M.S. RAMAIAH INSTITUTE OF TECHNOLOGY
BANGALORE
(Autonomous Institute, Affiliated to VTU)

SYLLABUS
(For the Academic year 2016 – 2017)

VII & VIII Semester B. E.
Industrial Engineering and Management
History of the Institute:

M. S. Ramaiah Institute of Technology was started in 1962 by the late Dr. M.S. Ramaiah, our Founder Chairman who was a renowned visionary, philanthropist, and a pioneer in creating several landmark infrastructure projects in India. Noticing the shortage of talented engineering professionals required to build a modern India, Dr. M.S. Ramaiah envisioned MSRIT as an institute of excellence imparting quality and affordable education. Part of Gokula Education Foundation, MSRIT has grown over the years with significant contributions from various professionals in different capacities, ably led by Dr. M.S. Ramaiah himself, whose personal commitment has seen the institution through its formative years. Today, MSRIT stands tall as one of India’s finest names in Engineering Education and has produced around 35,000 engineering professionals who occupy responsible positions across the globe.

History of Department:

The department was established in the year 1979 as Industrial & Production engineering and renamed as Industrial Engineering & Management in the year 1992 with an intake of 60 students and M.Tech program commenced in the year 2012. The department has been recognized as R&D center by VTU. The department has well modernized laboratories namely Industrial & Quality Engineering lab, Computer Lab and Metrology & Mechanical Measurement lab. The department highly qualified, motivated and result oriented faculty members. All the faculties are involved in research and technical paper publications in reputed technical journals, conferences across the world. The department was accredited by the NBA in 2001, 2004, 2010 & reaccredited in year 2015 as per the new NBA laid down by Washington Accord. It has consistently bagged university ranks in Bangalore University & VTU. It has set a unique record of achieving 1st rank eleven times. The department has successfully conducted seminars & workshops for academicians as well as Industry personnel. The society of Industrial Engineering and Management, “INDEMAN SOCIETY” was established in the year 1996. The activities of this society includes: Regular Industrial visits and Guest lectures are conducted twice every semester for all students. Many sponsored research projects are executed which are sponsored by UGC, DST and VTU
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<tr>
<th>Sl.No</th>
<th>Names of Faculty</th>
<th>Qualification</th>
<th>Designation</th>
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<tbody>
<tr>
<td>1</td>
<td>Dr. N.V. R Naidu</td>
<td>M.Tech, Ph.D</td>
<td>Principal and Professor</td>
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<tr>
<td>1</td>
<td>Dr. G.S. Prakash</td>
<td>B.E., M.Tech, Ph.D</td>
<td>Professor and Head</td>
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<tr>
<td>2</td>
<td>Sri. A. Balakrishna</td>
<td>B.E., M.Tech</td>
<td>Associate Professor</td>
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<td>3</td>
<td>Sri. S. Appaiah</td>
<td>B.E., M.Tech</td>
<td>Associate Professor</td>
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<tr>
<td>4</td>
<td>Dr. C.S. Chethan Kumar</td>
<td>B.E., ME, MBA, Ph.D</td>
<td>Associate Professor</td>
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<tr>
<td>5</td>
<td>Dr. S. Bharath</td>
<td>B.E, M.S., Ph.D</td>
<td>Associate Professor</td>
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<td>6</td>
<td>Dr. M. Shilpa</td>
<td>B.E., ME, Ph.D</td>
<td>Asst. Professor</td>
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<td>7</td>
<td>Sri. M.R. Shivakumar</td>
<td>B.E., ME, (Ph.D)</td>
<td>Asst. Professor</td>
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<td>8</td>
<td>Dr. R. Shobha</td>
<td>B.E., ME, Ph.D</td>
<td>Asst. Professor</td>
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<td>9</td>
<td>Dr. M. Rajesh</td>
<td>B.E., MSC (Engg.), Ph.D</td>
<td>Asst. Professor</td>
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<tr>
<td>11</td>
<td>Sri. Vivekanand Venkataraman</td>
<td>BE, MS</td>
<td>Asst. Professor</td>
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<tr>
<td>12</td>
<td>Sri. Deepak Kumar</td>
<td>B.Tech, M.Tech, (Ph.D)</td>
<td>Asst. Professor</td>
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<tr>
<td>13</td>
<td>Sri. P.R. Dheeraj</td>
<td>B.E, M.Tech</td>
<td>Asst. Professor</td>
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**Vision and Mission**

**The Vision of MSRIT:** To evolve into an autonomous institution of international standing for imparting quality technical education.

**The Mission of MSRIT:** MSRIT shall deliver global quality technical education by nurturing a conducive learning environment for a better tomorrow through continuous improvement and customization.

**Quality Policy**

“We at M. S. Ramaiah Institute of Technology, Bangalore strive to deliver comprehensive, continually enhanced, global quality technical and management education through an established Quality Management system Complemented by the Synergistic interaction of the stake holders concerned”.

**The Vision of the Department:** To nurture engineers, entrepreneurs who develop solutions to continually improve socio-technical systems and add value to the society.

**The Mission of the Department:** The department shall transform the entrants of the Program into professionally competent engineers through innovative educational curricula, balanced research program and effective collaboration with industry and academia.

**Process of deriving the vision and mission of the department**

Process of deriving the vision and mission of the department is shown in Figure below.
Process of Deriving the PEOs of the programme

Programme Educational Objectives (PEOs) of the program

PEO1: Use the knowledge and skills of industrial engineering to model and analyze the real life problems and interpret the results.

PEO2: Effectively design, implement, improve and manage the integrated socio-technical systems.

PEO3: Build and lead cross-functional teams, upholding the professional responsibilities and ethical values.

PEO4: Engage in continuing education and life-long learning to be competitive and enterprising.
PO’s of the program offered

a. Apply knowledge and skills of mathematical and social sciences to the various industrial scenarios.
b. Design and conduct experiments, as well as analyze and interpret data.
c. Design and improve integrated systems of people, materials, information, facilities, and technology.
d. Function as a member of a multi-disciplinary team.
e. Identify, formulate and solve industrial and systems engineering problems.
f. Understand and respect professional and ethical responsibility.
g. Communicate effectively both orally and in writing.
h. Understand the impact of industrial engineering solutions in a global and societal context.
i. Recognize the need for and an ability to engage in life-long learning.
j. Have knowledge of contemporary issues in industrial and service sectors.
k. Use updated techniques, skills and tools of Industrial and system engineering throughout their professional careers.
l. Implement the concepts of project and financial management to satisfy customer expectations.

Curriculum breakdown structure:

The curriculum of Industrial Engineering & Management programme is so structured to include all the courses that together satisfy the requirements of the programme specific criteria prescribed by the Institute of Industrial Engineers (An American Professional Society) for the Baccalaureate level of Industrial Engineering programme and Engineering Management programme. The Course code, Course title, the number of contact hours and the number of credits for each course are given in the following table. The courses are grouped in line with the major components of the curriculum namely: (i) Mathematics and Basic sciences, (ii) Basic Engineering courses, (iii) Humanities and Social Sciences, (iv) Professional core courses, (v) Electives and (vi) industry exposure/internship.
Board of Studies for the Term 2015-2017

1. Head of the Department concerned:
   Dr. G. S. Prakash, Professor and Head

2. At least five faculty members at different levels covering different specializations constituting nominated by the Academic Council
   Dr. N.V.R. Naidu, Principal and Professor
   Sri. A. Balaksishna, Associate Professor
   Sri. S. Appaiah, Associate Professor
   Dr. C. S. Chethan Kumar, Associate Professor,
   Dr. R. Shobha, Assistant Professor

3. Two experts in the subject from outside the college
   Dr. M.S. Prabhuswamy, Professor, Department of Mechanical Engineering, SJCE, Mysore – 570006.

