RAMAIAH
Institute of Technology

CURRICULUM

for the Academic year 2019 – 2020

INDUSTRIAL ENGINEERING AND MANAGEMENT

V & VI SEMESTER B.E

RAMAIAH INSTITUTE OF TECHNOLOGY
(Autonomous Institute, Affiliated to VTU)
Bangalore – 560054.

About the Institute

Ramaiah Institute of Technology (RIT) (formerly known as M. S. Ramaiah Institute of Technology) is a self-financing institution established in Bangalore in the year 1962 by the industrialist and philanthropist, Late Dr. M S Ramaiah. The institute is accredited with A grade by NAAC in 2014 and all engineering departments offering bachelor degree programs have been accredited by NBA. RIT is one of the few institutes with prescribed faculty student ratio and achieves excellent academic results. The institute was a participant of the Technical Education Quality Improvement Program (TEQIP), an initiative of the Government of India. All the departments have competent faculty, with 100% of them being postgraduates or doctorates. Some of the distinguished features of RIT are: State of the art laboratories, individual computing facility to all faculty members. All research departments are active with sponsored projects and more than 140 scholars are pursuing PhD. The Centre for Advanced Training and Continuing Education (CATCE), and Entrepreneurship Development Cell (EDC) have been set up on campus. RIT has a strong Placement and Training department with a committed team and excellent placement record a good Mentoring/Proctorial system, a fully equipped Sports department, large air- conditioned library with over 1,00,000 books with subscription to more than 300 International and National Journals. The Digital Library subscribes to several online e-journals like IEEE, JET etc. RIT is a member of DELNET, and AICTE INDEST Consortium. RIT has a modern auditorium, several hi-tech conference halls and all are air-conditioned with video conferencing facilities. It has excellent hostel facilities for boys and girls. RIT Alumni have distinguished themselves by occupying high positions in India and abroad and are in touch with the institute through an active Alumni Association. RIT obtained Academic Autonomy for all its UG and PG programs in the year 2007. As per the National Institutional Ranking Framework, MHRD, Government of India, Ramaiah Institute of Technology has achieved 64th rank in 2019 among the top 100 engineering colleges across India.

About the 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 was commenced in the year 2012. The department has been recognized as R&D center by VTU with 14 scholars pursuing their Ph.D. The department has well modernized laboratories namely Industrial & Quality Engineering lab, Computer Lab and Mechanical Measurement & Metrology lab. The department is having highly qualified, motivated and result oriented faculty members. All the faculty 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 format 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 around 35 faculty development programs, seminars & workshops for academicians as well as industry personnel, students and technical staff. The society of Industrial Engineering and Management, "INDEMAN SOCIETY"- a student body 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 research projects are executed which are sponsored by UGC, AICTE, DST, VTU and VGST.

VISION OF THE INSTITUTE

To be an Institution of International Eminence, renowned for imparting quality technical education, cutting edge research and innovation to meet global socio economic needs

MISSION OF THE INSTITUTE

MSRIT shall meet the global socio-economic needs through

- Imparting quality technical education by nurturing a conducive learning environment through continuous improvement and customization
- Establishing research clusters in emerging areas in collaboration with globally reputed organizations
- Establishing innovative skills development, techno-entrepreneurial activities and consultancy for socio-economic needs

QUALITY POLICY

We at M. S. Ramaiah Institute of Technology 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 Industrial Engineering & Management Department shall transform the entrants of the Industrial Engineering & Management program into professionally competent engineers through innovative educational curricula, balanced research program and effective collaboration with industry and academia.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

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.

PROGRAM OUTCOMES (POs):

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

THE PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1: Develop Knowledge, Skills and abilities in the fields such as System design and development, Manufacturing and Research.

PSO 2: Apply the core competence in the field of industrial and systems engineering to solve real world problem and continuously improve its performance.

PSO 3: Exhibit innovative abilities and develop towards entrepreneurial careers with a focus on leadership and responsibility.

Curriculum Course Credits Distribution

Batch 2017-18

Semester	Humanities & Social Sciences (HSS)	Basic Sciences / Lab (BS)	Engineering Sciences/ Lab (ES)	Professional Courses- Core (Hard core, soft core, Lab) (PC-C)	Professional Courses - Electives (PC-E)	Other Electives (OE)	Project Work (PW)	Internship /other activities (IS/ECA)	Total semester load
First	4	9	12						25
Second	2	9	14						25
Third		4		21					25
Fourth		4	2	19					25
Fifth	2			19	4				25
Sixth				15	4		6		25
Seventh				14	8	4			26
Eighth					4		16	4	24
Total	8	26	28	88	20	4	22	4	**200**

SCHEME OF TEACHING
V SEMESTER

Sl. No.	Course Code	Course Name	Category	Credits					Contact Hours
				L*	T*	P*	S*	Total	
1	IM51	Applied Probability and Statistics	PC-C	3	1	0	0	4	5
2	IM52	Operations Research	PC- C	3	1	0	0	4	5
3	IM53	Facilities Planning and Design	PC-C	3	0	0	1	4	3
4	IM54	Computer Integrated Manufacturing and Automation	PC-C	3	0	0	1	4	3
5	IM55	Intellectual Property Rights	HSS	2	0	0	0	2	2
6	IME	Elective – A	PC-E	4	0	0	0	4	4
7	IML56	Applied Probability and Statistics Lab	PC	0	0	1	0	1	2
8	IML57	Mechanical Measurements and Metrology Lab	PC	0	0	1	0	1	2
9	IML58	Computer Integrated Manufacturing Lab	PC	0	0	1	0	1	2
			Total	**18**	**2**	**3**	**2**	**25**	**28**

*** L:** Lecture ***T:**Tutorial ***P:** Practical ***S:** Self Study

Elective-A Code	Elective-A Title
IME01	Data Base Management System
IME02	Maintenance and Safety Engineering
IME03	Human Factors in Engineering
IME04	Finite Element Methods

SCHEME OF TEACHING
VISEMESTER

Sl.No.	Course Code	Course Name	Category	Credits					ContactHours
				L*	T*	P*	S*	Total	
1	IM61	Operations Planning and Control	PC-C	3	1	0	0	4	5
2	IM62	Quality Assurance and Reliability	PC-C	3	0	0	1	4	3
3	IM63	Principles of Management and HRM	PC-C	3	0	0	1	4	3
4	IM64	Mini Project	PW	0	0	6	0	6	-
5	IME	Elective – B	PC-E	4	0	0	0	4	4
6	IML65	Operations Planning and Control Lab	PC-C	0	0	1	0	1	2
7	IML66	Quality Assurance and Reliability Lab	PC-C	0	0	1	0	1	2
8	IML67	Facilities Planning and Design Lab	PC-C	0	0	1	0	1	2
			Total	**13**	**1**	**9**	**2**	**25**	**21**

