<td>Mathematics for Engineering Applications</td>
<td>3 1 0</td>
<td>4</td>
</tr>
<tr>
<td>S₅</td>
<td>IP26103</td>
<td>Strength of Machine Elements</td>
<td>2 1 0</td>
<td>3</td>
</tr>
<tr>
<td>P₁</td>
<td>IP20301</td>
<td>Manufacturing Practices 1 (Workshop)</td>
<td>0 0 2</td>
<td>1</td>
</tr>
<tr>
<td>P₂</td>
<td>IP21305</td>
<td>Theory of Machines</td>
<td>0 0 2</td>
<td>1</td>
</tr>
<tr>
<td>P₃</td>
<td>IP20303</td>
<td>Material Science</td>
<td>0 0 2</td>
<td>1</td>
</tr>
<tr>
<td>MP₃</td>
<td>IP24301</td>
<td>Machine Drawing &amp; GDT</td>
<td>0 0 4</td>
<td>1</td>
</tr>
<tr>
<td>SD₃</td>
<td>IP27401</td>
<td>Mini Project</td>
<td>0 0 2</td>
<td>2</td>
</tr>
<tr>
<td>CVV₁</td>
<td>IP20401</td>
<td>Comprehensive Viva Voce</td>
<td>Based on Courses P₁, P₂, P₃</td>
<td>2</td>
</tr>
<tr>
<td>OE₃</td>
<td>HS20108</td>
<td>Technical Writing</td>
<td>2 0 0</td>
<td>1</td>
</tr>
<tr>
<td>GP</td>
<td></td>
<td>General Proficiency</td>
<td>0 2 0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>16 2 12</td>
<td>26</td>
</tr>
</tbody>
</table>
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 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,c)

Unit I  (8 Hrs)
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  (8 Hrs)
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
Welding II
B. Welding defects and Remedies

Unit V
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
1. 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
IP21105 :: 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,d)

Unit I (8 Hrs)
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 II (8 Hrs)
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

Unit III (8 Hrs)
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.
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 V

Introduction to Simple Mechanisms (8 Hrs)

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 inversions and double slider crank chain and its inversions.
B. Steering mechanism - Ackerman steering mechanism, Davis steering mechanism, Hookes joint

Text Books


Reference Books

IP20103 :: MATERIAL SCIENCE

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, d)

Unit I

Plastic Deformation

B. Classification of Engineering Materials. Important properties of each group & some typical applications of each group.

Unit II

Material Testing

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

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.
IP21103 :: MATHEMATICS FOR ENGINEERING APPLICATIONS

Credits: 04                                                                 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,m)

Unit I (8 Hrs)
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 (8 Hrs)
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 (8 Hrs)
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, --------, --------
IP20103 :: MATHEMATICS FOR ENGINEERING APPLICATIONS

Teaching Scheme: - - Tutorial 1 Hr/Week

Prerequisites: : Nil

Objectives:
1. To make the students understand the concepts & broad principles of 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,m)

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
5. Pipes and Harvill, Applied Mathematics for Engineers and Physicists, McGraw-
IP26103 :: STRENGTH OF MACHINE ELEMENTS

Credits: 03

Teaching Scheme: - Theory 2 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,m)

Unit I (8 Hrs)

Simple Stresses and Strains ; Principal Stresses and Strains
A. Concept of stress and strain (Linear, lateral, shear and volumetric) Hooke’s law. Poisson’s 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 (8 Hrs)

Pure Bending & 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.

B. Derivations of Various Formulae, Safe Load on Columns.
Unit III

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, cantilever beams, Construction of loading diagram and BMD from SFD and construction of loading diagram and SFD from BMD.

B. Derivations of Various Formulae, Bending of curved bars/beams (Winkler & Bach Theory) Stresses in ring, chain link and crane hooks.

Unit IV

Torsion of Shafts & Thin Cylinders

A. Pure Torsion – Theory of pure torsion with assumptions, Deformation in circular shaft, polar moment of inertia, elastic torsion formula, Torsional failure, Stresses in thin walled pressure vessels, Cylindrical pressure vessels, Spherical pressure vessels. Mohrs circle for thin walled pressure vessels.

B. Thick walled pressure vessels

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
IP26103 :: STRENGTH OF MACHINE ELEMENTS

Teaching Scheme: - - Tutorial 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. Simple Stresses and Strains
2. Deformations in homogeneous and composite bars under concentrated loads
3. Principal Stresses and Strains
5. Slope and Deflection of Beams
6. Axially Loaded Columns
7. Shear Force and Bending Moment Diagrams: Due to concentrated loads, uniformly distributed loads, uniformly varying loads and couples
8. Shear Force and Bending Moment Diagrams: Relation between SF and BM diagrams for cantilevers, simple and compound, cantilever beams
9. Bending of curved bars/beams
10. Stresses in ring, chain link and crane hooks
11. Pure Torsion
12. Stresses in thin walled pressure vessels

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
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)

List of Practical
1. Sand Preparation & Testing (Compression Test, Shear Test, Mould & Core Hardness Test, Permeability & Moisture)
2. Design of Gating System
3. 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.
4. Foundry: Introduction, uses of different foundry tools, sand preparation, mould preparation, metal pouring, safety precautions etc.
   Practical: One job of casting.

