

SYLLABUS FOR THE BATCH 2017-2021

SYLLABUS FOR THE BATCH 2017-2021**VII SEMESTER**

| DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING SCHEME OF TEACHING AND EXAMINATION SEVENTH SEMESTER B.E (AUTONOMOUS SCHEME) | | | | | | | |
|--|--------------------|--|-----------------|----------------------------|----------|----------|-----------------------|
| Sl. No. | Course Code | Course | Category | Contact Hrs. / Week | | | No. of Credits |
| | | | | L | T | P | |
| 1 | IP0422 | Operations Research | FCC | 4 | 0 | 0 | 4 |
| 2 | IP0458 | Management and Entrepreneurship | GC | 4 | 0 | 0 | 4 |
| 3 | IP0424 | Financial Management | FCI | 4 | 0 | 0 | 4 |
| 4 | IP 0108 | Machine Tool and Fluid Power Systems Lab | FCD | 0 | 0 | 3 | 1.5 |
| 5 | IP0116 | Software Application Laboratory | FCI | 0 | 0 | 3 | 1.5 |
| 6 | IP0203 | Project Work (Preliminary) | FCC | 0 | 0 | 4 | 2 |
| 7 | IP0113 | Industrial Visit / Internship | GC | - | - | - | 1 |
| 8 | | Elective – II | | 3 | 0 | 0 | 3 |
| 9 | | Elective – III | | 3 | 0 | 0 | 3 |
| Total Credits | | | | | | | 24 |
| Contact hours per week | | | | | | | 28 |
| Elective-II | | | | | | | |
| Sl. No. | Course Code | Course | Category | Contact Hrs. / Week | | | No. of Credits |
| | | | | L | T | P | |
| 2 | IP0310 | Theory of Metal Cutting | FEP | 3 | 0 | 0 | 3 |
| 3 | IP0311 | Industrial Robotics | FED | 3 | 0 | 0 | 3 |
| 4 | IP0312 | Facility Planning and Design | FEI | 3 | 0 | 0 | 3 |
| 5 | IP0313 | Finite Element Methods | FEP | 2 | 2 | 0 | 3 |

| Elective-III | | | | | | | |
|--------------|-------------|-----------------------------|----------|---------------------|---|---|----------------|
| Sl. No. | Course Code | Course | Category | Contact Hrs. / Week | | | No. of Credits |
| | | | | L | T | P | |
| 1 | IP0314 | Database Management System | FEI | 3 | 0 | 0 | 3 |
| 2 | IP0307 | Mechanical Vibrations | FED | 3 | 0 | 0 | 3 |
| 3 | IP0316 | Automation in Manufacturing | FEM | 3 | 0 | 0 | 3 |
| 5 | IP0318 | Total Quality Management | FEI | 3 | 0 | 0 | 3 |

VIII SEMESTER

| DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING SCHEME OF TEACHING AND EXAMINATION EIGHTH SEMESTER B.E (AUTONOMOUS SCHEME) | | | | | | | |
|--|-------------|---|----------|---------------------|---|----|----------------|
| Sl. No. | Course Code | Course | Category | Contact Hrs. / Week | | | No. of Credits |
| | | | | L | T | P | |
| 1 | IP0425 | Operations Management | FCC | 4 | 0 | 0 | 4 |
| 2 | IP0111 | Seminar on Contemporary Technical Topics | FCC | 0 | 0 | 2 | 1 |
| 3 | IP0601 | Project Work | FCC | 0 | 0 | 12 | 6 |
| 4 | | Elective – IV | | 3 | 0 | 0 | 3 |
| 5 | | Elective – V | | 3 | 0 | 0 | 3 |
| Total Credits | | | | | | | 17 |
| Contact hours per week | | | | | | | 24 |
| Elective-IV | | | | | | | |
| Sl. No. | Course Code | Course | Category | Contact Hrs. / Week | | | No. of Credits |
| | | | | L | T | P | |
| 1 | IP0334 | Digital Manufacturing | FEM | 3 | 0 | 0 | 3 |
| 2 | IP0319 | Machine Tool Design | FED | 3 | 0 | 0 | 3 |
| 3 | IP0335 | Joining Processes and Non Destructive Testing | FEM | 3 | 0 | 0 | 3 |
| 4 | IP0322 | Product Design and Development | FEP | 3 | 0 | 0 | 3 |
| Elective-V | | | | | | | |
| Sl. No. | Course Code | Course | Category | Contact Hrs. / Week | | | No. of Credits |
| | | | | L | T | P | |
| 1 | IP0324 | Management Information system | FEI | 3 | 0 | 0 | 3 |
| 3 | IP0320 | Industrial Design and Ergonomics | FEI | 2 | 2 | 0 | 3 |
| 3 | IP0326 | Organizational Behavior | FEI | 3 | 0 | 0 | 3 |
| 5 | IP0328 | Marketing Management | FEI | 3 | 0 | 0 | 3 |

OPERATIONS RESEARCH (4:0:0)

Course Code : IP 0422
 Hrs/Week : 04
 SEE Hrs : 03

CIE : 50% Marks
 SEE : 50% Marks
 Max. Marks: 100

Course Objectives:

The objective of the course is to give an exposure to student in modeling, solving and analyzing problems using operations research models. Emphasis will be on basic concepts, applications and computer usage.

Unit 1

Introduction: Historical development of OR, definition of OR, models of OR, features of OR models.

Linear Programming: Definition, mathematical formulation, standard form, solution space, solution – feasible, infeasible, multiple, optimal, redundancy, degeneracy, graphical method.

8 Hrs

SLE: Application of OR to engineering and managerial problems.

Unit 2

Linear Programming: Simplex method, variants of simplex algorithm – artificial basis techniques, duality, economic interpretation of dual, solution of LPP using duality concept.

8 Hrs

SLE: Degeneracy problems.

Unit 3

Assignment Problem: Formulation of the assignment problem, unbalanced assignment problem.

Transportation Problem: Formulation of transportation model, basic feasible solution using North-West corner, least cost, Vogel's approximation method, optimality test by MODI method. unbalanced transportation problem, degeneracy in transportation problems, applications of transportation problems.

10 Hrs

SLE: Traveling salesman problem

Unit 4

Queuing Theory: Queuing system and their characteristics. The M/M/1 queuing system, steady state performance, analyzing of M/M/1 queuing model, M/M/K/ Model.

Replacement Analysis: Introduction, reasons for replacement, Individual replacement of machinery of equipment with/without value of money, group replacement policy problem.

10 Hrs.

SLE: Derivation of birth and death model (M/M/1): (∞ /FCFS)

Unit 5

Project Management Using Network Analysis: Network construction, determination of critical path and duration, floats. PERT – estimation of project duration, variance, crashing of network.

8Hrs.

SLE: Resource smoothing, resource leveling.

Unit 6

Game Theory: Formulations of games, two person zero sum game, games with and without saddle point, dominance property, graphical solutions (2xn, mx2 game).

8Hrs

SLE: Solving problems using linear programming method.

Text Books:

1. **Operations Research**, S D Sharma and Kedarnath, Ramnath publications, 2014.

References:

1. **Operations Research Theory and Application** – J K Sharma, Laxmi Publications – New Delhi, 5thEdn, 2012.
2. **Operations Research** – Kanthi Swarup and others, Sultan chand and Sons. 17thEdn. 2014.
3. **Operation Research an Introduction**-Taha H A, Pearson India ltd., 9thEdn, 2014.
4. **Principles of Operations Research** – Philips, Ravindran and Soleberg-Theory and Practice, Wiley Inc, 2nd Edition, 2014.

Link:

<https://www.youtube.com/watch?v=a2QgdDk4Xjw&list=PLjc8ejfjpgTf0LaDEHgLB3gCHZYcNtsoX>

Course Outcome:

Upon successful completion of the course, the students will be able to

1. Identify and develop operational research models that consider the key elements of the real world problem from the verbal description of the real system.
2. Solve the linear programming models for their optimal solution and interpret the model's solution
3. Analyze and solve managerial problems in industry so that they are able to use resources more effectively using assignment and transportation model.
4. Select mathematical and computational modeling of real decision making problems, including the use of modeling tools and computational tools, as well as analytic skills to evaluate the problems under uncertainty
5. Design new simple models: CPM, PERT, to improve decision-making and develop critical thinking and objective analysis of decision problems.
6. Analyze and solve basic mathematical models of games with strategic considerations.

Mapping of COs to POs:

| Course Outcomes | Programme Outcomes that are satisfied by the COS |
|------------------------|---|
| CO1 | PO1 |
| CO2 | PO1, PO2 |
| CO3 | PO4 |
| CO4 | PO6 |
| CO5 | PO11 |
| CO6 | PO4, PO7 |

MANAGEMENT AND ENTREPRENEURSHIP (4:0:0)

Course Code : IP0458
 Hrs/Week : 04
 SEE Hrs : 03

CIE : 50% Marks
 SEE : 50% Marks
 Max. Marks: 100

Course Objective:

By this course, a student should diagnose a firm's competitive situation based on real world situations and implement entrepreneurial knowledge to overcome various short range and long range problems.

Unit 1

Management: Introduction- meaning-nature and characteristics of management, scope and functional areas of management- management as a science, art or profession – management and administration – roles of management, levels of management, skills and competence for effective managing, development of management thought, classical approach and neo classical approach, social responsibility of manager, case studies. **5Hrs**

SLE: Maslow's hierarchy theory

Unit 2

Planning and Decision Making: Nature and purpose of planning, types of plans, steps in planning, planning process, importance and limitations of rational decision making, approaches for selecting an "alternative", Decision making under certainty, uncertainty and risk, case studies. **5Hrs**

SLE: Modern approaches to decision making under uncertainty

Unit 3

Organizing and Staffing: Nature and purpose of organizing, formal and informal organizations, organization levels and the span of management, structure and process of organizing, organizing through departmentalizing, matrix organizations, authority and power, line and staff concepts, decentralization and delegation of authority, systems approach to staffing, systems approach to selection, case studies. **6Hrs**

SLE: Basics of organizational behavior

Unit 4

Motivating and Leading technical people: Human factors in managing, creativity and innovation, motivation and motivators, overview on theories of motivation, special motivation technique, leadership and its ingredients, overview on theories of leadership, importance of communication, communication process model, barriers to communication, towards effective communication, case studies

International business management: International management in selected countries, International management and multinational corporations (MNCs). **8Hrs**

SLE: Managerial functions in International Business, Global theory of Management.