Elective-B Code	Elective-B Title
IME05	Enterprise Resource Planning
IME06	Engineering Economy
IME07	Design of Experiments
IME08	Lean Manufacturing

V Semester

APPLIED PROBABILITY AND STATISTICS

Course Code: IM51 **Credit:3: 1: 0:0**
Prerequisite: Nil **Contact Hours: 42L+ 14T**
Course Coordinator(s): Dr. C.S. Chethan Kumar / Dr. M. Shilpa

Course Content:

Unit I

Introduction to statistics: Statistical Thinking, Collecting data, Statistical Modeling Frame work, measure of central tendency and variance, Importance of Data summary and Display, Tabular and Graphical display.

Unit II

Discrete Random Variables and Probability distributions: Discrete Random variables, Probability distributions and Probability mass functions, Cumulative distribution functions, Mean and Variance of a discrete random variable, discrete uniform distribution, Binominal distribution, Hyper Geometric distribution, Poisson distribution, Applications.

Unit III

Continuous Random Variables and Probability Distributions: Continuous random variables, Probability distributions and probability density functions, cumulative distribution functions, Mean and Variance of a continuous random variable, uniform distribution, Normal distribution, Central Limit Theorem
Normal approximation to Binominal and Poisson distribution
Exponential, Weibull and Erlang probability distributions (Simple problems)

Unit IV

Testing of Hypothesis: Estimation theory, Hypothesis testing, Inference on the mean of a population (variance known and unknown), Inference on the variance of a normal population, Inference on a population proportion, Testing for Goodness of Fit, Inference for a difference in Means, Variances known, Inference for a difference in means of two normal distributions, Variances unknown, Inference on the Variances of two normal populations, Inference on two population proportions.

Unit V

Simple Linear Regression and Correlation: Simple Linear Regression, Properties of Least Square Estimators and Estimation of variances, Transformations to a straight line.

Multiple linear Regression: Multiple linear regression model, least square estimation of parameters,
Correlation- types, correlation coefficient, Karl Pearson and Spearman's coefficients, properties of least square estimators.

Use of Statistical packages – output analysis

Text Books

1. George C Runger-Applied statistics and Probability for Engineers, John Wiley and Sons, ISBN-0-471-17027-5, 2ndEdn.
2. Richard I Levin, David S Rubin -Statistics for Management, Prentice Hall India, ISBN-81- 203-0893-X, 6thEdn.

References

1. William W Hines, Douglas C Montgomery -Probability and Statistics in Engineering, John Wiley and Sons, 2ndEdn.
2. Douglas C. Montgomery, George C. Runger, Norma F. Hubele, "Engineering Statistics", John Wiley and Sons, 5th Edn, ISBN-13: 978-0470631478 ISBN-10: 0470631473 year: 2010
3. Schaum's Outline of Statistics, 5th Edition (Schaum's Outlines) March 14, 2014, ISBN- 13: 978-0071822527 ISBN-10:0071822526
4. Daniel, Terrell -Business Statistics for Management and Economics, Houghton Mifflin Company, ISBN-0-395-62835-0, 6thEdn.
5. Walpole & Mayer -Probability and Statistics, MacMillan Publishing Company, 1989.

Course outcomes (COs):

At the end of the course, student will be able to

1. Collect, organize and analyze the data in the real life situation (PO-1,2 & PSO-2)
2. Apply the correct discrete probability distribution for the given situation (PO-5 &PSO-2)
3. Identify the correct continuous probability distribution for the given situation and apply the same to determine the probability. (PO-5&PSO-2)
4. Set up, test and make decisions about hypotheses when uncertainty exists. (PO-2,5&PSO-1)
5. Identify the degree and direction of relationship among process variables and develop appropriate regression models for the same. (PO-1,5&PSO-1)

OPERATIONS RESEARCH

Course Code: IM52 **Credit:3: 1: 0:0**
Prerequisite: Nil **Contact Hours: 42+ 14T**
Course coordinator(s): Dr. N.V.R. Naidu / Dr. G.S. Prakash

Course Content:

Unit I

Introduction: OR methodology, Definition of OR, Application of OR to engineering and Managerial problems, Features of OR models, Limitation of OR, Models of OR. **Linear Programming: Definition**, mathematical formulation, standard form, Solution space, solution – feasible, basic feasible, optimal, infeasible, multiple, optimal, Redundancy, Degeneracy. Graphical method. Product mix problems.

Unit II

Linear Programming: Simplex method, variants of simplex algorithm – Artificial basis techniques, Duality, Solution of LPP using duality concept, Dual simplex method.

Unit III

Transportation Problem: Formulation of transportation model, Basic feasible solution using different methods (North-West corner, Least Cost, Vogel‟s Approximation Method) Optimality Methods. Unbalanced transportation problem, Degeneracy in transportation problems, Variants in Transportation Problems, Applications of Transportation problems.

Unit IV

Assignment Problem: Formulation of the Assignment problem, unbalanced assignment problem, Typical Assignment problems, Traveling salesman problem.
Project Management: Network construction, determination of critical path, project duration and floats. PERT - estimation of project duration and variance and crashing. Use of M S project packages.

Unit V

Queuing Theory: Queuing system and their characteristics, The M/M/I Queuing system, Steady state performance analyzing of M/M/1 queuing model.
Game Theory: Formulations of games, Two person zero sum game, games with and without saddle point, graphical solutions (2x n, mx2 game), dominance property.

Text Books

1. TahaHA-OperationResearchanIntroduction,ISBN-81-203-3043-9, 8th Edition, 2006.
2. Ravindran, Philips and Soleberg-Operations Research Principles and practice, John Wiley & Sons, ISBN-13 978-81-265-1256-0, 2nd Edition-2007.