Demonstrations
1. Gas Welding, Study of Types of Flames
2. TIG & MIG Welding – Voltage & Current Characteristics

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

IP21305 :: THEORY OF MACHINES

Credits: 01

Teaching Scheme: - Lab 2 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,d)

List of Contents

Term work consist of any following exercises :

[A] Laboratory Experiments:
Any eight of the following shall be performed and record to be submitted in the form of journal.
1. 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).
2. Identifying different mechanisms used for motion conversion in sewing machine.
3. To determine the mass moment of inertia of a connecting rod using a compound pendulum method.
4. To determine the mass moment of inertia of a flat bar using bifilar suspension method.
5. To determine the mass moment of inertia of a flywheel/gear/circular disc using trifilar suspension method.
7. Study of various types of cam and follower systems and Verification of cam jump phenomenon.
8. Study of different types of brakes and dynamometer
10. Study of different types of gear trains.
11. To observe the effect of varying sleeve weight or spring force on the operation of a Porter Governor

[B] Drawing Sheets (4 sheets of ½ imperial size) :
Any four of the following shall be performed and record to be submitted in the form of journal.
1. To study and draw (any four) mechanisms for practical applications such as: mechanical grippers in robot, lifting platform, foot pump, toggle clamp, folding chair

etc.; straight line mechanisms such as : Peaucellier Mechanism, Scott Russell Mechanism, Grasshopper Mechanism etc., for various link positions.
2. Graphical solution of two problems on velocity analysis using relative velocity method.
3. Graphical solution of two problems on acceleration analysis using relative acceleration method.
4. Graphical solution of problems on velocity and acceleration in mechanisms by Kleins construction method.
5. To draw a cam profile for specific follower motion
6. To draw a conjugate profile for any general shape of gear tooth.

Text Books

Reference Books
IP20303 :: MATERIAL SCIENCE

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
- Understanding of fundamentals of the subject
- Mapping with PEOs: I, II, III (c, d)

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, l)

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 Counter-bores,
2. Sketches of Conventional Representation of Machine Components as per ‘IS Code SP 46’of Bearing, Splined Shafts, Tapers, Chamfers, 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
IP27401 :: MINI PROJECT

Credits: 02

Teaching Scheme: - Laboratory 4 Hrs/Week

Prerequisites: Nil

Objectives:
- Scope for creativity
- Getting a hands on experience
- Acquire team-work, project management, and organizational skills

1. Mini Project can be an individual or a group activity depending on the depth and scope of the topic.
2. The project work can be any of the form given below (but not restricted to below mentioned topics only):
   a) Making physical working models, prototypes, scaled models, of a concept machine.
   b) Making virtual / CAD models of machines / concepts.
   c) Making study, modeling, analysis, programming and simulation of a system / machine operation / process.
   d) Making study / teaching modules of a sufficiently complex topic for pedagogy purposes.
3. A complete assembly and details drawings of the project should be submitted along with a detailed project report, where applicable.
4. A Detailed background / field / literature survey, related to the topic must be made presented in the report.
5. Entire work should be presented at the end of the Semester.
### Structure & Syllabus of B.Tech. (Industrial) Program – Pattern ‘F’ 11

**S.Y. B.TECH. (Module IV): B.TECH. Industrial Engg. Structure: Pattern A11**

<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>
<tbody>
<tr>
<td>S&lt;sub&gt;6&lt;/sub&gt;</td>
<td>IP21102</td>
<td>Design of Machine Elements</td>
<td>Lect. 3</td>
<td>Tutorial 1</td>
</tr>
<tr>
<td>S&lt;sub&gt;7&lt;/sub&gt;</td>
<td>IP20106</td>
<td>Metrology &amp; Mechanical Measurements</td>
<td>Lect. 3</td>
<td>Tutorial 0</td>
</tr>
<tr>
<td>S&lt;sub&gt;8&lt;/sub&gt;</td>
<td>IP20104</td>
<td>Metal Cutting &amp; Finishing Processes</td>
<td>Lect. 3</td>
<td>Tutorial 0</td>
</tr>
<tr>
<td>S&lt;sub&gt;9&lt;/sub&gt;</td>
<td>IP21104</td>
<td>Thermal &amp; Fluid Energy Conversion</td>
<td>Lect. 3</td>
<td>Tutorial 0</td>
</tr>
<tr>
<td>S&lt;sub&gt;10&lt;/sub&gt;</td>
<td>IP26101</td>
<td>Electrical &amp; Electronics Engineering</td>
<td>Lect. 2</td>
<td>Tutorial 1</td>
</tr>
<tr>
<td>P&lt;sub&gt;4&lt;/sub&gt;</td>
<td>IP20306</td>
<td>Metrology &amp; Mechanical Measurements</td>
<td>Lect. 0</td>
<td>Tutorial 0</td>
</tr>
<tr>
<td>P&lt;sub&gt;5&lt;/sub&gt;</td>
<td>IP20304</td>
<td>Manufacturing Practices 2 (Workshop)</td>
<td>Lect. 0</td>
<td>Tutorial 0</td>
</tr>
<tr>
<td>P&lt;sub&gt;6&lt;/sub&gt;</td>
<td>IP21304</td>
<td>Thermal &amp; Fluid Energy Conversion</td>
<td>Lect. 0</td>
<td>Tutorial 0</td>
</tr>
<tr>
<td>MP&lt;sub&gt;4&lt;/sub&gt;</td>
<td>IP27402</td>
<td>Mini Project</td>
<td>Lect. 0</td>
<td>Tutorial 0</td>
</tr>
<tr>
<td>SD&lt;sub&gt;4&lt;/sub&gt;</td>
<td>IP24302</td>
<td>Computer Graphics</td>
<td>Lect. 0</td>
<td>Tutorial 0</td>
</tr>
<tr>
<td>CVV&lt;sub&gt;2&lt;/sub&gt;</td>
<td>IP20402</td>
<td>Comprehensive Viva Voce</td>
<td>Based on Courses P&lt;sub&gt;4&lt;/sub&gt;, P&lt;sub&gt;5&lt;/sub&gt;, P&lt;sub&gt;6&lt;/sub&gt;</td>
<td>1</td>
</tr>
<tr>
<td>OE4</td>
<td>HS27302</td>
<td>General Seminar-II</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>GP</td>
<td></td>
<td>General Proficiency</td>
<td>Lect. 0</td>
<td>Tutorial 2</td>
</tr>
</tbody>
</table>

**Total**: 14 Lect., 2 Tutorial, 12 Practical, Total Credits 26
IP21102 :: DESIGN OF MACHINE ELEMENTS

Credits: 04  
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  
Design considerations of Machine Elements

A. Basic procedure of Machine Design, Materials selection, Important mechanical properties of materials used in design, Codes and standards used in design, Preferred numbers, Manufacturing considerations in design, stress-strain diagrams for ductile and brittle materials, factor of safety, Theories of failure, Design for static loading, Review of types of loads and simple stresses. Stresses due to Biaxal and Triaxal loads.