Unit 5

Entrepreneurship: Meaning of entrepreneur, evolution of the concept, functions of an entrepreneur, types of entrepreneur, entrepreneur – an emerging class, concept of entrepreneurship – development of entrepreneurship, steps in entrepreneurial process, role of entrepreneurs in economic development. **6Hrs**

SLE: Entrepreneurship in India and Barriers.

Unit 6

Micro small and Medium Enterprises (MSME): Definition, characteristics, need and rationale, objectives, scope, role of MSME in economic development. steps to start an MSME – Government policy towards MSME, impact of liberalization, privatization, globalization on MSME, effect of WTO/GATT

Feasibility study: Market Feasibility study, technical feasibility study, financial feasibility study and Social feasibility studies.

Preparation of Project: Meaning of project, project identification, project selection: project report, need and significance of report, contents, formulation, guidelines by planning commission for project report, network analysis, errors of project report, project appraisal. identification of business opportunities. **12Hrs**

SLE: Institutional Support: Different Schemes, TECKSOK, KIADB, KSSIDC, KSIMC, DIC Single Window Agency: SISI, NSIC, SIDBI, KSFC.

Text books:

1. **Management and Entrepreneurship** – N.V.R. Naidu and T. Krishna Rao, I.K.International, New Delhi – 2008.
2. **Essentials of Management** – Herald Koontz and Heinz Weihrich – Tata McGraw Hill, 10th Edition, 2017.

References:

1. **Principles of Management** – P.C. Tripathi, P.N.Reddy, Tata McGraw Hill, 4th Edition, 2008.
2. **Management Fundamentals – concepts, application, skill development** – 1st Edition, Robert Lusier – Thomson, 2004.
3. **Entrepreneurship Development** – S S Khanka – S Chand and Co. 1999.
4. **Management** – Stephen Robbins – Pearson Education / PHI – 17th Edition, 2003.
5. **Entrepreneurship Development** – Small Business Enterprises – Poornima M Charantimath – Pearson Education, 2nd Edition, 2006.

Course outcomes:

Upon successful completion of the course, the student will able to:

1. Defines the meaning, nature, levels and characteristics of management.
2. Describes the nature, types, purpose of planning and taking decision under different conditions.
3. Defines the different organization structures and staffing policies and procedures.
4. Demonstrate the motivation, leadership theories and communication process model.
5. Define the entrepreneurship concept, process and barriers in entrepreneurship.
6. Demonstrate scope, role ofMSME and guide lines to write project report.

Mapping of COs to POs:

| Course Outcomes | Programme Outcomes that are satisfied by the COS |
|------------------------|---|
| CO1 | PO11 |
| CO2 | PO11,PO10 |
| CO3 | PO9 |
| CO4 | PO10,PO11 |
| CO5 | PO11 |
| CO6 | PO11,PO12 |

FINANCIAL MANAGEMENT (4:0:0)

Course Code : IP0424
Hrs/Week : 04
SEE Hrs : 03

CIE : 50% Marks
SEE : 50% Marks
Max. Marks: 100

Course Objective:

- To introduce the basic tools and techniques required in financial management, decision making, financing, dividend and working capital.

Unit 1

Introduction: Evolution of financial management, goals, scope, objectives, key activities, financial decisions in a firm, principles of finance, risk return trade-off. **6 Hrs**

SLE: Forms of Business

Unit 2

Financial statements: Balance sheet, profit and loss account, relationship, financial analysis, nature of ratio analysis, types of ratios. **10 Hrs**

SLE: users of Financial Analysis

Unit 3

Capital Budgeting: Techniques and problems, cost volume profit analysis, break even analysis, problems **8 Hrs**

SLE: Process of capital budgeting

Unit 4

Working capital management: Introduction to working capital, determination of operating cycle, types of operating cycles, budgets, purposes of budgeting, essentials of budgeting, types of budgets, problems. **10Hrs**

SLE: Factors influencing working capital requirement

Unit 5

Long Term Sources of Finance: Shares, debentures, preference shares, term loans, primary and secondary markets, venture capital. **6 Hrs**

SLE: SEBI guide lines on capital issues, stock market in India

Unit 6

Dividend Policy: Introduction, reasons for payment of dividends, bonus shares and stock splits.
Mergers and Acquisitions: reasons, mechanics, takeovers, acquisitions, leasing, portfolio management, international financial management, hybrid financing. **12 Hrs**

SLE: Dividend policies in practice.

Text Books:

1. **Financial management** –I M Pandey, Vikas publishing House Pvt. Ltd.,11th edition, 2015.
2. **Financial Management – Theory and practice**, Prasanna Chandra, 9th edition, 2015. Tata McGraw Hill publishing company ltd.,

References:

1. **Financial Management and Policy** – James C.Van Horne & Sanjay Dhamija, Pearson, 12th Edition, 2011
2. **Fundamentals of Financial Management** - James C. Van Horne &John.M.Wachowicz, Jr.,13th Edition,2008.
3. **Financial Management Text, Problemsand Cases** – Khan and Jain, 7th edition, 2015- Tata McGraw Hill publishing company ltd.,

Course outcome:

Upon successful completion of the course, the student will be able to

1. Understand the basic concepts of financial management.
2. Explain the financial statements with a case study.
3. Interpret different techniques in selecting a project using capital budgeting and concepts of Cost-Volume-Profit.
4. Recall the basic concepts of working capital management and prepare different types of budgets.
5. Interpret different sources of finance and knowledge of venture capital.
6. Interpret dividend policies and demonstrate the concept of mergers and acquisition for various firms.

Mapping of COs to POs:

| Course Outcomes | Programme Outcomes that are satisfied by the COS |
|------------------------|---|
| CO1 | PO1 |
| CO2 | PO11 |
| CO3 | PO5 |
| CO4 | PO11 |
| CO5 | PO4 |
| CO6 | PO12 |

MACHINE TOOL AND FLUID POWER SYSTEMS LAB (0:0:3)

Sub Code : IP 0108
Hrs/Week : 03
SEE Hrs : 03

CIE : 50% Marks
SEE: 50% Marks
Max. Marks: 50

Course Objectives:

- To conduct experiments on various machine tools to establish the cutting forces during machining using dynamometers.
- Know the components of machine tool parts by disassembling and assembling the same.
- To build hydraulic circuits to control the machine tool parts.

Experiments:

1. Acceptance tests on lathe, drilling machine, milling machine.
2. Determination of cutting forces during turning using lathe tool dynamometer.
3. Determination of thrust and torque during drilling with drill tool dynamometer.
4. Measurement of cutting tool temperature using thermo-couple.
5. Determination of chip-reduction ratio during orthogonal cutting on a lathe.
6. Assembly and disassembly of screw jack
7. Assembly and disassembly of tail stock
8. Assembly and disassembly of tool head of shaper
9. Assembly and disassembly of indexing head
10. Building up of hydraulic pressure intensification circuit.
11. Building up of hydraulic regenerative cylinder.
12. Comparison of tandem centre and closed centre directional control valve.
13. Speed control of cylinder: meter-in and meter-out circuits.
14. Study of will, travel and time dependent control in pneumatic systems.
15. Building up of AND and OR logic functions in pneumatic system.

Course Outcomes:

Upon successful completion of this course, the students will able to

1. Demonstrate how the machine tools can be tested for their accuracy by conducting acceptance tests.

2. Explain the important elements of a machine tool part by performing disassembly and assembly.
3. Evaluate the cutting forces during machining operations with the help of dynamometers.
4. Build hydraulic circuits to control the machine tool parts.

Mapping of COs to POs:

| Course Outcomes | Programme Outcomes that are satisfied by the COS |
|------------------------|---|
| CO1 | PO1, PO2, PO9, PO10 |
| CO2 | PO1, PO2, PO9, PO10 |
| CO3 | PO1, PO2, PO9, PO10 |
| CO4 | PO1, PO2, PO3, PO4 PO9, PO10 |

SOFTWARE APPLICATION LABORATORY(0:0:3)

Course Code : IP0116
Hrs/Week : 03
SEE Hrs : 03

CIE : 50% Marks
SEE: 50% Marks
Max. Marks: 50

Course Objectives:

Student learn Oracle/MS SQL server and use of software packages to solve linear programming problems, plotting appropriate charts and diagrams relevant to various industrial applications.

- Develop of simple MIS applications using Oracle / MS SQL server as the back-end, and VB6.0 / Developer 2000 as the front-end.
- Developing the applications for basic transactions. Purchase and sales using trigger concept and on delete cascade.
- Use of software packages to solve assignment model problems. Transportation model Problems and Linear Programming Problems, Plotting appropriate charts and diagrams relevant to various industrial applications.
- Use of Mini Tab package

Text Books:

1. **Database system** – RameElmasri and Shamakanth B Navathe, 6thEdn, Peason publisher, 2014.

References:

1. **Database Management and Design** – Gary Whansen and James V Hansen, 2nd edition, PHI Pvt. Ltd. 1995.

Course Outcomes:

Upon successful completion of the course, the student will able to:

1. Explain the basic concepts of oracle and write the SQL queries for the given application
2. Demonstrate trigger and on delete cascade concept in developing banking application.
3. Solve the practical cases using TORA packages.

Mapping of COs to POs:

| Course Outcomes | Programme Outcomes that are satisfied by the COS |
|-----------------|--|
| CO1 | PO1,PO5 |
| CO2 | PO1,PO5 |
| CO3 | PO5 |

PROJECT WORK (PRELIMINARY) (0:0:4)

Course Code : IP0203
Hrs/Week : 04

Mid Term Evaluation : 40 Marks
Final Evaluation : 60 Marks
Max. Marks: 100

Course Objective:

Enabling the students to form heterogeneous group to carry out project work.

Students will form teams with a maximum of four in each group. They identify Industry / Instituteto carry out Project work. The students will carry out a detailed literature surveyand arrive at the objectives and methodology for the same.

Course Outcomes:

Upon the successful completion of the Industry Internship, the student will be able to:

- Identify their areas of interest, carry out literature survey and explore the possibility of carrying out live projects in Industries
- Arrive at the objective and scope of the project
- Decide upon methodology and modern tools to be used
- Appreciate the need for team work and understand the ethics of doing things

Mapping of COs to POs:

| Course Outcomes | Programme Outcomes that are satisfied by the COS |
|-----------------|--|
| CO1 | PO1,PO2,PO3,PO8,PO9,PO10 |
| CO2 | PO1,PO2,PO3,PO6,PO7,PO8,PO9,PO10,PO11 |
| CO3 | PO1,PO2,PO3,PO4,PO5,PO9,PO10 |

INDUSTRIAL VISIT /INTERNSHIP**Sub Code :IP0113****SEE : 50Marks****Course Objective:**

To expose students to industrial working environment.
Students should undergo minimum of two weeks of industrial training in a reputed company at the end of fourth/ fifth/ sixth semester examination and submit a report during the beginning of sixth semester followed by presentations.