4. One expert from outside the college, nominated by the Vice Chancellor
   Dr. S. S. Hebbal, Principal, PDA College of Engineering, Gulbarga-585102

5. One representative from industry/corporate sector allied area relating to placement nominated by the Academic Council
   Dr. N. S. Narahari, Professor & Head, Dept of IEM, RVCE, Bangalore -560059.

6. One postgraduate meritorious alumnus to be nominated by the Principal
   Sri. Prakash Viswanathan, Group Practice Head, Tech Mahindra, Bangalore – 560100

Sri. V. Nanda kumar, Senior Consultant, DET- NORSKEVRITAS AS,No.25 FTI Colony, 12 Main, 4th Block, Nandini Layout, Bangalore -560096
**M.S. RAMAIAH INSTITUTE OF TECHNOLOGY, BANGALORE – 54**  
(Autonomous Institute, Affiliated to VTU)  
**VII SEMESTER B.E. INDUSTRIAL ENGINEERING AND MANAGEMENT**

<table>
<thead>
<tr>
<th>Sl.No.</th>
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<tr>
<td></td>
<td>IM701</td>
<td>Human Resource Management</td>
<td>Industrial Engineering &amp; Management</td>
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<td></td>
<td>IM702</td>
<td>Financial Accounting and Costing</td>
<td>Industrial Engineering &amp; Management</td>
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<td></td>
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<td>Innovations and Entrepreneurship</td>
<td>Industrial Engineering &amp; Management</td>
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<td>IM704</td>
<td>Supply Chain Management</td>
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<td>IM705</td>
<td>Advanced Operations Research</td>
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<td>Reliability Engineering</td>
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<td>IM708</td>
<td>Internship</td>
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**Electives – C (Any one)**

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**Total**

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* L : Lecture  
* T : Tutorial  
* P : Practical
Human Resource Management

Course Code: IM701  Credits: 3 : 0 : 0
Prerequisite: IM507 Principles of Management  Course Hours: 42
Course Coordinator(s): S. Appaiah / Dr. M Shilpa

Course objectives:

- To make students understand the significance of manpower planning in an organization
- To analyze which recruitment / selection strategy is better applicable for a given organization
- To identify the training needs of the employees and provide suitable development for continuous growth of the individual and organization
- To understand the general induction procedure in the organization and appreciate the significance of communication function.
- To understand the various performance appraisal methods and analyze their pros and cons

Course contents:

Unit I

Man Power Planning: Uses and benefits, Man Power Inventory, Man Power Forecasting, Methods of Man Power Forecasting.

Unit II

Recruitment And Selection: Sources of Man power, Advertisement, Short Listing of Candidates calling Candidates for selection Process, Selection procedure – Written Test, Group Discussion, Interview – Different methods, advantages and Limitations, Psychological testing – Advantages and limitations.

Unit III


Unit IV

Induction and Communication: Induction procedure, transfers, promotion exit interview, (Tutorial on written test, Group Discussion, Interviews) Communication function, communication process, effective communication.

Unit V

Performance Appraisal: Components (all round performance appraisal), Methods, Advantages and limitations of different methods, Personal Counseling based on Annual Confidential Reports, competency mapping, CSR.
Text Books:


References:


Course outcomes:

Students will be able to

**CO1:** Plan for manpower for a given type of organization (PO: d,l)

**CO2:** Analyze and select the right recruitment / selection strategy for a given organization (PO: d,l)

**CO3:** Design the appropriate training and development to the employee after analyzing the training needs (PO: d)

**CO4:** Design the right induction procedure for the new entrant in the organization (PO: b,l)

**CO5:** Identify the performance appraisal method depending on the type of organization (PO: g,h)
Financial Accounting and Costing

Course code: IM702  
Credit: 3 : 1 : 0 : 4

Prerequisites: Nil  
Contact Hours: 42+ 14 Tutorial Sessions

Course Coordinator(s): Dr. N.V. R Naidu / Dr. R. Shobha

Course Objectives:

- To learn about the contemporary issues and understand the impact of engineering solutions in a financial context.
- To gain knowledge about the various accounting principles and concepts for obtaining comprehensive accounting solutions.

Course contents:

Unit I


Unit II


Unit III


Unit IV


Unit V

Budgeting and Budgeting Control: Sales budget, production budget, raw materials purchasing budget, selling and administrative expense budget, cash budget, Flexible Budget, Master budget.

Text books:

References:

1. B.S Raman - Elements of Accountancy.

Course Outcomes:

Students will be able to

CO1: Apply the concept of various accounting principles for obtaining comprehensive solutions in accounting. (PO:a,l)

CO2: Understand the accounting ratios and their implications in industry. (PO:a,d,l)

CO3: Enhance knowledge about the cost of product, process and their controlling factors. (PO:a,l)

CO4: Understand the working capital requirement and its management. (PO:a,l)

CO5: Identify the importance of finance and methods to control finance in industry. (PO:a,l)
Innovation and Entrepreneurship

Course code: IM703

Credit: 3 : 0 : 0

Prerequisites: None

Contact hours: 42

Course coordinator(s): Dr. R. Shobha / Deepak Kumar.

Course objectives:

- To enable students to understand the need for innovation and new businesses in the globalized business world
- To help them understand how innovation and technology strategies contribute to business success
- To enable them to analyze the components of innovation process and the building blocks of innovation culture in organizations
- To make them aware of the process of translation of idea into sound business plans and then into an enterprise
- To provide them information about the sources of all types of support needed to float their own businesses.

Course Contents:

Unit I
Introduction: Global industrial competition: Changes in World industry, Dominant trends and issues in World business, Technology as the driving force, Definition of technology, Relationship between Business strategy and technology strategy, Stimuli for and sources of technological innovations

Unit II
Innovation: Concepts, Types of innovation, Linear, Cyclic and Network models of innovation, Management of technological innovation, Dynamics of innovation process, Organizational roles for innovation, Facilitators and impediments of innovation, Strategic issues in innovation management, Case study

Unit - III
Trends in Innovation Management: Technology fusion, Examples and principles, New R&D strategies, Core competencies and business strategy, Building innovation culture in organizations, challenges and opportunities, Case study
Entrepreneurship: Importance of entrepreneurship in an economy, Concepts of entrepreneurship, Characteristics of successful entrepreneur, Myths of entrepreneurship

Unit IV
Entrepreneurial problems and capacity building measures, Entrepreneurship v/s Intrapreneuship, Fostering intrapreneuship in corporations, Cases of successful and unsuccessful entrepreneurs.
Institutions Supporting Small Business Enterprises: Introduction, Some important central-level and State-level institutions and non-governmental agencies
Unit V

Setting up of an Enterprise: Business opportunities in various sectors, Formalities for setting up a small business enterprise, Project selection, Constitution, Registration, State clearances, Requirements of land & building, plant & machinery and infrastructure, Preparation of project report, Securing financial support for project and implementation.

Text Books:
1. P.N.Rastogi, Management of Technology and Innovation, Sage Publications, new Delhi, 1995
3. Case material will be supplied during the course by the faculty-in-charge

Reference Books:

Course Outcomes:
Students will be able to

CO1: Understand the global industrial competition to adopt the new technology to build the relationship bridge between business strategy and technology strategy. (PO:h,j)

CO2: Apply the various innovation concepts and models in organization to their strategic issues in innovation management. (PO:a,e)

CO3: Analyze the trends in Innovation Management, New R&D strategies to build innovation culture to strengthen the activities of entrepreneurs. (PO:e,h)

CO4: Evaluate and forecast the entrepreneurial problems to train the successful entrepreneurs and avoid upcoming unsuccessful entrepreneurs. (PO:c,e)

CO5: Create the skills to setting up a small business enterprise and the opportunities in various sectors by considering the mandatory rules and regulations from the government. (PO:j,k)
Supply Chain Management

Course code: IM704  Credit: 3 : 0 : 0

Pre requisite: Inventory Management

Contact Hours: 42

Course Coordinator(s): Dr. C. S. Chethan Kumar / Deepak Kumar

Course objectives:

- To provide a strategic framework to analyze the design, planning, and operational decisions within supply chains
- To Discuss a set of frameworks and tools used to design supply chain networks.
- Discusses how a supply chain manager can plan pricing and promotions along with supply planning.
- Describes the role that inventory plays in a supply chain.
- To highlight the importance of coordination in a supply chain and discuss how information technology and e-business can help a supply chain improve performance.