B. Design of components subjected to impact loading.

Unit II  
Design for Fluctuating Loads


B. Design of machine parts for fluctuating loads, Stresses due to combined loading

Unit III  
Design shafts, Keys and Couplings

A. Design of solid and hollow shafts based on strength, rigidity, ASME code for shaft design.
   Keys, Types of keys, Design of keys and key ways.
   Couplings, Types of Couplings, Design of muff coupling, Design of rigid and flexible couplings.
B. Design of shaft for variable load and based on stiffness, Design of spline

Unit IV

Design of Springs and Levers (8 Hrs)

A. Springs: Types, Application and materials of springs, Stress and deflection equation for Helical springs, Styles of ends, Design of helical springs, Helical Springs in Parallel and Series, Design of Helical Springs for Variable Load.

B. Levers: Introduction to levers, Application of levers in engineering practice, Design of hand, foot and Crank Levers.

B. Design of Concentric and Composite Helical Springs

Unit V

Design of Gears (8 Hrs)


B. Proportion of the Helical Gears, Strength of Helical Gears, Design of Helical Gears

Text Books


Reference Books

1. Machine Design – Dr. Sadhu Singh
2. Mechanical Engineering Design- J.E. Shigley
IP21102 :: DESIGN OF MACHINE ELEMENTS

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,h)

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
IP20106 :: 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  
(8 Hrs)
Introduction to Metrology
B. Manufacture of slip gauges, Sine Center, Uses of sine bars, angle gauges, Angle Dekkor, vernier bevel protractor

Unit II  
(8 Hrs)
Limits, Fits and Tolerances
B. Optical, Electrical, Pneumatic Comparators.

Unit III  
(8 Hrs)
Surface Finish Measurement & Interferometry
A. Surface Texture, Meaning of RMS and CLA values, Tomlison’s Surface Meter, Taylor- Hobson Surface Meter, Grades of Roughness, Specifications Interferometry: Introduction, Flatness testing by interferometry, NPL Flatness Interferometer
Recent Trends in Engineering Metrology- Optical measurement, LASER interferometers, Machine vision System, Introduction to CMM
B. Co-ordinate Metrology – Co-ordinate Measuring Machines, Types, computerized CMM, CMM probes

Unit IV

Screw & Gear Metrology

A. Screw Thread Metrology: External Screw Thread terminology, Floating Carriage Instruments, Pitch and flank Measurement of External Screw Thread.

Gear Metrology: Spur Gear Parameters and their Inspection Methods, pitch & Tooth thickness measurement by various methods

B. Measurement of pitch – Internal Thread, Measurement of gear tooth profile, Profile projector

Unit V

Temperature, Strain, Force, Shaft Power Measurement

A. Transducers- Analog & digital transducers, types

Pressure measurement- Mechanical & Electromechanical instruments/devices

Velocity measurement—linear & angular velocity measurement

Temperature Measurement – Non-electrical, Electrical & Radiation methods (pyrometry)

Strain Measurement -Strain gauge – classification (metallic, semiconductor), gauge factor, properties of gauge wire, rosettes

Force Measurement - Basic methods of force measurement, Strain gauges, LVDT

Shaft power Measurement -Belt, Gear Dynamometer, Absorption Dynamometer

B. Methods of Force Measurement - Piezoelectric, Vibrating Wire type

Shaft power Measurement - Instantaneous power measurements, Alternator power

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,d)

Unit I (8 Hrs)
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 (8 Hrs)
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 (8 Hrs)
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 (8 Hrs)
Grinding and Super Finishing
A. Definition, composition of grinding wheel, standard markings of grinding wheels, standard shapes of grinding wheels Dressing of grinding wheels, grinding operations

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

Unit V

(Cylindrical Conical, internal, surface) (8 Hrs)

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 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,h)

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)
A. Classification of I.C. Engines, construction and working of two stroke, four stroke, S.I. and C.I. Engines, terms used in air cycles, thermodynamic air cycles-Otto, Diesel

and Dual combustion cycles, Cooling and lubrication systems of I.C. engines., applications of I.C. Engines.

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

Unit IV
(8 Hrs)
Air Compressors:
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
(8 Hrs)
Refrigeration and Air conditioning:
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
IP26101 :: ELECTRICAL & ELECTRONICS ENGINEERING

Credits: 03
Teaching Scheme: - Theory 2 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,r)

Unit I (8 Hrs)
DC Motors
A) Construction, working principle, types of DC motors, Equations, Characteristics.
B) DC servo motors

Unit II (8 Hrs)
Three Phase Induction Motor
A) Construction, working principle, Torque equation, T-Slip Characteristic, types.
B) AC servo motors

Unit III (8 Hrs)
Selection of Motors and Drives
A) Starting/ methods of speed control, applications of DC motors, Starting/ methods of speed control, applications of 3-ph Induction motors, Drives for DC motors, Drives of Induction motors, Application and working of stepper motors, Selection of motors.
B) 3-point and 4-point starters for dc motors.

Unit IV (8 Hrs)
Switchgear and Automation
A) Switches, contactors, relays, timers, limit switches, sensors, interlocking, study of a typical electrical control panel.
B) Fuses, MCB, MCCB, ELCB, OCB, ACB.