Course Outcomes:**Upon successful completion of the course, students will be able to:**

- Understand the working environment in the Industry.
- Know the modern tools, techniques and procedures adopted in the Industries

Mapping of COs to POs:

| Course Outcomes | Programme Outcomes that are satisfied by the COS |
|------------------------|---|
| CO1 | PO1,PO2,PO3,PO4,PO5,PO6,PO7,PO8,PO9,PO10,PO11,PO12 |

Electives- II

THEORY OF METAL CUTTING (3:0:0)

Course Code : IP 0310
Hrs/Week : 03
SEE Hrs : 03

CIE : 50% Marks
SEE : 50% Marks
Max. Marks: 100

Course Objective:

To introduce to the students theory of metal cutting through mechanism of metal cutting, Tool geometry, cutting..

Unit 1

Geometry of Cutting Tools: Nomenclature of a single point cutting tool, cutting parameters and tool geometry, nomenclature of a drill bit, significance of different tool angles, recommended tools and geometry for different work materials.

Tool Materials: Importance of Tool materials - composition and structure. desirable properties of tool materials, composition and structure of : high carbon steel, high speed steel, cemented carbides, ceramics, coated tools, poly crystalline cubic boron nitride and diamond tools, recommended cutting speeds for the above tools and their applications. **8Hrs**

SLE: CVD and PVD Coating Techniques and their applications.

Unit 2

Mechanism of Metal Cutting: Orthogonal and oblique cutting, mechanism of chip formation, different types of chips like continuous, discontinuous and continuous chips with built up edge, cutting ratio, determination of shear plane angle, force components in orthogonal cutting, Merchant's circle diagram and analysis, velocity relationship, power and energy relationship, problems on the above. **7Hrs**

SLE: Chip flow direction, Stablers law, slip line field -theory a simple concept.

Unit 3

Measurement of Cutting Forces: Introduction, Forces involved in machining, requirements of tool dynamometers, different types of force measurement, thermal aspects, economics, machine tool dynamometers, dynamometers for lathe, drilling and milling operations. **7Hrs**

SLE: Importance of Piezo Electric Dynamometer, riding Tool Dynamometers

Unit 4

Thermal Aspects in Metal Cutting: Heat sources during metal cutting, factors influencing tool temperature, techniques for temperature measurement, temperature in chip formation.

Cutting Fluids: Importance of cutting fluids in metal cutting, desirable properties of cutting fluids, different types of cutting fluids, their properties and composition, selection of cutting fluids for different application, recommended cutting fluids, methods of applications. **8Hrs**

SLE: Experimental determination of tool temperature.

Unit 5

Tool Wear and Tool Life:Types of tool wear, mechanism of tool wear like adhesion, abrasion, diffusion, crater wear and flank wear, tool wear criterion, Taylor's tool life equation, effect of process parameters on tool life,numerical problems. **7Hrs**

SLE: Machinability of Materials.

Unit 6

Economics of Machining: elements of production cost like material, labor and overhead costs, tool cost ,cutting speed for maximum productivity,numerical examples. **5Hrs**

SLE: Cutting speed for minimum cost.

Text Books:

1. **Fundamentals of Metal Cutting and Machine Tools** by B L Juneja and G S Sekhon New age International. 2nd edition 2012,

References:

1. **Fundamentals of metal machining and machine tools** by G Boothroyd, Mc. Graw Hill publication, 3rd edition ,2006.
2. **Metal cutting principles** by Milton C Shaw Oxford University press, 2nd edition-2014.

Course Outcomes:

Upon successful completion of the course, the student will be able to

1. Understand the geometry of cutting tools and the different types of tool materials and their applications.
2. Explain mechanics of metal cutting supported by relevant theories.
3. Demonstrate the cutting force measurement technique in different machining operations.
4. Comprehend the importance of temperature build up during metal cutting and means of reducing the same with the application of cutting fluids.
5. Explain the wear types and the mechanisms involved , Taylor's Tool life equations and the parameters involved.
6. Understand the need for achieving economy in machining through relevant models.

Mapping of COs to POs:

| Course Outcomes | Programme Outcomes that are satisfied by the COS |
|-----------------|--|
| CO1 | PO1,PO2 |
| CO2 | PO1,PO2,PO4 |
| CO3 | PO1,PO2,PO5 |
| CO4 | PO1,PO2,PO3 |
| CO5 | PO1,PO2 |
| CO6 | PO1,PO2 |

INDUSTRIAL ROBOTICS (3:0:0)

Course Code : IP 0311
Hrs/Week : 03
SEE Hrs : 03

CIE : 50% Marks
SEE : 50% Marks
Max. Marks: 100

Course Objective:

To imbibe in students the basic concepts, mechanism and controls of robot system for developing robotic program used in manufacturing systems.

Unit 1

Introduction: Automation and robotics, brief history of robotics, social and economic aspects of robots, advantages and disadvantages of using robots in industries.

Classification and structure of robotic system: Classifications, geometrical configurations, wrist and its motions, end effectors and its types, links and joints.

Robot drive systems: Hydraulic, electric and pneumatic drive systems, resolution, accuracy and repeatability. **8Hrs**

SLE: Overview of robots – present and future applications and advantages and disadvantages of drive systems

Unit 2

Control Systems and Components: Basic control system concepts and models, transformation and block diagram of spring mass system, controllers – ON and OFF, proportional integral, proportional and integral, transient and response to second order system.

6Hrs

SLE: Robot Actuation and Feedback components: position, velocity sensors, Actuators.

Unit 3

Robot Arm Kinematics: Rotation matrix, composite rotation matrix, rotation matrix about an arbitrary axis, Euler angles, representation, homogeneous transformation, links, joints and their parameters, D – H representation. **8Hrs**

SLE: Kinematics – Introduction, direct and inverse kinematics

Unit 4

Robot Arm Dynamics: Lagrange – Euler Formulations, Joint velocities, kinetic energy, potential energy and motion equations of a robot manipulator.

Trajectory Planning: Introduction, general considerations on trajectory planning, joint interpolated trajectories, 4-3-4 trajectory examples. **6Hrs**

SLE: Planning of Cartesian Path Trajectory.

Unit 5

Robot programming: Introduction, programming languages –VAL [Simple examples], graphical programming, storing and operating, Task programs. **6Hrs**

SLE: Manual teaching, lead through teaching

Unit 6

Sensors: Internal state sensors, tactile sensors, proximity sensing, range sensing, force and torque sensors, elements of computer vision, sensing and digitizing function in machine vision – image devices, lighting techniques – analog to digital signal conversion, sampling, quantization, encoding – image storage. image processing and analysis, **6Hrs**

SLE: Features Extraction and Object recognition.

Text Books:

1. **Industrial robotics** – Groover, Mc Graw Hill, Year 2011.
2. **Robotics: control, sensing, vision and intelligence** – K.S.Fu, R.C.Gonzales and Lee. Mc Graw Hill International, Year 1987.

References:

1. **Robot manipulators**, Mathematics, programming and Control – Richard Paul, Year 2000.
2. **Robotics** – YoremKoren, Mc Graw Hill Intl. Book Co., New Delhi, Year 2001.
3. **Fundamentals of Robotics: Analysis and control** – Robert J Schilling, Year 2009, Phi publication. 4th edition.
4. **Robotics Engg: An Integrated approach** by Richard D.Klafter, PHI, Year 2003.
5. **Robotics and Control** by R.K.Mittal and J.Nagarath, Tata Mc Graw Hill, Year 1995.

Course Outcomes:

Upon successful completion of the course, the student will able to

1. Outline the basics of robotics and its drives used for various motions.
2. Recall the concepts of control system and components used for robots.
3. Solve problems related to transportations and kinematics of robotics.
4. Understand the importance of Robotic arm dynamics and its trajectory planning
5. Learn different types of programming methods and languages of robots.
6. Understand the importance of various sensors and their applications in robots.

Mapping of COs to POs:

| Course Outcomes | Programme Outcomes that are satisfied by the COS |
|-----------------|--|
| CO1 | PO1,PO2 |
| CO2 | PO1,PO2,PO3,PO5 |
| CO3 | PO1,PO2,PO3,PO4 |
| CO4 | PO1,PO2,PO3,PO4,PO5 |
| CO5 | PO1,PO2,PO4,PO5 |
| CO6 | PO1,PO2 |

FACILITY PLANNING AND DESIGN (3:0:0)

Course Code : IP 0312
Hrs/Week : 03
SEE Hrs : 03

CIE : 50% Marks
SEE : 50% Marks
Max. Marks: 100

Course Objective:

To make the students understand the importance of layouts in plants using models using appropriate design and computerized techniques.

Unit 1

Plant Location: Factors influencing plant location, theories of plant location, plant layout – objectives of plant layout, principles of plant layout, types of plant layout, their merits and demerits, facilities design function: objectives. Case studies on layouts layouts.

Introduction to Material Handling: Objectives and principles of material handling, unit load concept, Basic handling equipment types, Common material handling equipments. **7Hrs**

SLE: Classification of material handling equipment.

Unit 2

Plant Design: Layout procedure, Immer, Nadler, Muther, Apple James and Reed's approaches, systematic layout planning, the activity relationship chart, Constructing the activity relationship chart, Activity relationship diagram. **6Hrs**

SLE: Space relationship diagram to plant layout.

Unit 3

Computerized Layout Planning: Computerized relative allocation of facility techniques (CRAFT), Plant layout Evaluation Techniques (PLANET), Computerized Relationship Layout Planning (CORELAP), Comparison of computerized layout techniques. **5Hrs**

SLE:, Automated layout design program (ALDEP), Criteria for a computerized layout program

Unit 4

Space Determination and Area Allocation: Factors for consideration in space planning, receiving, storage, production, shipping, tool room and tool crib, other auxiliary service actions, establishing total space requirement, area allocation factors to be considered, expansion, flexibility, aisles column, area allocation procedure, the plot plan.

Construction of the Layout: Methods of constructing the layout, evaluation of layout, efficiency indices, presenting layout to management. **9Hrs**

SLE: Standardized office planning, Work place Design.

Unit 5

Quantitative approaches to facilities planning: Deterministic models, single and multi facility models, Conventional layout model: Block stacking, location allocation models,

7Hrs

SLE: Automated storage and retrieval systems

Unit 6

Layout Models: Warehouse layout models, waiting line models, Storage models.