Course Contents:

Unit I


Unit II


Unit III

Planning and Managing Inventories in a Supply Chain: Review of inventory concepts, Trade promotions, Managing multi-echelon cycle inventory, safety inventory determination, Impact of supply uncertainty aggregation and replenishment policies on safety inventory, Optimum level of product availability, importance factors, Managerial levers to improve supply chain profitability.

Unit VI

Sourcing, Transportation and Pricing Products: Role of transportation, Factors affecting transportation decisions, Modes of transportation and their performance characteristics, Designing transportation network, Trade-off in transportation design, Tailored transportation, Routing and scheduling in transportation, International transportation, Analytical problems, Role of sourcing, supplier – scoring & assessment, selection and contracts, Design collaboration.
Unit V


Introduction to reverse logistics: reasons, activities and role.

Text Book:


References:


Course Outcomes

The students should be able to

CO1: Thorough understanding of supply chain management processes. (PO:c,d)
CO2: Ability to identify and classify key supply chain drivers. (PO:a,c)
CO3: Establish a set of frameworks and evaluate design distribution network and facility location. (PO:b,d)
CO4: Calculate the influence of appropriate level of product availability within a supply chain. (PO:a,c)
CO5: Evaluate sourcing strategies for interacting with suppliers and assess different options for designing transportation networks. (PO:d,g)
Advanced Operations Research

Course code: IM705
Contact Hours: 42 + 14 Tutorial Sessions
Credit: 3 : 1

Prerequisite: IM501 Applied Probability and Statistics
IM504 Operations Research

Course coordinator: Dr. N.V.R. Naidu / V.Vivekanand

Course objectives:
• To enable students get acquainted with the mathematical logic behind the advanced operations research techniques
• To build capacity in students to formulate real-life problems into mathematical models amenable for solution.
• To enable them to evaluate alternative solutions and arrive at the optimum one based on predetermined criteria
• To make them learn the application of sophisticated techniques such as Integer programming, nonlinear programming, dynamic programming, queuing and network analysis.

Course Contents:

Unit I

Linear Programming : Two phase simplex technique, Revised simplex techniques, Sensitivity analysis.

Unit II

Integer Programming, Gomory’s technique.
Non-Linear Programming : Kuhn – Tucker conditions, QPP Problems solution using Wolfes algorithm.

Unit III

Queuing Theory: Queuing system and their characteristics, The M/M/I Queuing system, steady state performance analyzing of M/M/1 queuing model, M/M/K/ Model, M/Ek/1, M/D/1, M/M/C and MG1 models.

Unit IV

Dynamic Programming: Characteristics and DP model, Computational procedure -Simple problems only.

Unit V

Project Management Using Network Analysis : Network construction, determination of critical path and duration, floats. PERT- Estimation of project duration, variance and Crashing, Elements of crashing, least cost project scheduling, Resource Allocation for optimal utilization of resources.
Texts Books:

References:

Course outcomes:
Students will be able to

CO1: Apply and Analyze LP Techniques and Conduct Sensitivity analysis for real life problems. (PO:a,b,e,k)

CO2: Apply and Solve Non Linear Programming Techniques for various real life problems. (PO:a,b,e,k)

CO3: Analyze complex problems by using queuing theory. (PO:a,b,e,k)

CO4: Formulate and Analyze various complex problems by using Markov Chain and Dynamic Programming approaches (PO:a,b,e,k)

CO5: Implement and Analyze the concepts of Project Management through network techniques (PO:a,b,e,k,l)
Quality Assurance and Reliability Lab

Course Code : IML706
Credits : 0 : 0 : 1
Pre requisite : Nil
Contact Hours: 14
Course co-ordinator(s): Dr. G.S. Prakash / A. Balakrishna

Course objectives:
- To familiarize the students with practices in industries regarding quality control aspects and to test the goodness of fit.
- To educate students regarding the usage of modern quality control procedures.
- To introduce concepts of six sigma, Gauge R&R and MSA

Course content

List of Experiments:

Laboratory

1. Testing the goodness of fit for the given quality characteristic of component using normal distribution.
2. Testing the goodness of fit for the given quality characteristic using Poisson distribution.
3. Testing the goodness of fit for the given quality characteristic using Binomial distribution.
4. Testing the goodness of fit for the given quality characteristic using Uniform distribution.
5. Application of 7 QC tools as applied to manufacturing and service operations.
6. Assessment of process capability of the given manufacturing process using normal probability paper method.
7. Assessment of process capability of the given manufacturing process using process capability indices.
8. Assessment of process capability of the given manufacturing process using Digital motorized multifunctional height gauge.
9. Construction of control chart for variable quality characteristic using Digital motorized multifunctional height gauge.
10. Construction of control chart for variable quality characteristic using SQC display unit?
11. Construction of control chart for variable quality characteristic using SQC software.
12. Construction of control chart for attribute quality characteristic using SYSTAT statistical software package.
13. Determination of producer’s risk and consumer’s risk using single and double sampling plans.
15. Process Mapping – Input and output Models
Text books:


References:


Course outcomes:

The student will be able to

CO1: Conduct experiments on various distributions and measurements of variables and attributes, collect data, analyze and interpret the same.(PO:a,b)

CO2: Interpret the results given by the software and make appropriate decisions. (PO:b,e,f)

CO3: Apply the knowledge obtained to solve the real life problems encountered in industry. (PO:f,j,k)
Financial Accounting and Costing Lab

Course code: IML707 Credit: 0 : 0 : 1
Prerequisites: Nil Contact hours: 14
Course Coordinator: Dr. N.V.R. Naidu / Dr. R. Shobha

Course Objectives:

- To educate students about the contemporary issues and help them understand the impact of engineering solutions in a financial context.
- To educate students to gain knowledge about the various accounting principles and concepts for obtaining comprehensive accounting solutions.

Course content:

Laboratory Exercises

1. Introduction to Accounting and Tally software
2. Preparation of double entry system of book keeping – Journal entries using Tally
3. Preparation of double entry system of book keeping – Ledger balances using Tally
4. Preparation of final accounts for a given journal problem using Tally
5. Preparation of final accounts for a given trial balance problem without adjustments using Excel
6. Preparation of final accounts for a given trial balance problem with adjustments using Excel
7. Preparation of financial ratios for a given journal problem using Tally
8. Preparation of Cost Sheet for a given job costing problem using Excel
9. Preparation of Cost Sheet and profit for a given job costing problem using Excel
10. Preparation of various process accounts for a given problem using Excel
11. Preparation of income statements for a given problem using Excel
12. Preparation of cash budget for the given expenditure using Excel
13. Preparation of flexible budget for a given level of activity using Excel

Suggested Software Packages

1. Tally
2. M.S. Excel, SYSTAT

Text books:

References:

1. B.S Raman - *Elements of Accountancy*,

Course Outcomes:

Students will be able to

**CO1:** Apply the concept of various accounting principles for obtaining comprehensive solutions in accounting. *(PO:d,f,k)*
Elective -C

Industrial Robotics

Course Code: IMPE11  Credit: 3 : 0 : 0
Prerequisite: Computer Integrated Manufacturing  Contact hours: 42
Course coordinator(s): Dr. G. S. Prakash / M.R. Shivakumar

Course objectives

- To know the overview of robotics - present and feature applications.
- To understand the components of robot.
- To learn about control system of robot.
- To learn the concepts of robot arm kinematics and trajectory planning.
- To know robot programming methods.