References

1. Hiller andLibermann-Introduction to OperationResearch, McGrawHill 5thedn. -2000
2. J K Sharma -Operations Research Theory and Application, Pearson Education PvtLtd,2ndEdn, ISBN-0333-92394-4-2006

Course outcomes (COs):

At the end of the course, student will be able to

1. Appreciate the wide applicability of operations research technology from agriculture to defense, covering almost all domains of science, arts, commerce and technology. (PO- 1&PSO-1)
2. Build the optimum solution for numerous problems of operations research by systematic defining, formulating, analyzing, developing an optimum solution and further refining the solution using simplex method. (PO- 1,2,3 &PSO-2)
3. Obtain optimum cost /profit by the application of transportation algorithm. (PO- 1,2,3&PSO-2)
4. Develop minimum cost and maximum profit solutions to Assignment and travelling salesman problems. Optimize the project duration and cost using PERT/CPM techniques. (PO- 1,2,3&PSO-2)
5. Provide probabilistic and heuristic solutions for real life problems using the Queuing and Game theory models. (PO- 1,2,3&PSO-2)

FACILITIES PLANNING AND DESIGN

Course Code: IM53 **Credit:3: 0: 0:1**
Prerequisite: Nil **Contact Hours: 42**
Course Coordinator(s): Dr M. Rajesh / Dr. M. Shilpa

Course Content:

Unit I

Plant Location and layout : Factors influencing plant location, location economics - problems. Objectives of plant layout, Principles of plant layout. Line Balancing. – Problems.

Unit II

Material Handling : Objectives and principles of Material handling, Unit load concept, classification and types of material handling equipment, Muther's Systematic Layout Planning procedure – problems.

Unit III

Space Determination and Area Allocation: Factors for consideration in space planning, area allocation factors to be considered, Sequence demand Straight line and non directional methods – Analytical treatment**.** Determination of manpower and equipment requirement, use of travel chart for layout planning, analytical treatment.

Unit IV

Layout Evaluation: Methods of constructing the layout, efficiency indices. Green technology for layouts

Layout models: Single facility and multi facility location models, warehouse layout models, Warehouse design as per International standards.

Unit V

Computer Aided Layout: Introduction to CRAFT, COFAD, PLANET, CORELAP and ALDEP– Analytical treatment.

Self-study : Types of plant layout their merits and demerits, modern material handling concepts and equipment, RFID, plot plan, conveyor and storage models, layout for software and service organizations.

Note: Industry visit – illumination, health and safety, occupational health hazards, noise, ergonomic design of workplace to be observed and report to be prepared.

Text Books

1. James M Apple -Plant Layout and Material handling, 2nd Edition, John, Wielyand Sons.
2. rancies, R.L. and White,J.A-Facility layout and Location, Mc Graw Hill, 2nd edition.
3. Tompkins J A, White, Bozer and Tanchoco-A Facilities planning, John Wiley &Sons; 4th edition, 2010

References

1. Muther Richard -Practical Plant Layout, Mc GrawHill-1955.
2. SundereshHeragu-Facilities Design, PWS Publishing Company, ISBN-0-534 -95183.
3. James M Moore -Plant Layout Design, Mac Millan Co.1962 LCCCN61-5204.

Course outcomes (COs):

At the end of the course, student will be able to

1. Identify the optimal location and layout from the alternatives. (PO- 2,3 &PSO-2)
2. Aware of the different types of modern material handling equipment for their use in the industry. (PO- 5 &PSO-1)
3. Enhance productivity of the organization by efficient usage of men, materials andequipment. (PO- 1,2&PSO-3)
4. Evaluate the layout efficiency. (PO- 1,4 &PSO-3)
5. Use computer algorithms to design plant layouts. (PO- 5,11&PSO-1)

COMPUTER INTEGRATED MANUFACTURING AND AUTOMATION

Course Code: IM54 **Credit:3: 0: 0:1**
Prerequisite: Nil **Contact Hours: 42**
Course Coordinator(s): A. Balakrishna / Dr. M. Rajesh

Course Content:

Unit I

Introduction to CIM: The Production system, Production System Facilities, Manufacturing Support Systems, CAD / CAM defined, the product cycle and CAD / CAM.
Fundamentals of CAD: Introduction, The Design Process, The Application of Computers for Design, Creating the manufacturing Data Base. Benefits.

Unit II

Conventional Numerical Control: Introduction, NC Coordinate Systems. NC Part Programming - APT Language
Computer Controls in NC: Introduction, NC Controller Technology, Computer Numerical Control, Direct Numerical Control, Combined DNC/CNC Systems, Adaptive Control Systems.

Unit III

CNC programming- Part programming fundamentals, manual part programming methods, preparatory function, miscellaneous functions, program number, tool length compensation, conned cycles, cutter radius compensation, Simple programs.
Computer Networks in Manufacturing: Hierarchy of computers in manufacturing, network topologies, manufacturing automation protocol.

Unit IV

Introduction to Automation: Definition of automation, Automation in production systems, manual labor in production systems, basic elements of an automated system, advanced automation functions, levels of automation.
Transfer lines and similar automated manufacturing systems: Fundamentals of automated production lines, applications of automated production lines, analysis of transfer lines with no internal storage, analysis of transfer lines with storage buffers.

Unit V

Automated Material Handling and Storage System: Types of material handling systems, automated conveyor system, automated guided vehicle system, AS/RS and its types.
Industrial Robotics: Introduction to Robots, Anatomy and related attributes, robot control systems, ends effectors, sensors in robotics, industrial robot applications.

Self-Study : Advantages and disadvantages of CAD/CAM, Basic components of an NC System, the NC Procedure, problems with conventional NC, CAPP – retrieval & generative CAPP system, Benefits of CAPP, reasons for automating, arguments for and against automation, social and economic aspects of robots, APT and manual part programming problems.

Text Books

1. P Mikell. Groover -Automation, Production systems, and Computer – Integrated Manufacturing, PHI 2008, 2ndedition
2. Mikell P. Groover Emory W. Zimmers-CAD / CAM Computer – Aided Design and Manufacturing, "CAD / CAM Computer – Aided Design and Manufacturing. Jr. Pearson Education inc, 2008.

References

1. P.N. Rao -CAD/CAM Principles and Applications, TMH , New Delhi, 2nd edition2004
2. Newman and sproull-Principles of Interactive Computer Graphics,TMH,1995
3. Ibrahim Zeid, Management of CAD databases

Course outcomes (COs):

At the end of the course, student will be able to

1. Apply the knowledge acquired to work in CNC machine shop.(PO- 1,12 &PSO-1)
2. Use Numerical control system in manufacturing. (PO- 2,3 &PSO-3)
3. Build program to perform various operations on CNC machines.(PO- 2,3 &PSO-3)
4. Appreciate the application of automation in manufacturing industry.(PO- 2,3,4 &PSO-2)
5. Develop an understanding of the fundamental concepts of robotics and its functioning.(PO- 1,2,3 &PSO-1)

INTELLECTUAL PROPERTY RIGHTS

Course Code: IM55 **Credit:2: 0: 0:0**
Prerequisite: Nil **Contact Hours: 28**
Course coordinator(s): Sudheer D. Kulkarni / Dr. M. R. Shivakumar

Course Content:

Unit I

Basic principles of IP laws: Introduction, History, Concept of property, Constitutional aspects of IP, Evolution of the patent system in UK, US and India, Basis for protection, Invention, Criteria for patentability, Non – patentable inventions.