6Hrs

SLE: Evaluation, selection and implementation of facilities plan.

Text books:

1. **Plant layout and material handling**- James M. Apple, 3rd edition John, Wiley and sons, 1991.
2. **Facility layout and location** – Françoise, R.L. and White, J.A, Mc Graw Hill 2nd edition, 1994.

References:

1. **Practical layout** – Muther Richard -Mc Graw Hill-1956.
2. **Plant layout design** – James.M Moore, Mac Millon co.1962.
3. **Facilities design** –SundereshHeragu, PWS publishing company-ISBN-0-534-95183, August 2008
4. **Facilities planning** –Tompkins white –wiley India Pvt ltd 3rd edition
5. **Facility Layout and Location**, Richard LFrancies. 2nd Edition PHI learning Pvt. Ltd

Course Outcomes:

Upon successful completion of the course, the students will able to

1. Identify the planning strategies for implementation, evaluation and maintaining the facility.
2. Arrive at suitable layout for given situations having understand different approaches.
3. Demonstrates the ideas on various types of layout and evaluation techniques using computers .
4. Demonstrate the Space determination and area allocation procedure, construction of the layout .
5. Analyze the quantitative methods and models to determine for the plant location.
6. Explain the warehouse and waiting line models.

Mapping of COs to POs:

| Course Outcomes | Programme Outcomes that are satisfied by the COS |
|-----------------|--|
| CO1 | PO3, |
| CO2 | PO3 |
| CO3 | PO4 |
| CO4 | PO4,PO5 |
| CO5 | PO4,PO5 |
| CO6 | PO2, PO3 |

FINITE ELEMENT METHODS (2:2:0)

Course Code : IP 0313
Hrs/Week : 04
SEE Hrs : 03

CIE : 50% Marks
SEE : 50% Marks
Max. Marks: 100

Course Objective:

To learn the basic concept of Finite Element Method (FEM) and the theory of elasticity and apply effectively the FEM methods to problems in various structural engineering

Unit 1

Introduction to FEM and Theory of elasticity: Basic procedure of FEM. application of FEM. Theory of Elasticity and 2D and 3D equations of equilibrium, principle stresses and strains, equations in cylindrical and polar coordinates. Axisymmetric bodies. Strain analysis, stress strain relations and generalized Hooke's law, plane stress and plane strain problems.

8Hrs

SLE: Theories of failures strain energy.

Unit 2

Basics Concept of FEM: Discretization of continuum, finite elements, Nodes, DOF, shape functions of 1D, 2D and 3D elements. Higher order elements, linear, quadratic and cubic shape functions, subparametric, isoparametric and superparametric concepts. Local and global coordinate system, polynomial function and Pascal triangle. Principle of Potential. Energy and Rayleigh Ritz method.

8Hrs

SLE: Principle of virtual work and Galerkin method.

Unit 3

One Dimensional Analysis: Bar elements with linear shape functions – B matrix – K matrix – Body force and load vector – Assembly and Boundary conditions – Elimination and Penalty approach – Solution to overall equation, calculation of stresses and other results, Numerical Problems – Temperature stresses and problems, Bar element with Quadratic shape function. Numerical problems.

7Hrs

SLE: Properties of K-matrix and storage, convergence of solution

Unit 4

Truss Element: Local and Global Coordinate system, Transformation matrix. Stiffness matrix and assembly, stress calculation. Temperature stresses, numerical problems on simple truss structures.

6Hrs

SLE: Problems on real life truss element.

Unit 5

Beam Element: Hermite shape functions for beam element, Derivation of stiffness matrix. Numerical problems of beams carrying concentrated, UDL and linearly varying loads. **6Hrs**

SLE: Elementary beam theory**Unit 6**

Two Dimensional Analysis: 2 D stress strain relations, constant strain triangle, nodes, DOF, displacement functions – Jacobian and B Matrix, Expression for K_e –Load vectors – stress calculation – temperature effects – Problems, modeling and Boundary conditions – simple problems. **7Hrs**

SLE: study the basics of engineering vibrations.

Text books:

1. **Introduction to Finite Elements in Engg.** T.R. Chandrupatla, PhD, P E, Ashok. D. Belegundu, 1996 prentice hall.
2. **Fundamentals of Finite Elements Method**, 2nd Edition, - Dr. S.M.Murigundappa., International Publication- 2009.

References:

1. **A First Course in Finite Element Method**, 4th Edition Dary. L. Logan, University of Wisconsin, Platteville Thomson, Nelson Engineering 2007.
2. **Finite Element Method**, R.D. Cook, John Willy International, New edition 2007, 4th edition.
3. **Introduction to Finite Element Method**, Chandrakantha S. Desai, John F. Abel East, West-publication.

Course Outcomes:

Upon successful completion of the course, the student will able to

1. Formulate the three dimensional stress, strain equations using theory of elasticity.
2. Evaluate engineering problems by Rayleigh-Ritz method.
3. Solve the 1D problem using FEA.
4. Evaluate trusses and beams using FEA.
5. Evaluate beams using FEA.
6. Solve the 2D problem by FEA.

Mapping of COs to POs:

| Course Outcomes | Programme Outcomes that are satisfied by the COS |
|-----------------|--|
| CO1 | PO1,PO2,PO5 |
| CO2 | PO1,PO3 |
| CO3 | PO1,PO2, PO5 |
| CO4 | PO1,PO2, PO5 |
| CO5 | PO1,PO2, PO5 |
| CO6 | PO1,PO2,PO3 |

Electives- III**DATABASE MANAGEMENT SYSTEM (3:0:0)**

Course Code : IP 0314
Hrs/Week : 03
SEE Hrs : 03

CIE : 50% Marks
SEE : 50% Marks
Max. Marks: 100

Course Objective:

To make students understand the concepts of database management, models, relational models, writing simple and complex SQL queries, normalization and transaction in database system.

Unit 1

Database and Users: Introduction, characteristics of database approach, intended uses of a DBMS and advantages of DBMS.

Database Systems concepts and Architecture: Data models, schemas and instances, DBMS architecture and data independence, database languages and interfaces, database system environment, classification of database management systems. **6Hrs**

SLE: Implications of database approaches.

Unit 2

Data Modeling: High level conceptual data models for database design, entity types, entity sets, attributes and keys, relationships, relationship types, roles and structural constraints, weak entity types, ER diagrams. **8Hrs**

SLE: ER diagram for different applications.

Unit 3

Relational Data model and Relational Algebra: A Brief discussion on codd rules, relational model concepts, constraints and schemas. Update operation on relations, basic and additional relational algebra operations and queries in relational algebra. **7Hrs**

SLE: Writing queries in SQL for given application.

Unit 4

(SQL) Structured Query Language: Data definition in SQL2, basic and complex queries in SQL, insert, delete, update statements. **7Hrs**

SLE: Views in SQL, embedded SQL.

Unit 5

Database Design: Design guidelines for relational schemas, functional dependencies, normalization – 1st, 2nd, 3rd, 4th and 5th normal forms, and database design process and guide lines for relational systems. **7Hrs**

SLE: Factors influencing physical database design guidelines.

Unit 6

Transaction: Concepts, properties, schedules, based on serializability, transactional support in SQL– two phase locking, database recovery techniques. **7Hrs**

SLE: *Concurrency control techniques*

Text Books:

1. **Fundamentals of Database system** – RameElmasri and Shamakanth B Navathe, 6thEdn, Pearson, 2014.

References:

1. **Modern Database management**, Jeffrey A. Hoffer ,Ramesh Venkataraman,Heikki Topi,10th Edition, 2013
2. **Database Management and Design** – Gary W.Hansen and James V Hansen, 2nd edition, PHI Pvt. Ltd.1995.
3. **Database Management System** – Raghu Ramakrishnan and Johannes Gehrke 3rdedition, Tata Mc Graw Hill, 2014.

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Understand data, database and characteristics, advantages and models of data base.
2. Demonstrate the models, architecture, languages and classification of database management system.
3. Recall the relational data models and constraints and concepts.
4. Understand the basic concept of SQL and construct the queries for the given application.
5. Comprehend the Functional dependencies and normalization concepts in database design
6. Illustrate the transaction concepts, ACID properties and concurrency control to design the online transaction databases.

Mapping of COs to POs:

| Course Outcomes | Programme Outcomes that are satisfied by the COS |
|-----------------|--|
| CO1 | PO1 |
| CO2 | PO10 |
| CO3 | PO3 |
| CO4 | PO5 |
| CO5 | PO3 |
| CO6 | PO5 |

MECHANICAL VIBRATIONS (3-0-0)

Sub Code : IP 0307
Hrs / Week : 03
SEE Hrs : 03

CIE : 50% Marks
SEE : 50 %Marks
Max. Marks: 100

Course Objective:

To analyze and effect of mechanical vibration in simple components having degrees of freedom.

Unit 1

Undamped Free Vibrations: Types of vibrations, S.H.M, principle of super position applied to simple harmonic motions, beats, Fourier theorem and simple problems. single degree of freedom systems, introduction, undamped free vibration-natural frequency of free vibration, stiffness of spring elements. **7Hrs**

SLE: Effect of mass of spring,

Unit 2

Damped Free Vibrations: Single degree freedom systems, different types of damping, viscous damping concept of critical damping and its importance, study of response of viscous damped systems for cases of under damping, critical and over damping, logarithmic decrement

SLE: Coulomb Damping.

7Hrs**Unit 3**

Forced Vibrations: Single degree freedom systems, steady state solution with viscous damping due to harmonic force, solution by complex algebra, concept of response, reciprocating and rotating unbalance, vibration isolation-transmissibility ratio, energy dissipated by damping, sharpness of resonance, base excitation. vibration measuring instruments: whirling of shafts with and without air damping, discussion of speeds above and below critical speeds. **8Hrs**

SLE: Accelerometer and Vibrometers.

Unit 4

Systems With Two Degrees of Freedom: introduction, principle modes and normal modes of vibration, co-ordinate coupling, generalized and principal co-ordinates, free vibration in terms of initial conditions, geared systems. **8Hrs**

SLE: Dynamic vibration absorber

Unit 5

Multi Degree of Freedom Systems and Continuous Systems: Governing differential equation for a MDOF system, introduction to continuous systems, vibration of string, longitudinal vibration of rods, torsional vibration of rods. **6Hrs**

SLE: Euler's equation for beams.