Course contents:

**Unit I**

**Introduction:** Automation and robotics, brief history of robotics, Social and economic aspects of robots, Advantages and disadvantages of using robots in industries, Overview of robots – present and future applications.

**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, Advantages and disadvantages of drive systems.

**Unit II**

**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, Robot Actuation and Feedback components: Position, Velocity sensors, Actuators.

**Unit III**

**Robot Arm Kinematics:** Kinematics – Introduction, Direct and Inverse kinematics, Rotation matrix, Composite rotation matrix, Rotation matrix about an arbitrary axis, Euler angles representation, Homogeneous transformations, Links, joints and their parameters, D-H representation, Introduction to robot dynamics

**Unit IV**

**Trajectory planning:** Introduction, General considerations on trajectory planning, Joint interpolated trajectories, 4-3-4 trajectory example, Planning of Cartesian path Trajectories.
**Robot programming**: Introduction, Manual teaching, Lead through teaching, Programming languages – AML and VAL [simple examples], Programming with graphics, Storing and operating, Task programs.

**Unit V**


**Text Books:**

**Reference:**

**Course Outcomes:**

Students will be able to

**CO1**: Analyze areas of applications structure and drive in robot systems. *(PO:e)*

**CO2**: Identify the control systems and components of robots. *(PO:a,c,e)*

**CO3**: Apply the mathematical concepts in robot kinematics. *(PO:a,c,e)*

**CO4**: Develop the trajectory planning and robot programme. *(PO:a,c,e)*

**CO5**: Identify the sensors used in robots. *(PO:c)*
Reliability Engineering

Course Code: IMPE12  
Credits: 3: 0: 0

Prerequisite: Nil  
Course Hours: 42

Course Coordinator(s): Dr. G.S.Prakash / Dr. S. Bharath

Course objectives:

- To develop students in the area of Quality Assurance and Reliability, describe categories of statistical quality control (SQC), use of descriptive statistics in measuring quality characteristics and define & discuss quality and quality improvement.
- To make students aware of the evolution of modern quality improvement methods like six-sigma, quality systems and standards, different dimensions of quality and discuss the role of variability and statistical methods play in controlling and improving quality.
- To make students understand the fundamentals of control charts, identify the differences between x-bar, R-, x-bar, S, p-, np-, c- and u charts, explain the meaning of process capability and the process capability index.
- To develop students to know about the process of acceptance sampling and describe the use of operating characteristic (OC) curves, Statistical theory of tolerances and the concepts of Reliability.

Course contents:

**Unit I**

**Introduction:** Concepts, terms and definitions of reliability and related performance measure, Terminology in reliability, Failure rate, MTBF, Life test, importance of reliability, definition, meaning of adequate performance, reliability-engineering Programme and its scope, Typical applications.

**Component Life:** Failure distribution function, reliability function and hazard rate function, interrelationships, MTTF, MTBF, bath tub curve (Mortality curve), conditional reliability function, constant and time dependant failure models.

**Unit II**

**Combinatorial Reliability (Reliability of Systems):** Reliability analysis of systems: (Success-Failure models only) Analysis of Series, parallel, series parallel and parallel series configurations, R out of n configurations, redundancy improvement factor, standby systems.

**Techniques for Complex Systems Reliability Evaluation:** Inspection methods, event space methods, path tracing methods, decomposition methods, cut set methods, tie set methods.
Unit III

**Design for Reliability:** System effectiveness measures and life cycle cost analysis, reliability allocation, methods for reliability in design, failure analysis, systems safety and fault tree analysis, multi state model, Failure mode effect and criticality analysis.

**Markov Models for System Reliability:** Reliability analysis of state dependent systems, Markov analysis, standby system analysis.

Unit IV

**Maintainability and Availability:** Analysis of Down time, Repair Time distributions, maintainability, Maintenance increment, Design for maintainability, Availability analysis, Different forms of availability, system availability analysis, mission availability, Availability of standby system.

Unit V

**Analysis Failure Data:** Types of life testing, data collection, Empirical methods, Estimation of Static life, types of life testing, Development of confidence intervals, acceptance test procedures for life estimation using exponential, weibull and Gamma distribution models, Sequential life tests and acceptance criteria.

**Application And Case Studies:** Case example involving redundancy, burning tests, preventive maintenance analysis, Repairable system analysis, Software reliability.

**Text Books:**


**References:**

1. Ireson and Grant - *Reliability Hand Book*, 1995
**Course outcomes:**

The students will be able to

**CO1:** Analyze the role and importance of statistical quality control in modern industry. *(PO:k)*

**CO2:** Measure quality, impact of quality on other functions, and the need for continuous improvement. *(PO:e)*

**CO3:** Conduct Process Capability Studies and process capability analysis and interpret the output of Statistical Process Control methods effectively, avoiding misconceptions and identifying opportunities for process improvement. *(PO:a,l)*

**CO4:** Construct and use various types of control charts and apply Control Charts in the workplace. *(PO:a)*

**CO5:** Use sampling plans, statistical tolerancing and reliability concepts for quality control. *(PO:a,k,l)*
Productivity Engineering

Course Code: IMPE13  
Credits: 3 : 0 : 0

Prerequisite: Nil  
Course Hours: 42

Course Coordinator(s): Dr. G.S. Prakash / Dr. S. Bharath

Course objectives:

- Educate students with the background, the applications and the principles of Productivity at the International, National and Company levels.
- Discuss about strategies to be employed during organizational transformations.
- Explain students the re-engineering concepts and its applications.
- Train students to identify the right productivity model for solving problems related to productivity.

Course contents:

**Unit I**

**Introduction:** Productivity concepts- Macro and Micro factors of productivity, Productivity benefit model, Productivity cycle.

**Unit II**

**Productivity Models:** Productivity measurement at International, National and Organizational level, Total Productivity Models, Productivity Management in Manufacturing and Service sector, Productivity evaluation models.

**Unit III**

**Organizational Transformation:** Principles of Organizational transformation and re-engineering, fundamentals of process re-engineering, preparing the workforce for transformation and re-engineering, methodology, guidelines.

**Unit IV**

**Re-engineering Process Improvement Models:** PMI models, Edosomwan model, Moen and Nolan strategy for process improvement, LMICIP model, NPRDC model.

**Unit V**

**Re-engineering Tools and Implementation:** Analytical and process tools and techniques- Information and communication technology- Enabling role of IT, Re-oppurtunities, Process redesign- cases.

Text Books:

References:


Course outcomes:

The students should be able to

**CO1:** Understand the Micro & Macro aspects of productivity engineering. (PO:c,d,I,k)

**CO2:** Analyze the various productivity measure/models at International and national levels.(PO:e)

**CO3:** Discuss employees transformation and reengineering concepts to improve productivity. (PO:a,d,g,l)

**CO4:** Analyze the various process improvement models to improve productivity. (PO:a,f,j)

**CO5:** Implement re-engineering techniques in various sectors. (PO:a,c,h,l)
Design of Experiments

Course Code: IMPE14  Credits: 3:0:0
Prerequisite: IM501 Applied Probability and Statistics  Contact Hours: 42
Course Coordinator(s): Dr. M. Shilpa / V. Vivekanand

Course objectives:

- To educate students plan an experimentation and select an appropriate experimental design
- To ensure appropriate selection of control factors and their levels for the experimentation
- To identify the uncontrollable variations those exist during experimentation as well as in the customer environment
- To quantify the quality loss inflicted to the society when a product quality characteristic deviates from the target.