Unit II

Patents: Introduction, Origin and meaning of the term patent, Objective of a patent law, the legislative provisions regulating patents, principles underlying the patent law in India, patentable invention.
Procedure for obtaining patent: Submission of application, Filing provisional and complete specification, Examination of the application, advertisement of the acceptance, opposition, Grant and sealing of patent, Term of the patent, compulsory license.

Unit III

Rights conferred on a patentee: Patent rights, Exception and limitations, Duties of a Patentee.
Transfer of patent: Forms of transfer of Patent rights, Assignment, kinds of assignment, License, kinds of license, Rights conferred on a licensee, Transmission of patent by operation of law.
Infringement of patents: Construction of claims and infringement, patents held to be infringed, patents held to be not infringed, patent agents, patent drafting, database searching, case studies.

Unit IV

Copy Right: Meaning and characteristics of copy right, Indian copy right law, requirement of copy right, Illustrations copy right in literary work, Musical work, Artistic work, work of architecture, Cinematograph film, sound recording.
Author and Ownership of copy right: Ownership of copy right, Contract of service, Contract for service, rights conferred by copy right, terms of copy right, license of copy right.

Unit V

Trade Marks: Introduction, Statutory authorities, procedure of registration of trade marks, rights conferred by registration of trade marks, licensing in trade mark, infringement of trade mark and action against infringement.
Industrial Design: Introduction, procedure of registration of a design, Piracy of a registered design.

Text Books

1. Dr. T Ramakrishna - Basic principles and acquisition of Intellectual Property Rights, CIPRA, NSLIU -2005.
2. Dr.B.L.Wadhera-Intellectual Property Law Handbook, Universal Law Publishing Co. Ltd.2002.

References

1. Dr. T Ramakrishna -Ownership and Enforcement of Intellectual Property Rights, CIPRA, NSLIU -2005.
2. Intellectual Property Law (Bare Act with short comments) - Universal Law Publishing Co. Ltd.2007.
3. The Trademarks Act 1999 (Bare Act with short comments) - Universal Law Publishing Co. Ltd.2005.
4. The Patents Act, 1970 (Bare Act with short comments) - as amended by Patents (Amendment) Rules 2006 w.e.f. 5-5-2006. Commercial law publishers (India) Pvt.Ltd. 2006.
5. Thomas T Gordon and Arthur S Cookfair-Patent Fundamentals for Scientist and Engineers, CRC Press1995.
6. PrabuddhaGanguli-Intellectual Property Rights, TMH Publishing Co.Ltd..2001

Course outcomes (COs):

At the end of the course, student will be able to

1. Identify the historical development of IPR and its importance in the society (PO-6,8,10&PSO-3)
2. Understand the patent laws & regulations and procedures for obtaining patent (PO- 6,8,10&PSO-3)
3. Analyze the functioning of patent systems (PO- 6,8,10&PSO-3)
4. Analyze and apply copyright and ownership rights (PO- 6,8,10&PSO-3)
5. Design Trade mark and industrial designs (PO- 6,8,10&PSO-3)

Elective - A

DATABASE MANAGEMENT SYSTEM

Course Code: IME01 **Credit: 4: 0: 0:0**
Prerequisite: Nil **Contact Hours: 56**
Course Coordinator(s): Dr. G.S. Prakash/ S. Hamritha

Course Content:

Unit I

Databases and Database users: Introduction, characteristics of data base approach, intended uses of a DBMS, advantages and implication of database approach.
Database Systems Concepts and Architecture: Data models, Schemas and instances, DBMS architecture and data independence, database languages and interfaces, database system environment, classification of data base management systems.

Unit II

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.

Unit III

Relational Data Model and Relational Algebra: Brief discussion on **Codd's** rules, relational model concepts, constraints, and schemas. Update operation on relations, basic and additional relational algebra operations, and queries in relational algebra.

Unit IV

Structured Query Language (SQL): Data definition in SQL, Queries in SQL: Create, Select, and Insert, Delete, Update, and Alter.

Unit V

Database Design: Design guidelines for relational schemes, functional Dependencies, normalization -1st, 2nd, 3rd, 4th, and 5th normal forms, Database design process.
System Implementation: System catalog for RDBMSs, transaction processing and system concepts, properties of transactions, recovery techniques, database security and authorization.

Text Books

1. RamezElmasri and Shamkanth B. Navathe-Fundamentals of database systems, Addison Wesley Publishing Company, 6th Edition, 2009.
2. Raghu Ramakrishnan and Johannes Gehrke-Database Management System, TATA McGraw Hill, ISBN 0-07-1231511, 3rd Edition,2002.

References

1. Mc Lfadden, Hoffer, Prescott -Modern Data base management, Prentice Hall, 2012, 11th Edition
2. Gary W. Hansen and James V. Hanesn-Database Management and Design, PHI Pvt. Ltd 2nd Edition,1995.

Course outcomes (COs):

At the end of the course, student will be able to

1. Identify and define the information that is needed to design a database management system for a business information problem. .(PO- 3,5 &PSO-1,2)
2. Create conceptual and logical database designs for a business information problem.(PO- 3,5 & PSO- 1,2)
3. Build a database management system that satisfies relational theory and provides users with business queries, business forms, and business reports.(PO-1,3,5 &PSO-1,2)
4. Build a database management system that provides structure to database system usingSQL language (PO- 1,3,5 &PSO-1,2)
5. Identify the core terms, concepts, and tools of relational database management systems various security, transaction processing, recovery system.(PO- 3,5,6,8 &PSO-1,2

MAINTENANCE AND SAFETY ENGINEERING

Course Code: IME02 **Credit: 4: 0: 0:0**
Prerequisite: Nil **Contact Hours: 56**
Course Coordinator(s) : Dr. S. Appaiah / Deepak Kumar

Course Content:

Unit I

Introduction to Maintenance System: Definition, Scope, Objective, Importance of maintenance system, Type of maintenance system, Break down maintenance system, Preventative maintenance, Predictive maintenance, design out maintenance, corrective maintenance, Planned maintenance, total productive maintenance, total preventive maintenance condition monitoring.
Computer in Maintenance Management: File data bank, storage of data such as brake downs, spare parts, lubricating points, drawing of machine parts.