Unit 6

Numerical methods for Vibration Analysis: Introduction, influence coefficients, Method of matrix iteration, Dunkerley's equation, Rayleigh's method, Rayleigh Ritz method for beam vibrations, orthogonality of principal modes, orthogonality principle, Stodola Method Holzer's method, geared and branched systems. **6Hrs**

SLE: Maxwell reciprocal theorem.

Text Books:

1. **Theory of Vibration and Applications** by William T. Thomson and Maric Dillon Dhlech. Pearson Education, 5th Edn. 2001.
2. **Mechanical Vibration** by V.P.Singh, New Delhi Publishers.

Reference Books:

1. **Fundamentals of Vibration** by Leonard Meirovitch, Tata Mc. Graw Hill, 2001.
2. **Mechanical Vibrations** by S.S.Rao, Pearson Education, 4th Edition, 2009.
3. **Mechanical Vibration** by G.K. Grover, Nemi Chand and Bros. Roorkee (UP), 1986.

Course Outcomes:

Upon successful completion of this course, the students will be able to:

1. Identify and derive vibration characteristics of undamped free vibration systems using fundamental concepts of mathematics and physics.
2. Demonstrate and characterize the effect of damping on free vibration characterize.
3. Analyze and derive characteristics of forced vibrations and use various systems for vibration measurement.
4. Characterize two degree vibration systems in terms of natural frequency, mode shapes and coupling phenomena.
5. Demonstrate the characteristic of vibration of multi degree freedom systems of both translation and rotational vibrating systems.
6. Demonstrate the application of numerical methods to study the characterize of vibration of multi degrees of freedom systems.

Mapping of COs to POs:

| Course Outcomes | Programme Outcomes that are satisfied by the COS |
|-----------------|--|
| CO1 | PO1, PO2 |
| CO2 | PO2, PO2,PO3 |
| CO3 | PO1, PO2,PO4 |
| CO4 | PO2, PO3,PO4 |
| CO5 | PO2,PO3 |
| CO6 | PO2,PO3 |

AUTOMATION IN MANUFACTURING (3:0:0)

Course Code :IP 0316
Hrs/Week : 03
SEE Hrs : 03

CIE : 50% Marks
SIE : 50% Marks
Max. Marks: 100

Course Objective:

Able to appreciate the methods of automating and controlling manufacturing systems.

Unit1

Automation in production systems: Introduction, automated manufacturing systems, computerized manufacturing support systems, reasons for automating, automation principles and strategies. **8Hrs**

SLE: Automation migration strategy.

Unit2

Automated systems:Basic elements of automated system, advanced automation functions, levels of automation.

Hardware components for automation: Sensors, actuators, analog to digital converters, digital to analog converter. **7Hrs**

SLE: Input/output devices for discrete data.

Unit3

Numerical control (NC):Fundamentals of NC technology, computer numerical control, application of NC, advantages and disadvantages of NC.

NC part programming: Manual part programming, NC part programming using CAD/CAM

6Hrs

SLE:Computer assisted part programming.

Unit-4

Industrial Robotics: Introduction: Robot anatomy and related attributes, robot control systems, end effectors, industrial robot applications. **7Hrs**

SLE: Sensors in robotics

Unit-5

Discrete control:Discrete process control, concepts of logic control and sequencing, programmable logic controllers. **7Hrs**

SLE: Personal computers using soft logic.

Unit-6

Automatic Identification and Data Capture: Introduction, overview of automatic identification,Methods linear bar codes, radio frequency identification. **7Hrs**

SLE: Magnetic stripes. Optical character recognition (OCR), machine vision.

Text Books:

1. **Automation, production systems and computer integrated manufacturing-** Mikell.P.Groover PHI, New Delhi – 2009.

References:

1. **CAD/CAM-**Mikell.P.Groover and Emory W.Zimmers, PHI, New Delhi – 1994.
2. **Numerical control and computer aided manufacture,** pressman and willims PHI – 1991.
3. **An introduction to automated process planning system,** TiessChieu Chang and Richard A Wusk PHI – 2002.

Course Outcomes:

Upon successful completion of the course, the student will able to

1. Apprehend the application of automation in manufacturing systems.
2. Interpret the basis of automation.
3. Recall the concepts of numerical control.
4. Outline the application of robots in automated manufacturing systems.
5. Identify the control mechanism in automation.
6. Select the appropriate automatic identification and data encoding systems for use in automated systems.

Mapping of COs to POs:

| Course Outcomes | Programme Outcomes that are satisfied by the COS |
|------------------------|---|
| CO1 | PO1,PO2,PO3,PO4,PO5 |
| CO2 | PO1,PO2,PO3,PO4,PO5 |
| CO3 | PO1,PO2,PO3,PO4,PO5 |
| CO4 | PO1,PO2,PO3,PO4,PO5 |
| CO5 | PO1,PO2,PO3,PO4,PO5 |
| CO6 | PO1,PO2,PO3,PO4,PO5 |

TOTAL QUALITY MANAGEMENT (3:0:0)

Course Code :IP 0318
Hrs/Week : 03
SEE Hrs : 03

CIE : 50% Marks
SEE : 50% Marks
Max. Marks: 100

Course Objective:

To understand the quality management imperatives and practice of quality systems, tools and techniques in industries.

Unit 1

Introduction of TQM: Definition, basic approach, Gurus of TQM, TQM frame work, awareness, defining quality, historical review, obstacles, benefits of tqm

Leadership : Definition, characteristics of quality leaders, leadership concept, characteristics of effective people, ethics, The Deming philosophy, role of TQM leaders and various theories, implementation, core values, concepts, and frame work, strategic planning communication, decision making. **8Hrs**

SLE: Role of quality in survival of an organization.

Unit 2

Customer satisfaction and Employee Involvement: customer satisfaction: customer and customer perception of quality, feedback, using customer complaints, service quality, translating needs into requirements, customer retention, case studies.

Employee Involvement – Motivation, employee surveys, empowerment, teams, suggestion system, recognition and reward, gain sharing, performance appraisal, unions and employee involvement, case studies. **8Hrs**

SLE: Quality and employee satisfaction

Unit 3

Continuous Process Improvement: Process, the Juran trilogy, improvement strategies, types of problems, the PDCA Cycle, problem-solving methods, Kaizen, reengineering, six sigma, case studies.

Tools and Techniques: Benchmarking, information technology, quality management systems, environmental management system, and quality function deployment, quality by design, failure mode and effect analysis, product liability, total productive maintenance. **7Hrs**

SLE: Case studies on bench marking and QFD

Unit 4

Quality Management Tools: Why Why analysis, forced field analysis, nominal group technique, affinity diagram, interrelationship diagram, tree diagram, matrix diagram, prioritization matrices, process decision program chart, activity network diagram. **6Hrs**

SLE: Case studies on various quality tools.

Unit 5

Statistical Process Control: Pareto diagram, process flow diagram, cause and effect diagram, check sheets, histograms, statistical fundamentals, control charts, state of control, out of control process, control charts for variables, control charts for attributes, scatter diagrams, case studies.

5Hrs

SLE: Problems on regression and correlation.

Unit 6

Building and sustaining performance Excellence in Organizations: Making the commitment to total quality, organizational culture and total quality, change management, sustaining the quality organization, self-assessment process, implanting ISO 9000, six sigma, a view toward the future.

Design for six sigma: Tools for concept developments, tools for design development, Tools for design optimization and tools for design verification.

6Hrs

SLE: Case studies on ISO 14001, ISO 27001 and problems on six sigma.

Text books:

1. **Total Quality Management:** Dale H Bester field, Publisher – Pearson Education Inc, ISBN: 8129702606, Edition 04/e.
2. **Total Quality Management for Engineers:** M.Zairi, ISBN: 1855730243, Publisher: Wood head Publishing.

References:

1. **A New American TQM, four revolutions in management,** Shoji Shiba, Alan Graham, David Walden, Productivity press, Oregon, 1990.
2. **100 Methods for Total Quality Management.** Gopal k. Kanji and Mike Asher, ISBN:0803977476, Publisher: Sage Publications, Inc., Edition – 1
3. **Organizational Excellence through TQM,** H Lal, New age pub, 2008

Course Outcomes:

Upon successful completion of the course, the student will be able to:

1. Demonstrate the principles of TQM and importance of their implementation in industry.
2. Understand the importance of customer satisfaction and employee involvement in the growth of organization.
3. Describe the concept of quality from customer view and motivate the employees towards achievement.
4. Imbibe them with knowledge on various tools and techniques of quality management.
5. Understand the concepts of statistical process, tools and techniques
6. Explain the implantation for $6 - \sigma$ and its importance.

Mapping of COs to POs:

| Course Outcomes | Programme Outcomes that are satisfied by the COS |
|------------------------|---|
| CO1 | PO11 |
| CO2 | PO11,PO12 |
| CO3 | PO6,PO7 |
| CO4 | PO3,PO4 |
| CO5 | PO4,PO5 |
| CO6 | PO11 |

VIII Semester(Core Courses)**OPERATIONS MANAGEMENT (4:0:0)**

Course Code : IP0425
Hrs/Week : 04
SEE Hrs : 03

CIE : 50% Marks
SEE : 50% Marks
Max. Marks: 100

Course Objective:

This course is designed to address the key operations and logistical issues in service and manufacturing organizations that have strategic as well as tactical implications.

Unit 1

Operations Management Concepts: Introduction, historical development, the trend: information and non-manufacturing systems, factors affecting productivity,

Operations Decision Making: Introduction, management as a science, characteristics of decisions, framework for decision making, decision methodology, decision support systems, economic models, statistical models. **10Hrs**

SLE: The environment of operations.

Unit 2

Forecasting Demand: Forecasting objectives and uses, forecasting variables, opinion and judgmental methods, time series methods, exponential smoothing, regression and correlation methods, application and control of forecasts. **8Hrs**

SLE: Forecasting tools used in various types of industries.

Unit 3

System Design and Capacity: Introduction, manufacturing and service systems, design and systems capacity, capacity planning.

Material and Capacity Requirements Planning: Overview: MRP and CRP, MRP: underlying concepts, system parameters, MRP logic, capacity planning, capacity management, CRP activities. **8Hrs**

SLE: Master scheduling methods

Unit 4

Aggregate Planning and Master Scheduling: Introduction to planning and scheduling, objectives of aggregate planning, aggregate planning methods, master scheduling objectives.

Scheduling and Controlling Production Activities: Introduction, PAC, objectives and data requirements, scheduling strategy and guidelines, scheduling methodology, priority controls. **8Hrs**

SLE: Capacity control.