Course Contents:

Unit I

Unit II
Experimental designs: Completely Randomized Design, Randomized Block Design, Latin Square Designs, one way analysis of variance and two way analysis of variance.

Unit III
Steps in Robust Design: Noise factors and testing conditions, Quality characteristics and objective functions, Control factors and their levels, Matrix experiment and data analysis plan, Conducting the matrix experiment, data analysis, verification experiment and future plan. Quality Loss Function for static cases,

Unit IV
Signal-To-Noise Ratio: S/N ratios for static cases, for Smaller-the-better, Larger-the-better, Nominal-the-best and Asymmetric Cases and S/N ratios for dynamic cases.

Unit V
Constructing Orthogonal Arrays: Counting degrees of freedom, selecting a standard orthogonal array, dummy level technique, and compound factor method, Linear graphs and interaction assignment, Modification of linear graphs. Strategy for constructing an orthogonal array, comparison with the classical statistical experimental design.
Text Books:

Reference:

Course outcomes:
The students should be able to

**CO1:** Apply the knowledge of design of experiments for the selection of appropriate design as well as control factors and their levels. *(PO: b,e)*

**CO2:** Conduct experiments, analyze the experimental data and suggest optimal values for the control factors that make the product insensitive to uncontrollable variation. *(PO: b,e)*

**CO3:** Apply the steps in robust design to make the product insensitive to noise factors *(PO: b,c)*

**CO4:** Identify the right Signal-to-noise ratio for the given quality characteristic *(PO: b)*

**CO5:** Select the right orthogonal array for the given experimental situation*(PO: b,e)*
Internship

Course Code: IM 707
Pre requisite: Nil
Credits: 0:0:1
Course Hours: 2Weeks

Course Coordinator(s): S. Appaiah / Dr. M. Shilpa

Course objectives

- To provide opportunities for students to apply their knowledge in a real world environment
- To expose students to industrial working environment.

Course contents

Students are Course Subjected to industrial training in the form of Internship for 2 weeks in reputed industries.

Assessment and Evaluation vis-à-vis Course Outcomes

Note: Students have to undergo two weeks internship in an industry between 6th and 7th semester. A report compulsorily to be submitted at the end of the industrial training and the evaluation will be done by a committee constituted by the HOD. Each student must present a PPT for about 30 minutes, which is comprising of

- Brief about organization.
- Recording of information.
- Shortcomings noticed during the Industrial training.
- Application of industrial engineering techniques.
- Conclusions.

Course outcomes

The student will be able to

CO1: Demonstrate knowledge of industrial environment in terms of processes, functions, material flow, plant layout and information flow. (PO: d)
CO2: Perform data collection and interpret data. (PO: j)
CO3: Gain knowledge through visual inspection. (PO: h)
### M.S. RAMAIAH INSTITUTE OF TECHNOLOGY, BANGALORE – 54
(Autonomous Institute, Affiliated to VTU)


**VIII SEMESTER B.E. INDUSTRIAL ENGINEERING AND MANAGEMENT**

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Subject Code</th>
<th>Subject</th>
<th>Teaching Department</th>
<th>Credits</th>
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<tbody>
<tr>
<td></td>
<td>IM801</td>
<td>Total Quality Management</td>
<td>Industrial Engineering &amp; Management</td>
<td>L 3 T 0 P 0 Total 3</td>
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<tr>
<td>2</td>
<td><strong>OE</strong></td>
<td>One elective from other department</td>
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Electives – D (Any one)

| 3      | IMPE15       | Project Management           | Industrial Engineering & Management         | 3 0 0 3 |
|        | IMPE16       | World Class Management Practices |                                             |         |
|        | IMPE17       | Product Design and Development |                                             |         |
|        | IMPE18       | Managerial Economics         |                                             |         |

Electives – E (Any one)

| 4      | IMPE19       | Organizational Behavior      | Industrial Engineering & Management         | 3 0 0 3 |
|        | IMPE20       | Just In Time Manufacturing   |                                             |         |
|        | IMPE21       | Technology Management        |                                             |         |
|        | IMPE22       | Marketing Management         |                                             |         |

| 5      | IM802        | *Project Work*               |                                             | 0 0 14 14 |
| 6      | IM803        | Seminar                      |                                             | 0 0 2 2 |

**Total** 9 0 16 28

* L : Lecture  * T : Tutorial  * P : Practical  
OE: Open Elective

Subject*:
- Students have to form a group comprising of “**Four students**”
- Identify the company in which project work will be carried out
- Identify the problem area in order to carry out the project work
- Project work (IM802) evaluation will be carried out at the end of VIIIth Semester
Total Quality Management

Course Code: IM801  Credits: 3 : 0 : 0
Prerequisite: Nil  Course Hours: 42
Course Coordinator(s): Dr. C.S.Chethan Kumar / Dr. S. Bharath

Course objectives:

- To educate students the core concepts of Total Quality Management (TQM).
- To educate students to know how one can delight customers through continuous improvement of the quality of products and services.
- To educate to understand the importance of total participation of employees in an organization for improving quality.
- To educate students to recognize the importance of networking of companies with Govt, Semi-Govt. organizations, Research Institutes, Universities, etc

Course contents:

Unit I

Evolution Of Quality Concepts And Methods: Quality concepts, Development of four fitnesses, evolution of methodology, evolution of company integration, quality of conformance versus quality of design from deviations to weaknesses to opportunities, Future fitness, four revolutions in management thinking and four levels of practice.

Four Revolutions in Management Thinking: Introduction to Customer focus, Continuous Improvement, Total participation, and Societal Networking.

Focus On Customers: Change in work concept, marketing and customers.

Unit II

Continuous Improvement: Improvement as problem solving process, Management by process, WV model of continuous improvement, process control, process control and process improvement, process versus creativity. Reactive Improvement: Identifying the problem, standard steps and tools, seven steps, seven QC tools.

Unit III

Proactive Improvement: Management diagnosis of seven steps of reactive improvement, General guidelines for management diagnosis of a QI story, Discussion on case study for diagnosis of the seven steps. Proactive Improvement: Introduction to proactive improvement, standard steps for proactive improvement, semantics, example-customer visitation, Applying proactive improvement to develop new products- three stages and nine steps.

Unit IV

Total Participation: Teamwork skill. Dual function of work, teams and teamwork, principles for activating teamwork, creativity in team processes, Initiation strategies, CEO involvement, strategies for TQM introduction. Infrastructure for mobilization. Goal setting (Vision/ Mission),
organization setting, training and education, promotional activities, diffusion of success stories, awards and incentives, monitoring and diagnosis, phase-in, orientation phase, alignment phase, evolution of the parallel organization.

Unit V

**Hoshin Management:** Definition, phases in hosing management-strategic planning (proactive), hoshin deployment, controlling with metrics, check and act (reactive). Hoshin management versus management by objective, hoshin management and conventional business planning, an alternative hoshin deployment system, hoshin management as “Systems Engineering” for alignment.

**Societal Networking:** Networking and societal diffusion – Regional and nationwide networking, infrastructure for networking, openness with real cases, change agents, Center for quality Management case study, dynamics of a societal learning system. TQM as learning system, keeping pace with the need for skill, a TQM model for skill development, summary of skill development.