Unit V (8 Hrs)
Unit V: Programmable Logic Controller (PLC)
A) Introduction to PLC, Ladder diagram and its components, Ladder programming exercises, Case study I, Case study II.
B) Different types of sensors and their applications.

Text Books
1. Electrical Machinery and Transformer by Irvin Kosow, Prentice Hall

Reference Books
1. Electrical machinery.. S.K. Bhattacharya, T.T.T.I. Chandigarh
2. Electrical machines & Power system Vol I, Syed A. Asar , McGraw hill
3. Fractional and sub fractional horse power electrical motors. C.E. Veinou and J.E. Martits , McGraw hill
4. Electrical engineering handbook, Siemens, Wiley Eastern
IP26101 :: ELECTRICAL & ELECTRONICS ENGINEERING

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,r)

List of Contents
Any 12 practical from the list below - out of which 12 to 17 are compulsory.
1) Speed control of DC shunt motor.
2) Load test on DC shunt motor.
3) Load test on DC series motor.
4) Load test on 3-ph induction motor.
5) Study of induction motor starters.
6) Speed control of 3-ph induction motor.
7) Study of DC motor drive
8) Study of AC motor drive
9) Study of Stepper motor
10) Study of Servo motor
11) Visit to LT substation
12) Switchgear case study - I
13) Switchgear case study - II
14) PLC Programming - I
15) PLC Programming - II
16) PLC case study - I
17) PLC case study – II

Text Books
1. Electrical Machinery and Transformer by Irvin Kosow, Prentice Hall

Reference Books
2. Electrical machines & Power system Vol I, Syed A. Asar, McGraw hill
3. Fractional and sub fractional horse power electrical motors. C.E. Veinou and J.E. Martits, McGraw hill
4. Electrical engineering handbook, Siemens, Wiley Eastern
IP20306 : METROLOGY & MECHANICAL MEASUREMENTS

Credits: 01  Teaching Scheme: - - Laboratory Course 2 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, II (a, h, j, k)

List of Contents

1. Linear measurements by precision measuring instruments
2. Angular measurements by sine bar
3. Dial Gauge calibration
4. Profile Projector for measurement of screw thread parameters and saw tooth parameter
5. Design of limit gauge
6. Measurement of roundness using Johanson’s comparator
7. Measurement of gear tooth parameters
8. Measurement of screw thread parameters using floating carriage micrometer
9. Surface finish measurement
10. Use of interferometer for study of various surfaces
12. Study of Toolmakers Microscope

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

Credits: 01

Teaching Scheme: - Laboratory  2 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,h)

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
Text Books

Reference Books
IP24302 :: COMPUTER GRAPHICS

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

Prerequisites: Nil

Objectives:

- Mapping with PEOs: I, II (d,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

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
IP27402 :: MINI PROJECT

Credits: 02  
Teaching Scheme: - Laboratory 4 Hrs/Week

Prerequisites: Nil

Objectives:
- Scope for creativity
- Getting a hands on experience
- Acquire team-work, project management, and organizational skills

1. Mini Project can be an individual or a group activity depending on the depth and scope of the topic.
2. The project work can be any of the form given below (but not restricted to below mentioned topics only):
   a. Making physical working models, prototypes, scaled models, of a concept machine.
   b. Making virtual / CAD models of machines / concepts.
   c. Making study, modeling, analysis, programming and simulation of a system / machine operation / process.
   d. Making study / teaching modules of a sufficiently complex topic for pedagogy purposes.
3. A complete assembly and details drawings of the project should be submitted along with a detailed project report, where applicable.
4. A Detailed background / field / literature survey, related to the topic must be made presented in the report.
5. Entire work should be presented at the end of the Semester.

<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>
<tbody>
<tr>
<td>S1</td>
<td>IP30101</td>
<td>Manufacturing Processes &amp; Systems</td>
<td>3  1  0</td>
<td>4</td>
</tr>
<tr>
<td>S2</td>
<td>IP30111</td>
<td>Facilities Planning</td>
<td>3  0  0</td>
<td>3</td>
</tr>
<tr>
<td>S3</td>
<td>IP30105</td>
<td>Operations Management</td>
<td>3  0  0</td>
<td>3</td>
</tr>
<tr>
<td>S4</td>
<td>IP30107</td>
<td>Work Study</td>
<td>3  0  0</td>
<td>3</td>
</tr>
<tr>
<td>S5</td>
<td>IP30109</td>
<td>Engineering &amp; Managerial Economics</td>
<td>2  1  0</td>
<td>3</td>
</tr>
<tr>
<td>P1</td>
<td>IP30311</td>
<td>Facilities Planning</td>
<td>0  0  2</td>
<td>1</td>
</tr>
<tr>
<td>P2</td>
<td>IP30305</td>
<td>Operations Management</td>
<td>0  0  2</td>
<td>1</td>
</tr>
<tr>
<td>P3</td>
<td>IP30307</td>
<td>Work Study</td>
<td>0  0  2</td>
<td>1</td>
</tr>
<tr>
<td>PD1</td>
<td>***</td>
<td>*Department Level</td>
<td>0  0  2</td>
<td>1</td>
</tr>
<tr>
<td>CVV3</td>
<td>IP30401</td>
<td>Comprehensive Viva Voce</td>
<td>Based on Courses P1, P2, P3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>IP37301</td>
<td>Seminar</td>
<td>0  0  4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>IP37401</td>
<td>Mini Project</td>
<td>0  0  4</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>14 2 16</td>
<td>26</td>
</tr>
</tbody>
</table>
IP30101:: MANUFACTURING PROCESSES & SYSTEMS

Credits: 04

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
• 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 (8 Hrs)
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
IP30101: MANUFACTURING PROCESSES & SYSTEMS

Teaching Scheme: - - Tutorial 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