Unit 5

Inventory control: Introduction, types of inventory, inventory costs, factors involved in inventory analysis, inventory models, purchasing model with no shortage, purchasing model with shortage, manufacturing models with no shortage, manufacturing models with shortage, lead time, safety stock, buffer stock, ABC analysis. **8 Hrs.**

SLE: Inventory model with probabilistic demand.

Unit 6

Single Machine Scheduling: Concept, measures of performance, SPT rule, weighted SPT rule, EDD rule.

Flow-Shop Scheduling: Introduction, Johnson's rule for jobs on 2 and 3 machines. n jobs on m machines.

Job-Shop Scheduling: Types of schedules, heuristic procedure, scheduling 2 jobs on 'm' machines. **10Hrs**

SLE: Minimizing the number of tardy jobs.

Text Books:

1. **Production and Operations Management** – Pannerselvam. R, PHI , 3rd edition, 2015.

References:

1. **Production and Operations Management** – Chary, S.N, Tata-McGraw Hill., 5th edition, 2013.
2. **Operations Management** – Lee J Krajewski and Larry P Ritzman, strategy and Analysis, , Pearson Education Asia, 11th Edition, 2015.
3. **Modern Production/Operations Management** – Elwood S Buffa, Manoj K Malhotra, Samir K Srivastava, Rakesh K Sarin, 8th edition, Wiley India Ltd 2007.
4. **Operations Management**- Joseph Monks, Schaum's outline of operations management. 2ndEdn, 1996.

Course Outcomes :**Upon successful completion of the course, the students will be able to**

1. Identify the roles and responsibilities of operations managers in different organizational contexts. Select and apply relevant concepts and tools to optimize the process/production system.
2. Demonstrate the skills needed to design and manage change in an organization using qualitative and quantitative tools, with due consideration for impact on human resource Understanding of the global environment of business and use of business tools.
3. Optimize production objective of maximizing profit using qualitative and quantitative techniques in the areas of job design, inventory control, material requirement planning, aggregate planning and scheduling.
4. Understand capacity management, apply techniques relating to resource planning, and recommend appropriate actions in a given situation.
5. Demonstrate the skill needed to control the inventory.

-
6. Describe advanced production models like lean manufacturing, just in time and review their contribution to profit.

Mapping of COs to POs:

| Course Outcomes | Programme Outcomes that are satisfied by the COS |
|------------------------|---|
| CO1 | PO1,PO2 |
| CO2 | PO7 |
| CO3 | PO4 |
| CO4 | PO5 |
| CO5 | PO2 |
| CO6 | PO11 |

SEMINAR ON CONTEMPORARY TECHNICAL TOPICS (0:0:2)**Course Code: IP0111****Max.Marks: 50**
Hrs/Week : 02***Course Objective:***

To enable the students to identify their area of interest, making them to carry out literature survey and arrive at a latest topic in the field for presentation.

Course Outcomes:**Upon successful completion of the course, the students will be able to**

1. Identify contemporary technical topics for presentation.
2. Carryout literature survey to comprehend the topic.
3. Know the usage of modern tools and techniques.
4. Write reports and make effective presentations.
5. Understand the impact of engineering solutions on safety, environment and society.

Mapping of COs to POs:

| Course Outcomes | Programme Outcomes that are satisfied by the COS |
|------------------------|---|
| CO1 | PO1,PO2,PO12 |
| CO2 | PO1,PO2,PO11,PO12 |
| CO3 | PO1,PO2,PO4,PO5,PO12 |
| CO4 | PO1,PO2,PO3,PO9,PO10 |
| CO5 | PO3,PO6,PO7,PO12 |

PROJECT WORK (0:0:12)

Course Code :IP0601

Max. Marks : 100
Hrs/Week: 12

Course Objective:

To initiate innovation, to undergo industrial exposure and develop team building, leadership qualities.

The students continue with the project work, bring the same to logical conclusions and submit a report followed by a seminar on the same..

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Identify the problem and carryout literature survey so as to comprehend the same.
2. Analyze, evaluate, formulate the problem and arrive at optimal solutions using modern tools taking into consideration societal and environmental factors.
3. Write comprehensive reports and give presentations.
4. Understand the need for team work and develop leadership qualities.

Mapping of COs to POs:

| Course Outcomes | Programme Outcomes that are satisfied by the COS |
|-----------------|--|
| CO1 | PO1,PO2,PO3, PO8,PO9,PO10 |
| CO2 | PO1,PO2,PO3,PO4,PO5,PO6,PO7,PO8,PO9,PO10,PO11,PO12 |
| CO3 | PO1,PO2,PO3,PO9,PO10 |
| CO4 | PO9,PO12 |

Electives-IV

DIGITAL MANUFACTURING (3:0:0)

Sub Code : IP0334

Hrs / Week : 03

SEE Hrs : 3 Hrs

CIE: 50 % Marks

SEE: 50 %Marks

Max. Marks: 100

Course objectives:

Is to give an exposure of digital manufacturing and its techniques

Unit 1

Introduction To Digital Manufacturing: Definition of digital manufacturing, Operation Mode and Architecture of Digital Manufacturing System.

CAD Modeling: Design process and role of CAD, Types and applications of design models, Three dimensional modeling schemes, Wire frames and surface representation schemes, Solid modeling. **8Hrs**

SLE: Parametric modeling, Assembly modeling.

Unit 2

Computer Aided Manufacturing: Component modeling, Machine and tool selection, Defining process and parameters, Tool path generation, Simulation, Post processing.

Reverse Engineering: Need, Reverse engineering process, Reverse engineering hardware and software. **8Hrs**

SLE: Geometric model development.

Unit 3:

Concepts Modelers: Principle, Thermal jet printer, Sander's model market, 3-D printer. Genisys Xs printer HP system 5. **6 Hrs**

SLE: Object Quadra systems

Unit 4:

Rapid Tooling: Indirect Rapid tooling -Silicone rubber tooling –Aluminum filled epoxy tooling Spray metal tooling, Cast kirksite, 3Q keltool, Direct Rapid Tooling Direct. AIM, Quick cast process, Copper polyamide, Rapid Tool, DMILS, Prometal, Sand casting tooling, laminate tooling. **8 Hrs**

SLE: Soft Tooling vs. hard tooling

Unit 5

Digital Factory and Virtual Manufacturing: Introduction, Scope, Methods and Tools Used in Virtual Manufacturing, Benefits. **6Hrs**

SLE: Virtual factory simulation.

Unit 6

Internet of Things: Introduction, Applications, IoT data management requirements, Architecture of IoT, Technological challenges, RFID and the Electronic Product Code (EPC) network, The web of things. **6Hrs**

SLE: Issues in implementing IoT.

Text Books:

1. Ibrahim Zeid and Sivasubramanian R, "CAD/CAM - Theory and Practice", Tata McGraw Hill Education, 2011.
2. Vinesh Raja and Kiran J Fernandes, "Reverse Engineering- An Industrial Perspective", Springer-Verlag, 2008
3. Pham D T and Dimov S S, "Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping", Springer-Verlag, 2001.
4. Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", Springer, 2005.
5. Adrian McEwan and Hakim Cassimally, "Designing the internet of things", Wiley, 2013.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1. Comprehend the growth of digital manufacturing and their advantages.
2. Understand CAM and reverse engineering
3. Evaluate different Concept Modellers.
4. Distinguish direct and indirect tooling systems for Rapid Prototyping.
5. Understand digital factory and virtual manufacturing
6. Comprehend the importance of Internet of Things

Mapping of COs to POs:

| Course Outcomes | Programme Outcomes that are satisfied by the COS |
|-----------------|--|
| CO1 | PO1,PO2,PO3 |
| CO2 | PO1,PO2,PO3 |
| CO3 | PO1,PO2 |
| CO4 | PO1,PO2,PO3,PO4,PO5 |
| CO5 | PO1,PO2,PO3,PO4,PO5 |
| CO6 | PO1,PO2,PO3,PO4,PO5 |

MACHINE TOOL DESIGN (3:0:0)

Course Code : IP 0319
Hrs/Week : 03
SEE Hrs : 03

CIE : 50% Marks
SEE : 50% Marks
Max. Marks: 100

Course Objective:

To make students understand the principles of machine tool components design such as machine tool structures, guide ways and power - screws, spindles and spindle supports and the like.

Unit 1

Introduction to machine tool drives and mechanisms: working and auxiliary motions in machine tools, parameters defining working motions of a machine tool, machine tool drives, mechanical transmission and its elements, hydraulic transmission and its elements. general requirements of machine tool design.

Cutting force analysis and power requirement: Cutting force analysis and power requirement in turning, milling, drilling and broaching operation (with simple problems).

8Hrs

SLE: Technico-Economical prerequisites for undertaking the design of new machine tool.

Unit2

Regulation of Speed and Feed rates: Aim of speed and feed regulation, stepped regulation of speed, design of speed box, design of feed box, determining the number of teeth of gears, stepless regulation of speed and feed rates, hydraulic, electrical and mechanical stepless regulations.

8Hrs

SLE: Classification of speed and feed boxes.

Unit3

Design of Machine Tool Structures: Functions of machine tool structures and their requirements, design criteria for machine tool structures, materials for machine tool structures, static and dynamic stiffness, profiles of machine tool structures, basic design procedure for machine tool structures. design of beds, design of columns, design of housings, design of bases and tables.

8Hrs

SLE: Design of Cross rails, arms, saddles and carriages, design of rams.

Unit4

Design of guideways and power screws: functions and types of guideways, design of slideways, design criteria and calculations for slideways, design of anti friction guideways, design of aerostatic slideways, design of power screws.

6Hrs

SLE: Protecting devices for slideways.

Unit 5

Design of Spindles and Spindle Supports: Functions of spindle unit and requirements, materials of spindles, effect of machine tool compliance on machining accuracy, design calculations of spindles, antifriction bearings. **6Hrs**

SLE: Sliding bearings.

Unit 6

Dynamics of Machine Tools: Concept of dynamic cutting process, physical causes of chatter and vibrations, types of chatter, stability charts, chatter vibrations – lathes – drilling machines – grinding machines – milling machines, different methods for avoiding machine tool chatter and vibrations. **6Hrs**

SLE: Ergonomic considerations.

Text Books:

1. “Machine Tool Design” by N.K.Mehta, , Tata McGraw-Hill, 2nd edition, 2008

References:

1. “Design of Machine Tools and Numerical Control” by S.K.Basu and D.K.Pal, Oxford, 6th edition, 2014.
2. **Principles of Machine Tools** by Sen and Bhattacharya, Oxford I.B.M Publishing, 2006.