**Text Books:**

**References:**

**Course outcomes:**
The students should be able to

**CO1:** Understand the various quality concepts. (PO:c,h)
**CO2:** Apply continuous improvement models to satisfy customers. (PO:c,l)
**CO3:** Apply proactive improvement techniques to improve quality of products. (PO:d,h)
**CO4:** Develop total participation methods among employees to satisfy internal and external customers. (PO:b,e,j,l)
**CO5:** Implementation of societal networking and Hoshin management. (PO:f,i,l)
Elective- D  

**Project Management**

Course Code: IMPE15  
Credits: 3 : 0 : 0

Prerequisite: Nil  
Course Hours: 42

Course Coordinator(s): M. R. Shivakumar / Sudheer D Kulkarni

Course Objectives:

- Students should have an insight about Project Life Cycle, Project Team & Scheduling.
- Students should understand the applications of tools & techniques of Project Management.
- Students understand Project co-ordination & control methods
- Students should know the various performance measures in project management

Course contents:

**Unit I**

**Concepts of Project Management:** Concepts of projects, Categories of projects, Phases of project life cycle, Rules and Responsibility of project leader, Tools and techniques for project management.

**Unit II**

**Project planning and estimating:** Feasibility of report, Phased planning, Project planning steps, Objective and goals of the project, Preparation of cost estimation, Evaluation of the project profitability.

**Unit III**

**Organization and staffing the project team:** Skills / ability required for project manager, Authorities and responsibilities of project manager, Project organization and types of accountability in project execution, Controls, Tendering and Selection of contractors.

**Unit IV**

**Tools and techniques of project management:** GANTT chart, Networks, Critical Path Method, Project Evaluation and Review Technique, use of software package like MS projects.

**Unit V**

**Project scheduling and performance measures:** Different scheduling techniques, Resource allocation method, Performance indicators, Performance improvement for the CM and DM companies for better project management.
Text Books:
2. *Project management a system approach to planning scheduling and controlling*- Harold Kerzner, CBS Publisher and distributors, 2002.

References:
3. T R Banga, N K Agarwal and S C Sharma -*Industrial engineering and Management Sciences*, -Khanna Publishers

Course outcomes:
The students should be able to

**CO1:** Understand the concepts of various tools and techniques used in project life cycle phases. (PO:d,l)

**CO2:** Prepare the feasibility report of a project. (PO:d,l)

**CO3:** Organize the project staffing and execution of responsibility. (PO:d,l)

**CO4:** Apply the tools and techniques of project management. (PO:a,e,l)

**CO5:** Evaluate the project performance. (PO:d,l)
World Class Management Practices

Course Code: IMPE16  
Credits: 3 : 0 : 0

Pre requisite : Nil  
Course Hours: 42

Course Coordinator(s): Dr. M. Shilpa / Dr. R. Shobha

Course Objectives:

- To understand and apply fundamental principles and tools of business process to obtain dramatic improvement in the organizations.
- To learn about the tool which facilitate to know the best practices of the competitors and to inculcate the same and stay a head
- Entry level understanding of the six sigma tool to function effectively in both quantitative and non quantitative analysis
- To learn about the different management tools like total productive maintenance, activity based management and the awards given to the organizations for the world class quality

Course contents:

Unit - I

Introduction to world class manufacturing:
Manufacturing Excellence and Competitiveness, What is world-Class Manufacturing?-Hall’s framework of world-Class Manufacturing (WCM), Gunn’s Model of World-Class Manufacturing , Maskell’s Model of World-Class Manufacturing, America’s Best Plants Model of World Class Manufacturing.

Unit - II

World Class Manufacturing: The philosophy of world-class Manufacturing-The First Principles of World-Class Manufacturing, The practices of World-Class Manufacturing-The customers Interface ,The Supplier Interface, World-Class Practices in the factory.

Reengineering: Importance of 3 C’s, definition, rethinking business process, new world of work & role of information technology.

Unit - III

Principles and practices of WCM: Data collection plan, research-internal public domain sources, outside experts etc. original research, site visits, and code of conduct. Analyzing the gap: Top displaying data, deciding and combining best work practices, Balance Score Card Technique, Value Stream Mapping, validation, recommendations etc

Unit – IV

Benchmarking: Definition, mission and objectives, managing benchmarking process, training and code of conduct, future scope and benchmarking process. What to benchmark: concept of step zero, priorities, business processes – linking to goals etc, investigation, documentation, performance measures, improving business processes. Whom to benchmarks: Developing candidate list, systematic search, refining the initial list.
Unit – V

**Six Sigma:** The Basics, The core of Six Sigma(DMAIC), design for Six Sigma, DFSS and the customer, Quality time and the Bottom line, core of DFSS-IDOV method, DFSS Metrics, DFSS Infrastructure –People and resources, Implementing DFSS

**Text books:**

**References:**

**Course Outcomes:**

Students will be able to

**CO1:** Apply the different quality techniques to reach the level of world class in the manufacturing sector. **(PO:a,c)**

**CO2:** Appreciate the importance of change in terms of continuous learning and application of new technology to strive highest quality. **(PO:d,e)**

**CO3:** Analyze the importance of doing things right at the first time and learn the various techniques which helps to do so. **(PO:d,e)**

**CO4:** Enhance the knowledge of bench marking to strive industry needs. **(PO:d,e)**

**CO5:** Demonstrate the latest techniques like design for six sigma in reaching to world class level. **(PO:a,e)**
Product Design and Development

Course Code: IMPE17                  Credits: 3 : 0 : 0
Prerequisite: Nil                    Course Hours: 42
Course Coordinator(s): Dr. G.S.Prakash / Dr. S. Bharath

Course objectives:

- To make students familiar with product design through evolution or innovation.
- To make them understand an organization’s product development strategy, and the steps in that process.
- To make students aware of the designer’s role, problems, procedures and considerations in product development.
- To help them appreciate the economics, quality and time aspects of design.

Course contents:

Unit I


Unit II


Unit III


Unit IV


Unit V


Modern Approaches to Product Design: Concurrent Design, Quality Function Deployment (QFD).

Text Books:


References:


Course outcomes:

Students will be able to

CO1: Appreciate the incremental and radical approaches to product design and the steps involved. (PO:a,e,j)

CO2: Understand the organization’s product strategy and designer’s role. (PO:b,d)

CO3: Develop an understanding of product design problems and challenges in the strength, function, manufacturability. (PO:a,c)

CO4: Apply the optimization techniques in product design. (PO:a,e)

CO5: Analyze the economic consideration, value engineering and modern approaches in product design. (PO:j,l)
Managerial Economics

Course code: IMPE18
Credit: 3 : 0 : 0

Prerequisites: None
Contact hours: 42

Course coordinator(s): S. Appaiah / Dr. C. S. Chethan kumar

Course objectives:
- To enable students to understand the macro-economic aspects of business demand, price sensitivity, industry and market structures and relationship among these aspects.
- To enable students to analyze the factors determining demand and supply, and their elasticity.
- To equip them with techniques to estimate demand.
- To enable them to coordinate the factors of production to meet the demand, and estimate cost for various levels of production.
- To enable them to evaluate the pros and cons of various industry structures.
- To equip them with the techniques needed for making investment decisions.

Course Contents:

Unit I

Unit II
Demand Estimation: Methods, Model specification, Data collection, Simple regression, Goodness of fit, Power regression, Forecasting, Multiple regression, Implications of empirical studies, Problems.

Unit III
Production Theory: Introduction, Basic terms and definitions, Factors of production-The short run and the long run, Problems.