Unit II

Maintenance of Machinery: Causes of machine failure, performance evaluation, complete overhauling of Lathes, Drilling machines, Milling machines, shapers and grinding machines. Maintenance planning and scheduling. Repair order control manpower requirement, maintenance job analysis spare parts control. Tribology in Maintenance, friction wears and lubrication, friction & wear mechanisms, prevention of wear, types of lubrication mechanisms, lubrication processes

Unit III

Economics in Maintenance: Repair, replacement, Repair complexity, Finding out most optimal preventive maintenance frequency. Reliability of repairable and non-repairable systems, Improvement in reliability, reliability testing, reliability prediction, Alignment and testing of equipment, computer aided maintenance, data acquisition and analysis, application of intelligent systems, data base design

Unit IV

Industrial Safety: Economic importance of accidents. Types of safety organizations, Analysis of accident Safety standards for – Mechanical equipment. Electrical equipment and systems – Chemical hazards. Material handling, exhaust systems, Plant housekeeping – building, Aisles passages, floors, tool cribs, washrooms. Safety color codes, Safety Regulations Utilization factor, drinking water layouts, light, cleanliness, guarding, and pressure vessels, job safety analysis, Safety education and training

Unit V

Fire Prevention & Protection: Conditions favoring fire break down, prevention of firing methods, fire protection – classification of fires, fire extinguishing systems, fire alarms, firefightingequipment, Mock drills, and emergency response team.

Industrial Pollution Control: Dust control – Fiber collectors, mechanical dust collectors, wet type collectors, waste disposal. Electro static precipitators, Noise pollution Control –Noise measurement and control, Industrial vibration and its control, ILO conventions, Risk assessment. Various types of environmental pollution due to industries, effect of pollution on environment, methodologies for environmental pollution prevention

Text Books

1. Staniar-Plant Engineering hand book, McGraw-HiIl, 2ndEdition.
2. Morrow, Lindley. R and Higgins -Maintenance Engineering hand book, McGraw-HiIl- 2001, 3rdEdition.

References

1. Frank Herbaty-Hand book of maintenance management, Crest Publishinghouse-2004.
2. W. Grant Larson& Eugene L.Grant-Hand book of Industrial Engg. & Management- Prentice Hall of India, 2nd edition –1988.
3. Herbert. F. Lund -Industrial Pollution Control hand book,McGraw-HiIl
4. H.P. Garg -Industrial Maintenance, S. Chand publishers, 3rdedition.
5. "ChemicalProcessSafety,FundamentalswithApplications",SecondEditionbyDanielA. Crowl& Joseph F. Louvar Published by Prentice Hall, Inc. ISBN 0-13-018176-5

Course outcomes (COs):

At the end of the course, student will be able to

1. Understand the proper maintenance system in the organization. (PO- 3&PSO-2)
2. Analyze maintenance of machinery and other equipment (PO- 2&PSO-1)
3. Use computers in maintenance effectively for increasing the availability of machines by economics.(PO- 5&PSO-2)
4. Implement of industrial safety through a proper safety standards & reduceaccidents.(PO- 3&PSO-2)
5. Apply the suitable pollution control methods in various industries. (PO- 7&PSO-2)

HUMAN FACTORS IN ENGINEERING

Course Code: IME03 **Credit: 4: 0: 0:0**
Prerequisite: Nil **Contact Hours: 56**
Course Coordinator(s): Dr. M. Rajesh / Deepak kumar

Course Content:

Unit – 1

Introduction: Introduction to Human factors, History of Human factors, Human machine systems, Displaying information, coding of information, information processing, memory, decision making, age and information processing, mental workload. Design process involving ergonomics check, Environmental factors influencing human performance

Unit – II

Visual Displays: The process of seeing, Visual acuity types, quantitative visual displays, Dynamic quantitative displays, Qualitative visual displays, Representational displays, Visual performance, Maintain Security, Health and Safety, ENVIRONMENTAL CONDITIONS – Climate, Noise, Motion

Unit – III

Auditory, Tactual & Olfactory Displays: The nature and measurement of sound, the anatomy of ear, auditory displays, principles of auditory displays, Tactual display types, The Olfactory sense and displays. Latest developments in the use of olfactory displays, domestic application of auditory, Tactual & Olfactory Displays

Unit– IV

Human activities: Muscle physiology, Measure of physiological strain, physical work load, factors affecting, energy consumption, Strength and endurance, Biomechanics of human motion, Function of controls, factors in control design, C/R ratio, Optimum C/R ratio, Principles of hand tool and device design. Work methods improvement, Body mechanics at work

Unit– V

Work space and arrangement: Anthropometry, use of anthropometric data, work spaces, design of work surfaces, science of seating, example of individual work place, human error, accidents and warnings, effect of illumination on work performance, Posture and movement, Human body- structure and function, Human error and risk perception, Vertical arm reach and design application possibility, Accidents and Safety

Applications: use of ergonomics in service sector and IT sector.

Introduction to BIS on Human factors.

Text Books

1. M S Sanders and E J McCormick -Human factors in Engineering & Design, McGraw Hill, 7th Edition.
2. Wickens J. Lee, YD Liu, S GordanBeckere-Introduction to Human factor in Engineering, Prentice Hall Inc, 2003.

References

1. S Dalela and Sourabh-Work Study and Ergonomics, Standard publishers, 5th Revised & Enlarged Edition,1999.
2. R S Bridger, introduction to ergonomics, Taylor and Francis2008

Course outcomes (COs):

At the end of the course, student will be able to

1. Apply the concept of ergonomics and man-machine system.(PO- 3,5 &PSO-1)
2. Demonstrates the importance of visual, auditory, tactual and olfactory displays in Human factors in engineering.(PO- 4,10 &PSO-1)
3. Understand the various display types to make the proper decision and enhance the existing technique. (PO- 5,6&PSO-2)
4. Analyze the process of metabolism, physical work load, and biomechanics ofhuman motion. (PO- 4,9&PSO-1)
5. Create the work space, its arrangement and applications in industry. (PO-1,7&PSO-2)

FINITE ELEMENT METHODS

Course Code: IME04 **Credit: 4: 0: 0:0**
Prerequisite: Strength of materials **Contact Hours: 56**
Course Coordinator(s): Dr. M. Rajesh / Sudheer D. Kulkarni

Course Content:

Unit I

Basic theory of elasticity: Stress, strain, stress-strain relation for plane stress, plane strain, and equilibrium equations in elasticity Coursejected to body force, traction forces and point forces.
Introduction to FEM: General description of FEM, steps involved in FEM, engineering applications of FEM, Types of elements, 1D, 2D and 3D elements, Advantages and isadvantages of FEM, Gaussian quadrature 1pt, 2pt and 3pt formula.