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Know the general requirement for machine tool design understanding the cutting forces and power requirement for various machining operations.
2. Understand the mechanism of stepped and stepless- regulation of speeds and feeds.
3. Explain the design procedure for machine tool structures like beds, columns, housings etc.
4. Design the guide ways and power screws of machine tools.
5. Carry out design calculations for spindles.
6. Explain the dynamics of machine tool structures.

Mapping of COs to POs:

| Course Outcomes | Programme Outcomes that are satisfied by the COS |
|-----------------|--|
| CO1 | PO1,PO2,PO3 |
| CO2 | PO1,PO2,PO3 |
| CO3 | PO1,PO2 |
| CO4 | PO1,PO2,PO3,PO4,PO5 |
| CO5 | PO1,PO2,PO3,PO4,PO5 |
| CO6 | PO1,PO2,PO3,PO4,PO5 |

JOINING PROCESSES AND NON DESRUCTIVE TESTING (3:0:0)

Course Code : IP0335
 Hrs/Week : 03
 SEE Hrs : 03

CIE : 50% Marks
 SEE : 50% Marks
 Max. Marks: 100

Course Objective:

To make students aware of latest welding surface techniques and their applications; also to introduce different destructive and non destructive methods of inspection of welds.

Unit 1

Metal surfacing and spraying: Introduction, wear modes, types of surfacing process and procedure , selection of surfacing process and material, , applications, Introduction to metal spraying, types,sprayng techniques with oxyfuel and plasma coating charecterestics and evaluation,applications. **8Hrs**

SLE: Electric arc wire spraying method.

Unit 2

Welding in space and low gravity Environment: Need, principle of operation of electron beam welding, gas tungsten arc welding and their applications, metallurgy of these welds. **6Hrs**

SLE: Advantages and limitations of gravity welds.

Unit 3

Solid state Welding: Introduction to solid state welding,Friction welding, ultrasonic welding, diffusion welding, principle of operation and applications, advantages and limitations. **7Hrs**

SLE: Principles of explosive welding.

Unit 4

Welding of plastic and composites: Principle of welding plastics,common weldable plastics, welding joint design, surface preparation, plastic welding processes, principle of operation, equipment.Applications,methods of welding composites,induction welding, ultrasonic welding, gas tungsten arc welding (GTAM),Magnetically impelled arc butt welding (MIAB) **7Hrs**

SLE: Advantages, limitations and of plastic welding.

Unit 5

Introduction to nondestructive testing:Need , selection of ND methods, visual inspection, liquid penetration inspection, magnetic particle inspection,ultrasonic inspection procedure, pulse echo techniques,through transmission system,resonance system. **6Hrs**

SLE: A, B and C scanning methods.

Unit 6

Radiographic Inspection: Principles, radiation sources, x-rays and gamma rays, X rays tubes, radio graphic films, inspection of welds. **7Hrs**

SLE: Electron neutron radiography applications.

Text books:

1. **Welding Engineering and technology** –Dr.R.S.Parmar,-khanna publications, 2nd edition,2015.
2. **A Textbook of welding technology**-O.P.Khanna-Dhanpat rai and sons. Revised edition, 2015.

References:

1. **ASM Hand book-vol-6**, welding, brazing and soldering. 10th reprint - 2013.
2. **Non destructive testing** –McGonagall J.J.,- Garden and Reach, Newyork(Latest edition).
3. **Welding and welding technology**-Richard L Little, 27th reprint 2005 Mc Graw –HILL, Inc.
4. **ASM Hand book-vol-6A**, Welding Fundamentals & processes 2011.

Course outcomes:

Upon successful completion of the course, the students will be able to

1. Understand the need for metal surfacing thermal spraying and explain the spraying methods for producing the same .
2. Explain the various methods of welding to be used in space and low gravity simulations.
3. Identify the type of solid state welding techniques to be used for specific applications and know the procedure of the same.
4. Explain the various methods of plastic welding and procedure.
5. Understand the need for non-destructive testing of welds and know the procedure to conduct the same.
6. Explain in depth radiographic inspection of welds.

Mapping of COs to POs:

| Course Outcomes | Programme Outcomes that are satisfied by the COS |
|-----------------|--|
| CO1 | PO1,PO2 |
| CO2 | PO1,PO2 |
| CO3 | PO1,PO2 |
| CO4 | PO1,PO2 |
| CO5 | PO1,PO2 |
| CO6 | PO1,PO2 |

PRODUCT DESIGN AND DEVELOPMENT (3:0:0)

Course Code : IP0322
Hrs/Week : 03
SEE Hrs : 03

CIE : 50% Marks
SEE : 50% Marks
Max. Marks: 100

Course Objective:

Students will learn to develop different design concepts of a product and will select an appropriate concept for further development.

Unit 1

Introduction to Product Development process and organizations: characteristics of successful product development, product development team, challenges of product development, generic development process, concept development, variants of generic product development process. Product development organization. **7Hrs**

SLE: Characteristics of different organizational structures.

Unit 2

Product Planning: The product planning process: identify opportunities evaluate and prioritize projects, allocate resources and plan timing, complete pre-project planning, reflect on the results and the process. **6Hrs**

SLE: A Case study on product planning.

Unit 3

Identifying Customer Needs: Gather raw data from customers, interpret raw data in terms of customer needs, organize the needs into a hierarchy, establish the relative importance of the needs, reflect on the result and the process. **6Hrs**

SLE: Hierarchical list of primary and secondary customer needs for different products.

Unit 4

Product Specifications: Specifications, specifications established, establishing target specifications: Prepare the list of metrics, collect competitive benchmarking information, set ideal and marginally acceptable target values, reflect on the results and the process, Setting the final specifications: develop technical models of the product, develop a cost model of the product, refine the specifications, making trade-offs where necessary, flow down the specifications as appropriate, reflect on the results and the process. **8Hrs**

SLE: Preparation of final specifications using the list of metrics for any product.

Unit 5

Concept Generation and Selection: The activity of concept generation: clarify the problem, search externally, Search internally, explores systematically, reflect on the solution and the process.

Concept Selection: Concept in an integral part of the product development process, all terms are some method for choosing a concept, a structured method offers several benefits, overview of methodology, concept screening, concept scoring. **8Hrs**

SLE: Concept selection methods be used to benchmark evaluate existing product.

Unit 6

Concept testing: Concept testing steps, Define the purpose of the concept test, choose a survey population, choose a survey format, communicate the concept, measure customer response, interpret the results, reflect on the result and the process.

Product Architecture: Implication of the architecture, establishing the architecture, delayed differentiation, platform differentiation. **7Hrs**

SLE:Related system – level design issues.

Text book:

1. **Product design and development** – Karl T Ulrich, Steven D Epingner, and Anita Goyal, Tata McGraw Hill, 4thEdn. 2015.

References:

1. **The Mechanical Design Process** – David G. Ullman, Tata McGraw Hill, 4thEdn. 2011.
2. **Engineering Design** – George E. Dieter, Linda C. Schmidt, McGraw Hill, 4thEdn. 2013.
3. **Engineering by Design** – Gerald Voland, Pearson Education, 2ndEdn. 2012.

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Explain the characteristics and process of product development
2. Demonstrate the product planning, evaluating and allocation of resources.
3. Identify the importance of customer needs.
4. Establish the product specifications and set the final specifications based on identified customer needs.
5. Develop different concepts and select the appropriate one for further design.
6. Develop techniques for testing of generated concepts and product architecture.

Mapping of COs to POs:

| Course Outcomes | Programme Outcomes that are satisfied by the COS |
|-----------------|--|
| CO1 | PO1,PO12 |
| CO2 | PO1 |
| CO3 | PO1,PO2,PO5 |
| CO4 | PO1,PO2,PO3,PO5 |
| CO5 | PO1,PO2,PO3,PO5 |
| CO6 | PO1,PO2,PO3,PO4,PO5 |

Elective - V**MANAGEMENT INFORMATION SYSTEM (3:0:0)**

Course Code : IP 0324
Hrs/Week : 03
SEE Hrs : 03

CIE : 50% Marks
SEE : 50% Marks
Max. Marks: 100

Course Objective:

Students will learn different information systems and technology used in a business analysis and understand different decision support systems.

Unit 1

Foundation Concepts: Foundation of information systems in business – information systems and technologies, applications, development and management, competing with information technology. **8Hrs**

SLE: Fundamentals of strategic advantage, using information Technology for strategic advantage.

Unit 2

Review of information Technologies: Computer hardware , computer systems, end user and enterprise computing. computer peripherals: input, output, and storage technologies, computer software , application software: end user applications, system software. **5Hrs**

SLE: Computer system management.

Unit 3

Data resource management , technical foundations of database management. **6Hrs**

SLE: Managing data resources.

Unit 4

Business Applications: The internet worked E-business enterprise, the internet, intranets and extranets in business, enterprise communication and collaboration, electronic business systems, cross functional E-business systems functional E- business systems, electronic commerce systems, electronic commerce fundamentals, commerce applications and issues, E-business decision support system, artificial intelligence, technologies in business. **8Hrs**

SLE: Decision support in E-business.

Unit 5

Development Process: Developing E-business strategies, E-business planning fundamentals, implementing E-business strategies, Developing E-business solutions, developing E-business systems, implementing E-business systems. **8Hrs**

SLE: E-business planning fundamentals**Unit 6**

Management Challenges: Security and ethical challenges of E-business, security, ethical and societal challenges of E-business, security management of E-business, enterprise and global management of E-business technology, managing E-business technologies. **7Hrs**

SLE: Global E-business Technology Management.

Text Books:

1. **Management Information Systems** by W.S.Jawadekar TMH Publishing, 1998 Edition.
2. **Management Information Systems – Managing information technology in the internet worked enterprise** –James A O’Brien, Tata McGraw Hill publishing company limited, 2002, 5th edition.

References:

1. **Management Information Systems** – Laudon and Laudon, PHI publishing.
2. **Management Information Systems** – S.Sadagopan PHI Publishing.
3. **Information System for Modern Management** by G.R.Murdick, PHI Publishing.

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Explain the foundation concepts in information system technologies and E-business application.
2. Identify the computer hardware and software including business application software.
3. Interpret the new content on data resource management, data warehouses and data mining.
4. Illustrate how internet, intranet and extranet are used in E-business enterprises to support electronic business and commerce, team and enterprise collaboration and business decision making.
5. Develop and implementing E-business strategies and systems using several strategic planning and application development approaches.
6. Explain the challenges of E-business technologies and strategies, including security and ethical challenges and global IT management.