Unit IV

Unit V
Text Books:


References:


Course outcomes:

Students will be able to

**CO1:** Understand the roles of managers and the nature of internal and external decisions to be made by managers. *(PO:d,j)*

**CO2:** Analyze the demand and supply conditions and assess the position of a company. *(PO:a,e)*

**CO3:** Design competition strategies, including costing, pricing, product differentiation, and market environment according to the natures of products and the structures of the markets. *(PO:b,c)*

**CO4:** Analyze real-world business problems with a systematic cost estimation. *(PO:c,j)*

**CO5:** Make optimal business decisions by integrating the concepts of economics, mathematics and statistics and assess market risks. *(PO:a,j)*
Elective- E
Organizational Behavior

Course Code: IMPE19  
Credits: 3: 0 : 0

Pre requisite : IM507 Principles of Management  
Course Hours: 42

Course Coordinator(s): S. Appaiah / Sudheer D Kulkarni

Course Objectives:

- To understand the nature of human behavior in corporate and other organizations
- To learn about the concepts of different styles of motivation, company leadership, power and authority
- To know about the strategies of organization, organization design and structure and to measure organization effectiveness.
- To learn and adopt team work and collaboration

Course contents :

Unit I

Introduction; Definition of Organization Behavior and Historical development, Environmental context (Information Technology and Globalization, Diversity and Ethics, Design and Cultural, Reward Systems.

The Individual : Foundation of individual behavior, Ability

Unit II

Learning : Definition, Theories of Learning, Individual Decision Making, classical conditioning, operant conditioning, social Making, learning theory, continuous and intermittent reinforcement.

Perception: Definition, Factors influencing perception, attribution theory, selective perception, projection, stereotyping, Halo effect.

Unit III

Motivation : Maslow’s Hierarchy of Needs, Mc. Gregor’s theory X and Y, Herzberg’s motivation Hygiene theory, David Mc Cleland three needs theory, Victor vroom’s expectancy theory of motivation.

Unit IV

Values and attitudes :Definitions – values, Attitudes : Types of values, job satisfaction, job involvement, professional Ethics, Organizational commitment, cognitive dissonance.

Conflict Management: Definition of conflict, functional and dysfunctional conflict, stages of conflict process.
Unit V


The Organization: Mechanistic and Organic structures, Minitberg’s basic elements of organization, Organizational Designs and Employee behaviour, organization development – quality of work life (QWL).

Text Books:


References:


Course Outcomes:

Students will be able to

CO1: Manage the art of getting work in the corporate and other organization. (PO:c,d,h)
CO2: Identify the different motivational factors and leadership styles which can be applied to reach the organization’s goal. (PO:d)
CO3: Analyze the importance of motivation and its use in industry. (PO:c,d,f)
CO4: Develop the values and attitudes for betterment of organizational growth. (PO:c,d,f)
CO5: Develop the structure and hierarchy of the organization. (PO:c,d,f)
Just In Time Manufacturing

Course Code: IMPE20
Pre requisite : Nil
Course Hours: 42

Course Coordinator(s): Dr. G. S. Prakash / Dr. C.S. Chethan Kumar

Course Objectives:

- To understand the fundamental concepts of Just In Time manufacturing systems.
- To learn how to apply Just In Time manufacturing system in an industry.
- To know how Just In Time manufacturing system can increase the competitiveness of an industry in a globalised world.

Course contents:

UNIT - 1

JIT-AN INTRODUCTION: Speed of JIT movement, the new production system research association of Japan, some definitions of JIT, core Japanese practices of JIT, creating continuous manufacture, enabling JIT to occur, basic element of JIT, benefits of JIT.

MODERN PRODUCTION SYSTEM: Key feature of Toyota’s production system, basic framework of Toyota production system. KANBAN SYSTEM – other types of kanban’s, kanban rules, adapting to fluctuations in demand through kanban, whirligig, determining the number of kanban’s in Toyota production system, detailed kanban system example, supplier kanban and the sequence schedule for use by suppliers.

UNIT – II

PRODUCTION SMOOTHING IN TOYOTA PRODUCTION SYSTEM: production planning, production smoothing, adaptability to demand fluctuations, sequencing method for the mixed model assembly line to realize smoothed production, Criticism of Toyota production system by the communist party of Japan. EDP system for support of the Toyota Production system. Shortening lead time in Toyota Production system – reducing the setup time. Automation in Toyota production system, some comparisons with other manufacturers.

GLOBAL IMPLEMENTATION OF JIT: JIT in automotive industry, JIT in electronics, computer, telecommunication and instrumentation, JIT in process type industry, JIT in seasonal demand industry, other manufacturing industries, JIT in service and administrative operations, conclusion.

UNIT - III

JIT IMPLEMENTATION SURVEYS: JIT implementation in US manufacturing firms-analysis of survey results, just in time manufacturing industries, just in time production in West Germany, just in time production in Hong Kong electronics indu8stry, conclusion.
UNIT - IV

DESIGN, DEVELOPMENT AND MANAGEMENT OF JIT MANUFACTURING SYSTEMS: plant configurations and flow analysis for JIT manufacturing, comparison of JIT’s “demand pull” system with conventional “push type” planning and control systems, quality management system for JIT, product design for JIT human resource management in JIT, flexible workforce system at Toyota, creation and maintenance of teams for JIT, union organization and conduct of industrial relations in JIT, interface of JIT with advanced manufacturing technology, assessing performance in JIT manufacturing systems, product costing information systems in JIT manufacturing, an example of overhead allocation in JIT, potential for developing countries, potential for small manufacturing.

UNIT - V

FRAMEWORK FOR IMPLEMENTATION OF JIT: Implementation risk, risks Due to inappropriate understanding of JIT, risks due to technical, operational and people problems, risks associated with kanban system, some important activities to be performed during implementation, steps in implementation, a project work to approach to implementation, conclusion.

Text Books:

1. Just In Time Manufacturing - M.G. Korgaonker,”, Macmillan India Ltd.- 1992,

References :


Course Outcomes:

Students will be able to

CO1: A clearer understanding of the JIT. (PO:c)
CO2: Improved ability to analyze the inputs needed for production. (PO:b.c.h)
CO3: Ability to work on the facilitators of JIT implementations. (PO:c,e)
CO4: Adapt and select new manufacturing design and technologies. (PO:k)
CO5: Prepare and implement projects for new technologies. (PO:l)
Technology Management

Course code: IMPE21  Credit: 3 : 0 : 0

Prerequisites: Nil  Contact hours: 42

Course coordinator(s): Dr. C. S. Chethan kumar / P. R. Dheeraj

Course Objectives:

- To make students appreciate the role of technological change in shaping the future of a business/economy.
- To make them understand the process behind formulation of technology strategy, and its integration with business strategy.
- To prepare them for managing organizational change in view of increasing technology orientation of businesses.
- To enable them to effectively manage technology projects in an organization.

Course Contents:

Unit I

The concept of technology: Introduction, concept and meaning of technology, the nature of technology change, life cycle, technological convergence.

Unit II

Economics of technology: Introduction, meaning, engineering economics, concept of optimum size, corporate technological strategy, business mission, competitive technology, technology crisis, Technology Forecasting.

Unit III

Analysis for technology strategy: Introduction, technology assessment, forecasting, techniques, yield of technology forecasting, realization of new technology, concept of R& D, effectiveness of R& D.

Unit IV

The adoption of new manufacturing technology: Introduction, strategy, challenges, stages of factory automation, FMS, CIM, CAD/CAM, IMS, change management, work structure.

Unit V

Project management for new technology: Introduction, project preparation, risks, project planning, cost management, technology: an instrument of competition, technology competition analysis (TCA), technology leadership, adoption of new technology.

Text book:

Reference Books:

Course Outcomes:
Students will be able to

CO1: A clear understanding of the need for technological advancements for economic growth and social welfare. (PO:c)

CO2: Ability to analyze the inputs needed for building a technology strategy given the business strategy. (PO:b,c,h)

CO3: Ability to plan out projects for technological change and implement them. Ability to work on the facilitators of organizational change while switching over to newer technologies. (PO:c,e)

CO4: Adapt and select new manufacturing technologies. (PO:k)

CO5: Prepare and implement projects for new technologies. (PO:l)
Marketing Management
Course Code: IMPE22
Prerequisite: Nil
Course Coordinator(s): Dr. G.S.Prakash / Dr. S. Bharath

Credits: 3 :0 : 0
Course Hours: 42

Course objectives:

- To educate students the Historical development, core concepts and importance of Marketing Management in Socio-economic system.
- To make students understand Marketing Information System and research, Product planning and development and Marketing of Industrial goods.
- To make students understand the importance of Branding, Labeling Packaging, Distribution, Advertising and Personal selling.