54
IP30111:: FACILITIES PLANNING

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
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: II,III (f, g, h, n)

Unit I (8 Hrs)
Introduction to Facilities Planning

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

Unit II (8 Hrs)
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 (8 Hrs)
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 Analysis .. 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
Scope of Operations Management


Unit II
OPC and Material Requirement Planning (MRP I)


Unit III
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

(8 Hrs)

Demand Forecasting


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

Unit V

(8 Hrs)

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 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
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
B. Numerical and Cases on Recording Techniques

Unit III
Method Study II
B. Standard Operating Procedures – Developing SOPs, Responsibility Matrix, Standard Work Combination Charts

Unit IV
Work Measurement I – Time Study
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
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
IP30109:: ENGINEERING & MANAGERIAL ECONOMICS

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, II (e, o)

Unit I
Engineering Economic Analysis
(07 Hrs)


B. Significance of above concept in real life decision making

Unit II
Time Value of Money
(07 Hrs)

A. Concept of Interest, Time Value of Money – Basis for comparison of alternatives, Discount Rate, Compound Rate, Present Worth, Future Worth, Annual Worth, Annuity, Perpetuity, Life Cycle Costing

B. Numerical Applications on Time Value of Money

Unit III
Concept of Demand and Supply
(07 Hrs)


B. Exceptions of Law of Demand & Supply

Unit IV
Concept of Utility, Competition
(07 Hrs)

A. Law of Diminishing Marginal 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. Cases related with above concepts

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

Reference Books
IP30109::ENGINEERING & MANAGERIAL ECONOMICS

Teaching Scheme: - - Tutorial 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. Case on effect of Currency Fluctuations on decision making
2. Study of types of taxes (Direct & Indirect) applicable to the industry of student’s choice and its impact on profitability.
3. Numerical on Depreciation
4. Numerical on Discount Rate, Compound Rate,
5. Numerical on Present Worth, Future Worth,
6. Numerical on Annual Worth
7. Numerical on Annuity
10. Study of Various Types of Competitions and its applicability to minimum five industrial sectors

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

Reference Books
IP30311:: FACILITIES PLANNING

Credits: 01

Teaching Scheme: - Laboratory 2 Hr/Week

Prerequisites: Nil

Objectives:

- To develop skills in the subject
- Verify the principles of the course
- Mapping with PEOs: II,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
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
IP37301 :: SEMINAR

Credits: 02

Teaching Scheme: - Practical 4 Hr/Week

Objectives:
- To develop and test ability of student for self-study, presentation and communication skill
- Mapping with PEOs: IV (l, o)

Guidelines for selecting a topic
1. The topic should be the latest & related to the industrial engineering field.
2. It should not be taken directly from Syllabus.
3. Topic should be based on literature survey /a case study wherever applicable / possible, and approved by the staff- in- charge

Instruction for preparing a seminar report
1. The report should be of about 15-20 (A4 size) pages including figures and plates.
2. Use Arial 12 font with single spacing.
3. Report should be so arranged such that text matter, figures, plates, etc. will appear on right hand side only. Left hand side should be kept blank.
4. General sequence of the report material should be as follows: Title page, Certificate, Abstract, Literature, Bibliography

Evaluation & Assessment Scheme
- The student will be expected to deliver a presentation using audio-visual aids on the seminar topic. Assessment will be based on the following criteria: Report Content, Depth of Knowledge, Presentation Skills, Question-Answers, Adherence to Time

*Standard certificate Proforma will be made available by the department and the same should be used.

**Bibliography should be presented in the following sequence
i) Research papers from National/International Journals, proceedings, conferences
ii) Books (starting from latest)
iii) Websites

***Two copies of report with cover page (as supplied by department) duly filled up and spiral bound to be submitted before the term end.
IP37401 :: MINI PROJECT

Credits: 02

Teaching Scheme: - Laboratory 4 Hrs/Week

Prerequisites: Nil

Objectives:
- Scope for creativity
- Getting a hands on experience
- Acquire team-work, project management, and organizational skills

1. Mini Project can be an individual or a group activity depending on the depth and scope of the topic.
2. The project work can be any of the form given below (but not restricted to below mentioned topics only):
   a. Making physical working models, prototypes, scaled models, of a concept machine.
   b. Making virtual / CAD models of machines / concepts.
   c. Making study, modeling, analysis, programming and simulation of a system / machine operation / process.
   d. Making study / teaching modules of a sufficiently complex topic for pedagogy purposes.
   e. Undertake real life assignments on productivity improvement, process improvement, etc.
3. A complete assembly and details drawings of the project should be submitted along with a detailed project report, where applicable.
4. A Detailed background / field / literature survey, related to the topic must be made presented in the report.
5. Entire work should be presented at the end of the Semester.
MODULE VI