Unit II

Continuum method: Principle of minimum potential energy, Rayligh Ritz and Galerkien method applied to axially loaded member, cantilever, simply supported and fixed beams with point and UDL.

Unit III

Interpolation models: Polynomial form of interpolation function, linear, quadratic and cubic forms, selection of the order of interpolation polynomial, convergence requirements, 2D Pascal triangle, different coordinate systems, complete formulation of bar, truss, beam, triangular and quadrilateral elements (1D and 2D)(Including derivation of shape function in natural coordinates).

Unit IV

Higher order elements: Isoparametric , Course parametric, super parametric elements,1D ELEMENNTS-QUADRATIC, cubic elements and their shape functions, properties of shape functions, 2D quadrilateral elements, triangular elements, Lagrangian interpolation for 1D and 2Delements.

Unit V

Boundary conditions: Method of handling boundary conditions, solution of bars, stepped bars, plane trusses, and solution for displacement, reactions and stresses by using elimination and penalty approach.

Text Books

1. J.N.Reddy -Finite Element Method, Tata McGraw Hill – 3rd edition2006.
2. Chandraupatla and Belegundu -Introduction to Finite elements in engineering, Pearsonedn. –2009

References

1. Daryl.L.Logon -A First course in Finite Element methods, Thomson Learning –5th edition, 2012.
2. Hutton -Fundamentals of Finite Element method, Mc Graw Hill -2005.
3. Robert Cook et,al -Concepts & applications of FEA, Jonhwilley& sons – 4th edition 2007.

Course outcomes (COs):

At the end of the course, student will be able to

1. Identify and formulate mathematical model for engineering structures. (PO-2,3&PSO-1)
2. Apply various methods to study engineering components under different loading conditions. (PO- 2,3&PSO- 1)
3. Formulate and solve polynomial functions (PO- 2,3&PSO-1)
4. Analyze higher order polynomial functions(PO- 2,3&PSO-1)
5. Design and analyze machine components subjected to various boundaryConditions.(PO- 2,3&PSO-

APPLIED PROBABILITY AND STATISTICS LAB

Course Code: IML56 **Credit: 0: 0: 1:0**
Prerequisite: Nil **Contact sessions: 14**
Course Coordinator(s): Dr. M. Shilpa / Sri. V. Vivekanand

Course Content:

Part –A

Software: MS Excel

1. Determining the measures of central tendency and dispersion of a givenprocess
2. Graphical/ Pictorial representation of data – Histogram, Ogive curve, Bar Chart, Column chart, Pie chart, Linechart
3. Interval estimation and hypothesis testing on single populationmean
4. Interval estimation and hypothesis testing on Two populationmeans
5. Interval estimation and hypothesis testing on single populationProportion
6. Interval estimation and hypothesis testing on Two populationProportions
7. Hypothesis testing using paired t –test
8. Construction of scatter plot and determination of karlPearsons correlationcoefficient
9. Determination of Spearman's CorrelationCoefficient
10. Conduction of simple linear regressionanalysis
11. Testing the goodness of fit using Normaldistribution
12. Testing the goodness of fit using Binominaldistribution
13. Testing the goodness of fit using Poissondistribution
14. Testing the goodness of fit using Uniform distribution (for experiments 11 to 14, calculations through MSExcel)

Part –B

Software: SYSTAT statistical software package / R studio

1. Determination of basic statistics and construction of histogram for a given quality Characteristic
2. Determining the probability for discrete probability distributions – Hypergeometric, Binominal and Poissondistributions
3. Determining the probability for Continuous probability distributions – Normal and Exponentialdistributions
4. Interval estimation and Hypothesis testing on single populationmean.
5. Interval estimation and Hypothesis testing on two populationmeans
6. Interval estimation and Hypothesis testing on single populationProportion.
7. Interval estimation and Hypothesis testing on two populationProportions
8. Hypothesis testing using paired t –Test.

9. Construction of scatter plot and determining Karl Pearson's correlationcoefficient.
10. Conduction of simple linear regressionanalysis.
11. Conduction of Multiple linear regressionanalysis.
12. Case study on engineering and management relatedproblems.

Suggested software packages: MS Excel, SYSTAT / MINITAB 17 -Statistical Software Package/ R studio

Note: At least 12 experiments have to be conducted from the above list of experiments

Text Books

1. George C Runger-Applied statistics and Probability for Engineers, John Wiley and Sons, ISBN-0-471-17027-5, 2ndEdn.2003.
2. Richard I Levin, David S Rubin -Statistics for Management, Prentice Hall India, ISBN- 81-203-0893-X, 6th Edn. 1991

References

1. William W Hines, Douglas C Montgomery -Probability and Statistics in Engineering, John Wiley and Sons, 2ndEdn.
2. Daniel, Terrell -Business Statistics for Management and Economics, Houghton Mifflin Company, ISBN-0-395-62835-0, 6thEdn.
3. Walpole & Mayer -Probability and Statistics, MacMillan Publishing Company, 4th edition, 1989. ISBN :9780024242228.
4. Douglas C. Montgomery, George C. Runger, Norma F. Hubele, "Engineering Statistics", John Wiley and Sons, 5th Edn, ISBN-13: 978-0470631478 ISBN-10: 0470631473 year: 2010.
5. Schaum's Outline of Statistics, 5th Edition (Schaum's Outlines) March 14, 2014, ISBN- 13: 978-0071822527 ISBN-10:0071822526.