Course contents:

Unit – I

Define Marketing for the 21st Century: The importance of marketing, The scope of marketing, what is marketed?, Who markets?, How business and marketing are changing, Company orientations toward the marketplace.
The production concept, The product concept, The selling concept, The marketing concept, The holistic marketing concept, Fundamental marketing concepts, trends, and tasks, Core concepts, Shifts in marketing management, Marketing management tasks,

Developing marketing strategies and plans: Marketing and customer value, the value delivery process, The value chain, Core competencies, A holistic marketing orientation and customer value, The central role of strategic planning, Corporate and division strategic planning, Defining the corporate mission, Defining the business, Assessing growth opportunities, Organization and organizational culture, Business unit strategic planning, The business mission, SWOT analysis, Goal formulation, Strategy formulation, Program formulation and implementation.

Unit – II

Gathering information and scanning the environment: Components of a modern marketing information system, Internal records and marketing intelligence, The order to payment cycle, Sales information systems, Databases, data warehousing and data mining, The marketing intelligence system, Analyzing the macro environment, Needs and trends, Identifying the major forces, the demographic environment, Worldwide population growth, population age mix, Economic environment, Social-cultural environment, Natural environment.

Conducting marketing research and forecasting demand: The marketing research process-Step1: Define the problem and the research objectives, Step2: Develop the research plan, Step3: Collect the information, Step4: Analyze the information, Step 5: Present the findings, Step 6: Make the decision, Measuring marketing productivity, Measuring marketing plan performance, Profitability analysis, Marketing-mix modeling, Forecasting and demand measurement, The measures of market demand, A vocabulary for demand measurement, Estimating current demand.
Unit – III

Creating customer value, Satisfaction, and loyalty: Building customer value, satisfaction, and loyalty, Customer perceived value, Total customer satisfaction, Measuring satisfaction, Product and service quality, Total quality management, Maximizing customer lifetime value, customer profitability, measuring customer lifetime value, customer equity, Cultivating customer relationships, Customer relationship management (CRM), Customer database and database marketing, customer databases, Data warehouses and data mining, The downside of database marketing and CRM.


Unit – IV


Identifying market segments and targets: Levels of market segmentation, segment marketing, niche marketing, local marketing, customerization, segmenting consumer markets, geographic segmentation, Demographic segmentation, psychographic segmentation, behavioral segmentation, Bases for segmenting business markets, sequential segmentation, market targeting, effective segmentation criteria, Evaluative and selecting the market segments, Additional considerations.

Unit – V

Dealing with competition: Competitive forces, Identifying competitors, Industry concept of competition, Market concept of competition, Analyzing competitors, Strategies, Objectives, Strengths and weaknesses, Selecting competitors, Competitive strategies for market leaders, Expanding the total market, Defending the market share, Expanding market share, Other competitive strategies, Market challenger strategies, market-Follower strategies, Market-Nicher strategies, Balancing customer and competitor orientations, Competitor-centered companies, Customer-centered companies.

Creating brand equity: What is brand equity?, The role of brands, The scope of branding, Defining brand equity, Brand equity as a bridge, Brand equity models, Building brand equity, Choosing brand elements, Designing holistic marketing activities, Measuring brand equity,
Brand audits, Brand tracking, Brand valuation, managing brand equity, Brand reinforcement, Brand revitalization, Brand crisis, Devising a branding strategy, Branding decision: to brand or not to brand?, Brand Extensions, Brand portfolios, Product life-cycle marketing strategies, product life cycles, Style, fashion and fad life cycles.
Marketing strategies: introduction stage and the pioneer advantage, Growth stage, Maturity stage, decline stage, The product life-cycle concept: critique. Marketing channels and value networks, The importance of channels, Channel development, Value networks, the role of marketing channels, Channel functions and flows, Channel levels.

Text Books:

References:

Course outcomes:
Students will be able to

**CO1:** Design and develop marketing solutions for current retail environments by employing appropriate marketing strategies. *(PO:b)*

**CO2:** Apply knowledge of basic management skills to maximize employee productivity. *(PO:c)*

**CO3:** Evaluate and apply marketing practices to create measurable results to meet marketing objectives. *(PO:f)*

**CO4:** Analyze the competitors, Their Strategies, their Objectives, Strengths and weaknesses. *(PO:d)*

**CO5:** Devising a branding strategy for Value networks. *(PO:d,l)*
Project Work

Course Code: IM802  
Credits: 0 :0 : 14

Prerequisite: Nil

Course Coordinator(s): Dr. C S Chethan Kumar / A Balakrishna

Course outcomes:
Students will be able to

CO1: Appreciate the cross functional interdependencies in a project.
CO2: Implement the concepts of Project, financial, technology and industrial management to solve productivity and competitive issues.
CO3: Ability to work in cross functional teams.
CO4: Design and develop new subsystems, structures and policies.
CO5: Demonstrate the ability and skill to solve industrial problems within a specific time frame.
Seminar

Course Code: IM803

Credits: 0 :0 : 2

Prerequisite: Nil

Course Coordinator(s): S. Appaiah / Dr. M. Shilpa

Course outcomes:
Students will be able to

CO1: Gather current trends in technology, research literature, and self-learning interests on certain topics pertaining to industry.
CO2: Communicate effectively on technical issues, make presentations and write a detailed document.

Open Electives Offered to other departments
1. IMOE01 Operations Research
2. IMOE02 Project management
Graduate Exit Survey Form

To be responded by the Students of the Department

Please respond to the following items keeping in mind your need to acquire engineering capabilities and skills as against those being offered by the engineering program (B.E) at the department of IEM at MSRIT, Bangalore. You may use **tick mark** to indicate your response/Impression.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Item</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>I am being sufficiently well imparted with the necessary capability for applying mathematics and science to solve engineering problems in my field</td>
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<td>2.</td>
<td>With the inputs I am gaining in the program I feel confident of identifying and formulating engineering problems in my field</td>
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<td>3.</td>
<td>The inputs from the program are making me innovative enough to be able to design new engineering products and processes in future</td>
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<td>4.</td>
<td>With the insights from the program, I am developing capability to comprehend and analyze the real life engineering problems</td>
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<td>5.</td>
<td>The program is enabling me to design and conduct engineering experiments on my own and satisfactorily interpret the results</td>
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<td>6.</td>
<td>I am acquiring skills to handle modern machines and software to analyze engineering problems</td>
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<td>7.</td>
<td>I am being well enlightened about my professional and ethical responsibilities</td>
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<td>8.</td>
<td>The program has convinced me about the need for life-long learning</td>
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<td>9.</td>
<td>The program has been helping me to be a team player in various academic nonacademic activities and take leadership role too.</td>
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</table>
10. The program is designed to see engineering problems in the backdrop of contemporary issues helping me to be able to explain the impact of their engineering solution on those issues

11. The program has helped me to develop good communication skills to be able to easily explain even complex engineering ideas/thoughts to my friends and teachers

12. In this program, I have been able to appreciate the need for multi-disciplinary approach to solve modern engineering problems

13. I believe that, by the time I acquire engineering degree, I would be capable of qualifying in national-level competitive exams in engineering (For. Eg. Indian Engineering Service).

Any Other Comments:

Name of Respondent:

Affiliation:

Thank you for taking time to complete the questionnaire. Your opinions would be invaluable in improving the quality of our engineering program. Your views will be duly considered.