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

**T.Y. B.TECH. (Module VI): B.TECH. Industrial Engg. Structure: Pattern A11**

<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>
<tbody>
<tr>
<td>S₆</td>
<td>IP30112</td>
<td>Materials Management &amp; Logistics</td>
<td>3 0 0</td>
<td>3</td>
</tr>
<tr>
<td>S₇</td>
<td>IP30114</td>
<td>Statistical Methods &amp; Research Methodology</td>
<td>3 0 0</td>
<td>3</td>
</tr>
<tr>
<td>S₈</td>
<td>IP30106</td>
<td>Optimization and Simulation</td>
<td>3 0 0</td>
<td>3</td>
</tr>
<tr>
<td>S₉</td>
<td>IP30116</td>
<td>Quality Management</td>
<td>3 1 0</td>
<td>4</td>
</tr>
<tr>
<td>S₁₀</td>
<td>IP30110</td>
<td>Operations Scheduling</td>
<td>2 1 0</td>
<td>3</td>
</tr>
<tr>
<td>P₄</td>
<td>IP30312</td>
<td>Materials Management &amp; Logistics</td>
<td>0 0 2</td>
<td>1</td>
</tr>
<tr>
<td>P₅</td>
<td>IP30314</td>
<td>Statistical Methods &amp; Research Methodology</td>
<td>0 0 2</td>
<td>1</td>
</tr>
<tr>
<td>P₆</td>
<td>IP30306</td>
<td>Optimization and Simulation</td>
<td>0 0 2</td>
<td>1</td>
</tr>
<tr>
<td>PD₂</td>
<td>***</td>
<td>*Department Level</td>
<td>0 0 2</td>
<td>1</td>
</tr>
<tr>
<td>CVV₄</td>
<td>IP30402</td>
<td>Comprehensive Viva Voce</td>
<td>Based on Courses P₄, P₅, P₆</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>IP37302</td>
<td>Major Project</td>
<td>0 0 4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>14 2 12</td>
<td>24</td>
</tr>
</tbody>
</table>
IP 30112:: 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: II, 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 
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

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

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
IP30114 :: 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

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
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
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: III, IV (a, f, i, n)

Unit I

Linear Programming

A. Linear Programming, Formulation of LP Problem, Standard Form, Solution using Simplex Method, Duality. Special Conditions in LPP, Economic Interpretation of Dual, Solution of LPP using Duality concept, Dual Simplex Method, Sensitivity Analysis, Big M method, Two phase method.
B. Solution of LPP using TORA & Solver in Excel

Unit II

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

Unit III

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 IV**

(8 Hrs)

**Goal Programming & Decision Making Tools**


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

**Unit V**

(8 Hrs)

**Integer Programming & Dynamic Programming**


B. Case studies based on Integer Programming & Dynamic Programming

**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, Rammath &Co
4. Kanthi Swarup & others – Operations Research, Sultan chand and Sons
IP30116 :: QUALITY MANAGEMENT

Credits: 04  
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

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

Unit II
Acceptance Sampling

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

Unit III
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 7 above concepts from reference books and web sources

Unit V

Six Sigma & Quality Management Systems

A. Introduction to Six Sigma: Definition, Concept, Methodology. Six Sigma Approaches – Design for Six Sigma (DFSS) Approach & DMAIC Approach, Six Sigma Tools:


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.
IP30116 :: QUALITY MANAGEMENT

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: 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.
IP30110:: 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

(07 Hrs)
Single Machine Models

A. 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
B. Hybrid algorithm – Neighborhood search – Dynamic programming approach – Branch and Bound – dependent jobs – Sequence dependent set up times.

Unit II

(07 Hrs)
Parallel machine models

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

Unit III

(07 Hrs)
Flow shop models

B. Palmer’s method – Milten’s algorithm.

Unit IV

(07 Hrs)
Job Shop Models


**Text Books**

**Reference Books**
IP30110: OPERATION SCHEDULING

Teaching Scheme: - - Tutorial 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. Numerical based on – mean flow time, mean tardiness
2. Numerical based on SPT, Hodgson’s algorithm
3. Numerical based on ED order &– Smith’s rule
4. Make span minimization of jobs– Mc Naughton’s algorithms
5. Numerical based on jobs on parallel machine scheduling
7. A numerical based on John son’s rule for 3-machine problem.
8. A numerical based on Campbell Dudek method.
10. Assignment based on Job Shop Model
11. Assignment based on Feasible, semi-active and active schedules.
12. Assignment based on Scheduling of intermittent production & continuous production.

Text Books

Reference Books
IP 30312:: MATERIALS MANAGEMENT & LOGISTICS

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,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
IP30314 :: STATISTICAL METHODS & RESEARCH METHODOLOGY

Credits: 01

Teaching Scheme: - - Laboratory 2 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: III, 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
IP37302 :: MAJOR PROJECT

Credits: 2

Teaching Scheme: - Practical 4Hr/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>
</tr>
</thead>
<tbody>
<tr>
<td>S₁</td>
<td>IP42101, IP42103</td>
<td>*Elective Group I</td>
<td>3, 1, 0, 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Costing &amp; Cost Control</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reliability Engineering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S₂</td>
<td>IP42107, IP42109, IP42111</td>
<td>*Elective Group II</td>
<td>3, 1, 0, 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Energy Management</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Industrial &amp; Commercial Laws</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Entrepreneurship Development</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S₃</td>
<td>IP40113</td>
<td>Human Factors Engineering</td>
<td>3, 0, 0, 3</td>
<td></td>
</tr>
<tr>
<td>S₄</td>
<td>IP40115</td>
<td>World Class Manufacturing</td>
<td>3, 0, 0, 3</td>
<td></td>
</tr>
<tr>
<td>P₁</td>
<td>IP40313</td>
<td>Human Factors Engineering</td>
<td>0, 0, 2, 1</td>
<td></td>
</tr>
<tr>
<td>P₂</td>
<td>IP40315</td>
<td>World Class Manufacturing</td>
<td>0, 0, 2, 1</td>
<td></td>
</tr>
<tr>
<td>PS₂</td>
<td>IP47301</td>
<td>Major Project</td>
<td>0, 0, 8, 4</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>12, 2, 12, 20</strong></td>
<td></td>
</tr>
</tbody>
</table>
IP42101:: COSTING & COST CONTROL

Credits: 04

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 (8 Hrs)
Marginal Costing:
B. Concept of Break-Even, P/V Ratio, Margin of Safety.

Unit V (8 Hrs)
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
IP42101:: COSTING & COST CONTROL

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
2. Numerical on Material Cost & Labor Cost
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
IP42103:: RELIABILITY ENGINEERING

Credits: 04  
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  (8 Hrs)
Loads, capacity, maintainability and availability
A. Preventive maintenance, Testing and repair, reliability centered maintenance, system availability and maintainability.
B. Reliability and safety factors, Repetitive loading

Unit V  (8 Hrs)
Reliability testing and Failure Interactions
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
IP42103:: RELIABILITY ENGINEERING

Teaching Scheme: - - Tutorial 1 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
Credits: 04

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, IV (e, f)

Unit I
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
Types of Energy
B. Renewable and non-renewable energy, Conventional and unconventional energy.