Course outcomes (COs):

At the end of the course, student will be able to

1. Collect and present the real life data numerically as well as graphically. (PO-1,3&PSO- 1)
2. Arrive at appropriate estimates and inferences and take decisions in uncertainty (PO- 1,2&PSO-2)
3. Apply the right probability distribution for a real life problem(PO- 1,5&PSO-2)
4. Conduct correlation and regression analysis in situations involving many variables.(PO- 1,5&PSO- 1)

MECHANICAL MEASUREMENTS AND METROLOGY LAB

Course Code: IML57 **Credit: 0: 0: 1:0**
Prerequisite: Nil **Contact sessions: 14**
Course Coordinator(s):Dr. M R Shivakumar / Dr. R Shobha

Course Content:

Lab Experiments

1. Demonstration of optical flats, clinometers, load cell, stroboscope, slip gauges, sinebar.
2. Measurements of gear elements using Toolmaker'smicroscope.
3. Measurements of angle usingautocollimator.
4. Measurement of screw thread elements using floating carriage diameter measuring instruments.
5. Inspection of surfaceplate.
6. Alignment test on drillingmachine.
7. Testing of gear concentricity using Parkinson geartester.
8. Measurement of gear/thread parameters using profileprojector.
9. Measurement calibration of dial gauge using standardLVDT.
10. Calibration of LVDT.
11. Determination of elastic modulus using straingauges.
12. Measurements of cutting forces using lathe tooldynamometer.
13. Calibration of CMM using standardsphere.
14. Measurement of specimen dimensions in CMM usingMCS.
15. Measurement of specimen dimensions in CMM usingPCS.
16. Determination of thermal conductivity and thermal expansion of metalspecimen.

Note: At least 12 experiments have to be conducted from the above list of experiments

Text Books

1. Beckwith -Margangoni and Lienhard– Mechanical Measurements, Prentice Hall Publishers, 6th edition, 2006.
2. I.C. Gupta -Engineering Metrology, Dhampat Rai Publications, 7th edition,2013.
3. R K Jain, Engineering Metrology, Khanna publications,8th edition,2002

References

1. AC – DMIS EXT Version Guide - AEH Industrial Metrology Companylimited.
2. Quadra Check 200 Users Guide - Metronics, Inc., Bedford, New Hampshire,USA
3. J.F.W.GalyerandC.R.Shotbolt–"MetrologyforEngineers",5thed.Publishedby London :Cassell, 1990.

Course outcomes (COs):

At the end of the course, student will be able to

1. Perform measurement precisely using various measuring devices. (PO-1,2&PSO-1)
2. Develop calibration methods to the various measuring devices. (PO-1,2,3&PSO-1)
3. Compare and contrast the measuring equipment required for various applications in industry. (PO-4,5&PSO-1,2)
4. Interpret the measured results. (PO-4,5&PSO-1,2)
5. Solve the measurement related problems encountered in industries. (PO-4,5&PSO-2)

COMPUTER INTEGRATED MANUFACTURING LAB

Course Code: IML58 **Credit: 0: 0: 1:0**
Prerequisite: Nil **Contact sessions: 14**
Course Coordinator(s): Dr. M. Rajesh / A. Balakrishna

Course Content:

Lab Experiments

CAM: Part programming for CNC Machines using CAM Packages to perform Turning and Milling operations.

CNC Machining:
Models to perform Turning, Taper turning, Grooving and Threading.Models to perform drilling and Counter boring operations.
Demonstration on CNC milling and turning machines, robotic arm functioning.

Experiments:
6 models using turning center 6 models using milling4 models using manual part programming 4 models using machine center

Text Books

1. CAD/CAM principles and applications by P.N. Rao, Tata MC Graw Hill2002
2. CAD/CAM by Groover, Tata MC Graw Hill2003

References

1. CAD/CAM – Ibrahim Zeid- Tata MC Graw Hill 2ndedition
2. Computer graphics- Steron Harrington- Tata MC Graw Hill 2ndedition
3. Computer aided manufacturing- P.N. Rao, Tiwar, Tata MC Graw Hill 3rdedition

Course outcomes (COs):

At the end of the course, student will be able to

1. Acquire the basics of CAD/CAM, and know the hardware and software functions. (PO- 2,3 &PSO-1)
2. Model and virtually crate a product. (PO- 5,10 &PSO-2)
3. Build manual and computer assisted part programs (PO- 2,5)(PSO-3)

VI SEMESTER

OPERATIONS PLANNING AND CONTROL

Course Code: IM61 **Credit:3: 1: 0:0**
Prerequisite: Nil **Contact Hours: 42+ 14T**
Course Coordinator(s): Dr. G.S. Prakash / Dr. R. Shobha

Course Content:

Unit I

Operations Planning Concepts: Introduction, Operations Functions in Organizations, Historical development, Framework for managing operations, The trend: Information and Non- manufacturing systems, Definition of Operations management, Factors affecting productivity, International dimensions of productivity, The environment of operations

Unit II

Operations Decision Making : Introduction, Management as a science, Characteristics of decisions, Framework for decision making, Decision methodology, Decision Tree Problems, Economic models-Break-even analysis in operations, P/V ratio.
System Design and Capacity: Introduction, Manufacturing and service systems, Design and systems capacity, Capacity planning, Numerical on Design Capacity, System Capacity and Capacity Planning.

Unit III

Forecasting Demand: Forecasting objectives and uses, Forecasting variables, Opinion and Judgmental methods, Delphi technique, Time series methods, Moving Average methods, Exponential smoothing, Trend adjusted Exponential Smoothing, Regression and correlation methods, Application and control of forecasts-Mean Absolute Deviation, BIAS, and Tracking Signal.

Unit IV

Aggregate Planning and Master Scheduling: Introduction- planning and scheduling, Objectives of aggregate plan, Three Pure Strategies of Aggregate planning, aggregate planning methods, Master scheduling objectives, Master scheduling methods with numerical, Numerical on Level production and chase demand
Material and Capacity Requirements Planning: Overview: MRP and CRP, MRP: Underlying concepts, MRP logic, (Numerical examples on MRP calculations), Capacity management, CRP activities.

Unit V

Scheduling and Controlling Production Activities: Introduction, PAC, Objectives and Data requirements, Loading –Finite and Infinite Scheduling methodology, priority sequencing,

Single Machine Scheduling: Concept, measures of performance, SPT rule, Weighted SPT rule, EDD rule.
Flow –Shop Scheduling: Introduction, Johnson's rule for „n‟ jobs on 2 and 3 machines, CDS heuristic.**Job-Shop Scheduling**: Scheduling 2 jobs on „m‟machines.