Mapping of COs to POs:

| Course Outcomes | Programme Outcomes that are satisfied by the COS |
|------------------------|---|
| CO1 | PO1 |
| CO2 | PO2 |
| CO3 | PO5 |
| CO4 | PO1,PO5,PO10 |
| CO5 | PO1,PO2 |

| | |
|-----|--------------|
| CO6 | PO7,PO8,PO10 |
|-----|--------------|

INDUSTRIAL DESIGN AND ERGONOMICS (2:2:0)

Course Code : IP 0320
Hrs/Week : 04
SEE Hrs : 03

CIE : 50% Marks
SEE : 50% Marks
Max. Marks: 100

Course Objectives:

To introduce principles of industrial design and ergonomics facilitating the achievement of improved efficiency of man and machine.

Unit 1

Introduction: An approach to industrial design, Elements of design structure for industrial design in engineering application in modern manufacturing systems

Ergonomics and Industrial Design: Introduction to ergonomics, communication system, general approach to the man-machine relationship, human component of work system, machine component of work system, local environment-light, heat, sound. **8Hrs**

SLE: Design of layouts.

Unit 2

Ergonomics and Production: Ergonomics and product design, anthropometric data and its applications in ergonomic, working postures, body movements, work station design, chair design. **8Hrs**

SLE: Design and drawing of workstations.

Unit 3

Displays: Design principles of visual displays, classification, quantitative displays, qualitative displays, check readings, situational awareness, representative displays, design of pointers, signal and warning lights, colour coding of displays, design of multiple displays.

Controls: Design considerations, controls with little efforts – push button, switches, rotating knobs. controls with muscular effort – hand wheel, crank, heavy lever, pedals. design of controls in automobiles, machine tools. **6Hrs**

SLE: Design and Drawing of domestic and Industrial displays and controls.

Unit 4

Visual Effects of Line and Form: The mechanics of seeing, psychology of seeing, figure on ground effect. gestalt's perceptions – simplicity, regularity, proximity, wholeness. optical illusions, influences of line and form. **8Hrs**

SLE: Parts of Eye, structure of cones and rods

Unit-5

Colour: Colour and light, colour and objects, colour and the eye – after image, colour blindness, colour constancy, colour terms – colour circles, munsell colour notation, reactions to colour and colour combination – colour on engineering equipments, colour coding, psychological effects, colour and machine form, colour and style. **6Hrs**

SLE: Use of colours in Industries.

Unit-6

Aesthetic Concepts: Concept of unity, concept of order with variety, concept of purpose, style and environment, aesthetic expressions – symmetry, balance, contrast, continuity, proportion. style – the components of style, house style, style in capital good. **6Hrs**

SLE: Golden ratio and Use of aesthetics in design.

Text book:

1. Introduction to Ergonomics R.C.Bridger, McGraw Hill Publications.3rdEdn, 2008.

References books:

1. Human factor Engineering – Sanders and McCormick McGraw Hill Publications.7thEdn. 1993
2. Mayall W.H. “Industrial design for Engineers”, London Hiffie books Ltd., 1988.
3. Brain Shakel (Edited), “Applied Ergonomics Hand Book”, Butterworth scientific. London 1988.

Course Outcomes:**Upon successful completion of the course, the students will be able to**

1. Demonstrate familiarity with theoretical concepts explaining human cognitive functioning relating to the study of work.
2. Evaluate situations and recommend appropriate designing of work place.
3. Understand and apply ergonomic principles to design displays and controls for safer, efficient and effective utilization.
4. Recognize and value the diversity of human vision in product design.
5. Identify and use appropriate colours in workplace layout and engineering equipment design.
6. Apply aesthetic concepts for designing products.

Mapping of COs to POs:

| Course Outcomes | Programme Outcomes that are satisfied by the COS |
|------------------------|---|
| CO1 | PO1 |
| CO2 | PO3 |
| CO3 | PO3 |
| CO4 | PO5 |
| CO5 | PO4,PO7 |
| CO6 | PO5 |

ORGANIZATIONAL BEHAVIOUR (3:0:0)

Course Code : IP 0326
 Hrs/Week : 03
 SEE Hrs : 03

CIE : 50% Marks
 SEE : 50% Marks
 Max. Marks: 100

Course Objective:

Students will learn the the models of orhanizational behavior in general and also focus on the study of indivisual behavior which influences the functioning of the organizationa.

Unit 1

The foundations of organizational behavior: Introduction to OB, historical background, defining OB, theraticalfoundations for OB, Introduction to research methodology, use of research design **6Hrs**

SLE: Organizational behavior models.challenges and opportunities for OB

Unit 2

Organizational Learning: OB in global context, learning objectives, definition of TQM, TQM framework, basic approach,quality movement in india,obstracles to implement TQM, reengineering, bench marking, empowerment. **8Hrs**

SLE: Learning organizations.

Unit 3

Foundations of individual behavior: Biographical characteristics, ability, personality, types of personality, learning, types of learning, perception and individual decision, values, attitudes. **7Hrs**

SLE: Job satisfaction.

Unit 4

Basic Motivation concepts:Defining motivation, importance of motivation,Work motivation approaches, content theories of work motivation, process theories of work motivation, contemporary theories of work motivation. **6Hrs**

SLE: Job Design, Quality of work life and Goal Setting.

Unit 5

Foundations of Group Behavior: Defining and classifying groups,stages of group development, group structure, characteristics of effective groups, contingency variables that effect group behavior.

Communication and group decision making: Functions of communication, communication process.group versus indivisual, group descision making techniques **7Hrs**

SLE: Group processes and group tasks

Unit 6

Leadership: Leadership styles and skills, behavioral theories and contingency theories, power and politics, conflict and inter group behavior.

Foundations of organization structure: Organization structure, Job design, work settings and job stress, human resource policies and practices, organizational culture. **8Hrs**

SLE: Organizational change and development.

Text Books:

1. **Organizational Behavior** – Fred Luthans-Mc Graw Hill Publications –edition, 2013
2. **Organizational Behavior** – Stephen P Robbins- Prentice Hall India, Thirteenth Edition, 2008.

References:

1. **Human Behavior at work** – Keith Davis – Prentice Hall India, May 2006.
2. **Organizational Psychology** – Robin, Kolb, Oxford university press, USA, 4th Edition- 2006.

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Define different concepts related to Organizational behavior
2. understand different learning objectives with total quality management as bench mark.
3. Explain different characteristic of individual behavior
4. Summarize motivation approaches and consider job design with different contemporary theories.
5. Understand group dynamics in the light of indivisual and group behaviour
6. Extend the behavioral theories to leadership styles with group behavior as reference.

Mapping of COs to POs:

| Course Outcomes | Programme Outcomes that are satisfied by the COS |
|-----------------|--|
| CO1 | PO3 |
| CO2 | PO2 |
| CO3 | PO9 |
| CO4 | P12 |
| CO5 | P10 |
| CO6 | P9,P10 |

MARKETING MANAGEMENT (3:0:0)

Course Code : IP 0328
Hrs/Week : 03
SEE Hrs : 03

CIE : 50% Marks
SEE : 50% Marks
Max. Marks: 100

Course Objective:

This course provides an introduction to the fundamentals of marketing management, basic marketing concepts and elements of marketing practice. Emphasis will be on the managerial aspects of marketing plans, including analysis of the external environment.

Unit 1

Introduction: Historical development of marketing management, definition of marketing, core marketing concept, micro and macro environment, importance of marketing in the India socio economic system.

Consumer Markets and Buying behavior: characteristics affecting consumer behavior. Types of buying decisions, buying decision process, classification of consumer products.

10Hrs

SLE: Market segmentation.

Unit 2

Marketing Information system and Research: Components of marketing information system- benefits and uses of marketing research system, market research procedure, measurement of market demand.

4Hrs

SLE: Market research.

Unit 3

Marketing of Industrial Goods: Nature and importance of industrial market, classification of industrial products, participant in the industrial buying process, major factors influencing industrial buying behavior, characteristics of industrial market demand, determinants of industrial market demand buying process of industrial users. buying motives of industrial user, the industrial buying process.

6Hrs

SLE: Buying patterns of industrial users.

Unit 4

Products planning and development: The concept of a product, features of a product, product classification, policies, product planning and development, product line, product mix, factors influencing product mix, product mix strategies, meaning of new product, major stages in new product development, product life cycle.

Branding, Labeling and packaging: Branding reasons for branding, functions of branding, feature and types of brands, kinds of brand name.

Labeling: Types, functions,.

Packaging: Meaning, growth of packaging, functions of packaging.

10Hrs

SLE: Kinds of Packaging and Advantages and Disadvantages of Labeling.**Unit 5**

Pricing: Importance of price, pricing objectives, factors affecting pricing decisions, procedure for price determination, kinds of pricing strategies, strategies and decisions.

Distribution: Marketing channels, functions, number of channel level, physical distribution-importance, total system concept, strategy, use of physical distribution. **6Hrs**

SLE: Types of channels of distribution.**Unit 6**

Advertising and sales promotion: Objectives of advertisements, function of advertising classification of advertisement copy, advertisement media, kinds of media, advantages of advertising, objectives of sales promotion, advantages of sales promotion.

Personal selling: Objectives of personal selling, establishing the sales force objectives, sales force strategy, sales force structure and size, salesmanship, qualities of good salesman. **6Hrs**

SLE: Types of salesman, major steps in effective selling.**Text books:**

1. **Principles of Marketing** – Philip kotler, Prentice-Hall 11th edition, 2011.
2. **Marketing Management** – Philip kotler, Prentice-Hall, 12th edition, 2006.

References:

1. **Fundamentals of marketing** - William J Stanton, Mc GrawHill publications, 1998
2. **Marketing Management** – S A Sherlaker, Himalaya publishing house, 2009

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Describe micro and macro levels of marketing and the decision making processes.
2. Identify the different components of marketing information system and market research.
3. Explain the factors influencing buyer's behavior based on industrial products.
4. Comprehend the branding decisions with reference to a product considering product life cycle and factors such as branding, labeling and packaging.
5. Demonstrate the factors affecting pricing with different strategies and use of physical distribution systems with reference to marketing channels.
6. Predict the market, different media and salesmanship with selling and distribution strategies.

Mapping of COs to POs:

| Course Outcomes | Programme Outcomes that are satisfied by the COS |
|-----------------|--|
| CO1 | PO6 |
| CO2 | PO4 |
| CO3 | PO6,PO11 |
| CO4 | PO6,PO7 |

| | |
|------------|--------------------------|
| CO5 | PO6,PO11 |
| CO6 | PO6,PO8,PO10,PO11 |