Unit III
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  

B. Case study analysis. Provisions under the Electricity Act, functions of Bureau of Energy Efficiency  

Text Books  

Reference Books  
IP42107:: ENERGY MANAGEMENT

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: III, 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
IP42109::INDUSTRIAL AND COMMERCIAL LAWS

Credits: 04

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, 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:
B. Central Board, Employee’s Pension Scheme, Employee’s Deposit Linked Insurance Scheme, Contributions.

Unit IV
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
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
IP42109:: INDUSTRIAL AND COMMERCIAL LAWS

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: IV, 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.
IP42111:: ENTREPRENEURSHIP DEVELOPMENT

Credits: 04  
Teaching Scheme: - Theory 3 Hrs/Week

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: IV,V (j, i)

Unit I  
Introduction Motivation Inputs To Entrepreneurship


Unit II (8 Hrs)
Legal Inputs To Entrepreneurship


B: Shop ACT Business cards, venue Ambience,

Unit III (8 Hrs)
Business Opportunity Identification Inputs To Entrepreneurship


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

Unit IV (8 Hrs)
Marketing Inputs To Entrepreneurship

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 (8 Hrs)
Problem Solving Inputs To Entrepreneurship

A. How to solve problems as and when they arrive? Business crisis and how to solve them when they arise. Review of Cash crisis Starting Crisis, Delegation crisis, Management crisis and Succession crisis. Review of methods to solve each crisis. Methods to solve new crisis which may arrive in the future. Review of luck and the business cycle.

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.
IP42111:: ENTREPRENEURSHIP DEVELOPMENT

Teaching Scheme: - - Tutorial 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: IV,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
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 (8 Hrs)
Introduction to Human Factors
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 (8 Hrs)
Applied Anthropometry and Work Space
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 (8 Hrs)
Working Conditions
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
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
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. Gradjean, “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
WCM & Lean Manufacturing
(8 Hrs)
B. Hall’s, Schonberger,s framework of World Class Manufacturing, Various models of world class manufacturing

Unit II
Lean Manufacturing Tools & Techniques 2
(8 Hrs)
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
Total Productive Maintenance
(8 Hrs)
Bansilal Ramnath Agarwal Charitable Trust’s  
Vishwakarma Institute of Technology, Pune – 411 037

Department of Industrial & Production Engineering

Maintenance – Breakdown, Preventive, Predictive. TPM: Concept & Origin, Outline of TPM – 8 Pillars, TPM Performance Measures – PQCDSM & OEE, Introduction to Autonomous Maintenance (Jishu Hozen) activities, Small-Group activities of TPM. Introduction to 5S: Steps in 5S Methodology, Concept of 1S(Seiri), 2S(Seiton), 3S (Seiso), 4S (Shiketsu), 5S, (Shitsuke). Implementation of 1S & 2S
B. MBNQA, EFQM Award, RBNQA Award, JIPM TPM Award, Losses & Abnormalities in TPM, Home Assignment on 5S

Unit IV  
(8 Hrs)

Business Process Reengineering

B. Tools in BPR

Unit V  
(8 Hrs)

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

Text Books


113
Entrepreneurs.
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 Philisophy)
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 - Schonberay
FF No. : 654

IP47301 :: MAJOR PROJECT

Credits: 2

Teaching Scheme: - Practical 8Hr/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.
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 setups, 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
**B.TECH. (Module VIII): B.TECH. Industrial Engg. Structure: Pattern A11**

<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_5         | IP42102      | *Elective Group III  
- Financial Management & Management Accounting  
- Organization Behavior  
- Marketing Management | 3 1 0 | 4 |
|             | IP42104      |              |                            |         |
|             | IP42106      |              |                            |         |
| S_6         | IP42108      | *Elective Group II  
- Supply Chain Management  
- Product Design & New Product Development  
- Computer Integrated Manufacturing Systems | 3 1 0 | 4 |
|             | IP42110      |              |                            |         |
|             | IP42112      |              |                            |         |
| S_7         | IP40114      | Work Systems Analysis & Design | 3 0 0 | 3 |
| S_8         | IP40116      | Project Management | 3 0 0 | 3 |
| P_3         | IP40314      | Work Systems Analysis & Design | 0 0 2 | 1 |
| P_4         | IP40316      | Project Management | 0 0 2 | 1 |
| PS_3        | IP47302      | Major Project | 0 0 12 | 6 |
| **Total**   |              |              | 12 2 16 | 22 |
IP42102 :: FINANCIAL MANAGEMENT & MANAGEMENT ACCOUNTING

Credits: 04  
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, V (f, g)

Unit I (8 Hrs)
Financial Management

A. Nature and Scope of Finance Function; Financial goal - profit vs. wealth Maximization; Scope and Functions of Financial Management, Financial Planning and Forecasting. Budgets & Budgetary Control: Types of Budget, Preparation of Budgets: Operational & Financial Budgets


Unit II (8 Hrs)
Financial Statement Analysis

A: Ratio Analysis Classification, Ratio Analysis and its limitations. Types of Ratios – Activity Turnover, Profitability, Liquidity, etc.

B: Common Size Statement, Index Statement

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

A. Capital Budgeting: Nature of Investment decisions; Investment evaluation criteria – Non-DCF & DCF Techniques, PBP, Discounted PBP, NPV, IRR, PI, ARR, Annual Worth. Working Capital Management: Meaning, significance and types of working capital; calculating operating cycle period and estimation of working capital requirements; Sources of working capital

B. NPV and IRR comparison; Capital rationing. Various committee reports on bank finance; Dimensions of working capital management.

Unit IV  
Financial Accounting  
(8 Hrs)

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


B. Interpretation of Company Results published.

Text Books

Reference Books
IP42102 :: FINANCIAL MANAGEMENT & MANAGEMENT ACCOUNTING

Teaching Scheme: - - Tutorial 1 Hr/Week

Prerequisites: : Nil

Objectives:
- To give an idea about the scope of Financial Management
- Mapping with PEOs: IV, V (f, g)

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
Credits: 04  

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
- Sensitizes the students of the importance of course in real life environment
- Mapping with PEOs: III, IV (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. Personality & Attitudes: Meaning of personality, Attitude - Development of Personality – Attributes of Personality

Unit II  
Motivation  
(8 Hrs)

Definition, Importance, Motives – Characteristics, Classification of motives - Primary & Secondary motives. Theories of Motivation - Maslow’s Theory, Herzberg's theory, McClelland’s Theory, Adam’s Equity Theory, Victor Vroom’s Expectancy Theory
B. Morale - Definition and relationship with productivity - Morale Indicators.

Unit III  
Leadership  
(8 Hrs)

Leadership Theories: Fiedler’s Contingency Theory, House’s Path Goal Leadership Theory

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.
Unit V

(8 Hrs)

Organization Change

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.

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
IP42104 :: ORGANIZATIONAL BEHAVIOR

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, IV (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 – Hellriegel, Solcum, Woodman, South Western Publication
3. Organisational Development and Change – Cummings and Worley, South Western Publication
4. Organisational Development – W.L. French, Pearson Education
IP42106 :: MARKETING MANAGEMENT

Credits: 04  
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,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  
Product Management And Branding

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

Unit IV
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 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
IP42106 :: MARKETING MANAGEMENT

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,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
IP42108:: SUPPLY CHAIN MANAGEMENT

Credits: 04

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,IV (f, o)

Unit I

Concept of SCM


B. Importance of Supply Chain, Examples of Supply Chain

Unit II

Network Design in Supply Chain


B: Factors Influencing Network Design Decisions – Strategic, Technological, Macroeconomic, Political, Infrastructure, Competitive

Unit III

Planning Demand & Supply in a Supply Chain
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. Collaborative Planning Forecasting & Replenishment, Demand Forecasting & Aggregate Planning in Supply Chain.

Unit IV
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
Co-ordination & Technology in the Supply Chains

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
IP42108:: SUPPLY CHAIN MANAGEMENT

Teaching Scheme: - - Tutorial 1Hr/Week

Prerequisites: : Nil

Objectives:
- To develop skills in the subject
- Application of the theory
- Understanding of fundamentals of the subject
- Mapping with PEOs: III,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
IP42110 :: PRODUCT DESIGN & NEW PRODUCT DEVELOPMENT

Credits: 04

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 (8 Hrs)
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**

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**

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, Winstn Knight Marcel Dekker Inc., USA.
IP42110 :: PRODUCT DESIGN & NEW PRODUCT DEVELOPMENT

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: 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


Reference Books

1. Product design & Manufacture- Jhon R Lindbeck
and sons Ltd.

5 Product Design for manufacturing and Assembly Geoffry Boothroyd, peter dewhurst, Wistrn Knight Marcel Dekker Inc., USA.
IP42112:: COMPUTER INTEGRATED MANUFACTURING SYSTEMS

Credits: 04  
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,IV (h, i, j)

Unit I (8 Hrs)
Introduction to CIM & MRP-II


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

Unit II (8Hrs)
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 (8 Hrs)
Computer Communications


B: Case Study on Networking in manufacturing company.

Unit IV (8 Hrs)
Flexible Manufacturing System.
B. Conceptual understanding of Lean manufacturing, Agile manufacturing

Unit V (8 Hrs)
Artificial Intelligence
B. AI in vision system and scheduling

Text Books

Reference Books
IP42112:: COMPUTER INTEGRATED MANUFACTURING SYSTEMS

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,IV (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

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  
(8 Hrs)


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

Unit II  
Work, Workplace, Equipment & Tool Design  
(8Hrs)


B: Case studies on the above mentioned topics
Unit III (8 Hrs)
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 (8 Hrs)
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 (8 Hrs)
Industrial Safety


Text Books


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,V (f, o)

Unit I  
(8 Hrs)

Introduction:


B. Governmental Framework for Identification of Opportunities, Incentives from state & local authorities.

Unit II  
(8 Hrs)

Project Conceptualization & Feasibility Analysis


B Socio-Economic: Socio-Cost Benefit Analysis. Effective Rate of Protection, Domestic Resource Cost
Unit III (8 Hrs)
Project Planning, Implementation & Control
B: Project Organization & Management. Project Organization Structure, Role of Project Manager

Unit IV (8 Hrs)
Project Cost Management
B. Project Management Information System and Control, Management Pitfalls

Unit V (8 Hrs)
Computer Applications in Project Planning & Control
A. Introduction to MS Projects – Understanding the MS Project screen & different views, Defining the project, Working with calendar, Outline the project, Create dependencies between tasks, Creating WBS, Format task list and Gantt chart, Resource planning, leveling and preparing resource graph, Working with baseline, tracking the project.
B. Home Assignment on Exercise with MS Projects Software.

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 Education
Reference Books

1. Maylor, Project Management, Pearson Education,
2. Gopal & Ramamurthy; Project Management Handbook; Macmilan.
3. Project Management Body of Knowledge
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; Macmilian.
2. Prasanna Chandra; Preparation, Appraisal, Budgeting & Implementation
3. Project Management Body of Knowledge


FF No. : 654
IP 47302:: MAJOR PROJECT

Credits: 4

Teaching Scheme: - Practical 12 Hrs/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 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.