Text Books

1. Monks J.G -Operations Management, McGraw-Hill International 2nd, Editions-2004.
2. Pannerselvam. R -Production and Operations Management, PHI, 3rdedition.2012
3. Adam & Ebert -Production and Operatiosn Management, PHI, 5thedition,1992

References

1. Buffa -Modern Production/Operations Management, Wiely India Ltd. -4thedition.2009
2. Chary S.N -Production and Operations Management, Tata-McGraw Hill. -3rdedition 2015
3. Chase, Aquilano& Jacobs- Production and Operations Management, Tata-McGraw Hill. – 8th edition. 2014

Course outcomes (COs):

At the end of the course, student will be able to

1. Understand the historical development, frame work and functions of operations planning in organization (PO- 1,2,3&PSO-1)
2. Analyze the characteristics and methodologies for decision making & capacity planning (PO- 1,2,5&PSO-1,2)
3. Identify right methods & techniques for forecasting demands in various organizations (PO- 1,2,3,5&PSO-2)
4. Formulate strategies for solving day to day problems on planning & scheduling. (PO- 1,2,3&PSO-2,3)
5. Implement job scheduling rules for controlling production activities (PO-1,2,3&PSO-2,3)

QUALITY ASSURANCE AND RELIABILITY

Course Code: IM62 **Credit:3: 1: 0:0**
Pre requisite : Applied Probability and Statistics **Contact Hours: 42**
Course Coordinator(s): Dr. G.S. Prakash / A. Balakrishna

Course Content:

Unit I

Introduction: Definition of Quality, Dimensions of Quality, The Juran‟s Spiral of quality, Quality costs – four categories of costs and hidden costs. Brief discussion on sporadic and chronic quality problems.
Quality Assurance: Definition and concept of quality assurance, Quality audit concept, audit approach etc, ingredients of a quality program.

Unit II

Statistical Process Control: Introduction to statistical process control. SPC tools and techniques7QC tools, Process capability – Basic definition, standardized formula and six sigma conceptof processcapability.
Introduction to control charts: Classification, chance and assignable causes of variation. Basic principles of control charts, Analysis of patterns of control charts.
Control Charts for Variables: Controls charts for X bar and Range, statistical basis of the charts, development and use of X bar and R charts, interpretation of charts. Control charts for X bar and standard deviation (S), development and use of X bar and S chart.

Unit III

Control Charts for Attributes: Controls chart for fraction non- conforming (defectives) Development and operation of control chart, brief discussion on variable sample size.
Control chart for non-conformities (defects) – development and operation of control chart for constant sample size and variable sample size. Choice between variables and attributes control charts.
Advanced quality concepts.
Design of experiments – Purpose of DOE, Principles, Terminology, Methodology, Six Sigma - Basic concepts, DMAIC – Problem solving using DMAIC approach. (No analytical treatment for MSA and gauge R & R)

Unit IV

Sampling Inspection: Concept of accepting sampling, economics of inspection, Acceptance plans – single, double and multiple sampling. Operating characteristic curves – construction and use. Producer risk and Consumer risk. Determinations of AOQ, LTPD, ASN, AOQL, ATI

Unit V

Statistical Theory of Tolerances: Application of statistical theory of tolerances to design of tolerances in random assemblies and application in other areas.

Reliability and Life Testing : Failure models of components, definition of reliability,MTBF, Failure rate, common failure rate curve, types of failure, reliability evaluation in simple cases of exponential failures in series, paralleled and series-parallel device configurations, Redundancy and improvement factors evaluations.

Self-study: ZD program - case study, CUSUM chart, MSA and GRR, introduction to QMS (no analytical treatment)

Text Books

1. Montgomery -Introduction to Statistical Quality Control, John Wiley and Sons.-2007.
2. Grant and Leavenworth -Statistical Quality Control,McGraw-Hill.-2008
3. Juran and Gryna-Quality Planning and Analysis, 3rd edition,TMH.4th Edision2001
4. NVR Naidu, KM Babu, and G Rajendra-Total Quality Management, NewAge
5. International Pvt.Ltd-2006

References

1. Dale H. Besterfield-Quality control, Prentice-Hall International; 1998.-HardCover- 2003
2. Kesavan R -Total Quality Management, IK International, New Delhi-2007

Course outcomes (COs):

At the end of the course, student will be able to

1. Appreciate the role and importance of statistical quality control in modern industry, impact of quality on other functions, and the need for continuous improvement. (PO- 1,2,12&PSO-1)
2. Analyze the effects of variation on processes and utilize SPC tools for process control and improvement using variable control charts. (PO- 2,3,4,5&PSO-2)
3. Analyze the effects of variation on processes and utilize SPC tools for process control and improvement using attribute control charts. (PO- 2,3,4,5&PSO-2)
4. Apply the concept of acceptance sampling and analyze producers and consumer risk using the OC curve. (PO- 1,2,3 &PSO-2)
5. Use sampling plans, statistical tolerancing and reliability concepts, DOE and Six sigma concepts for quality control in real life situations(PO- 1,2,3,5 &PSO-3)

PRINCIPLES OF MANAGEMENT AND HRM

Course Code: IM63 **Credit: 3:0 : 0:1**
Prerequisite: Nil **Contact Hours: 42**
Course Coordinator(s): Dr. S. Appaiah / Dr. M Shilpa

Course Content:

Unit –I

Introduction to Management: Definition of Management, Its nature and purpose, Managing- Science of Art? Contributions of F.W. Taylor and Henry Fayol to management theory, Functions of managers,
Planning: Types of plans, Steps in planning, the planning process, Management by Objectives (MBO), Process of MBO,
Organizing: The nature and purpose of organizing, Formal and informal organization. Organization levels and Span of management, Principle of span of management and the factors determining an effective span. The structure and process of organizing

Unit –II

Staffing: Situational factors affecting staffing.
Leading: Human factors in managing, definition of leadership, Ingredients of leadership,
Controlling: Basic control process, Critical control points and standards, Control as a feedback system, Feed forward control, Requirements for effective controls.

Unit –III

Introduction to HRM: Evolution of HRM, Objectives, Functions and Policies.
Man Power Planning: Uses and benefits, Man Power Inventory, Man Power Forecasting, Methods of Man Power Forecasting.
Recruitment: Sources of Man power, Advertisement, Short Listing of Candidates calling Candidates for selection Process

Unit –IV

Training And Development : Identification of Training needs, Training Evaluation, Training Budget, Executive Development – Different Approaches, Non-executive development – Different methods, Training as a tool for continuous growth of Individual and Organizers.

Unit –V

Induction: Induction procedure, transfers, promotion exit interview, (Written test, Group Discussion, Interviews).

Performance Appraisal: Components, Methods, Advantages and limitations of different methods, CSR.

Self-Study:
Selection: Selection procedure – Written Test, Group Discussion, Interview – Different methods, advantages and Limitations, Psychological testing – Advantages and limitations.
Communication: Communication function, communication process, effective communication.

Text Books

1. Harold Koontz, H. Weihrich, and A.R. Aryasri, Principles of Management, Tata McGraw- Hill, New Delhi,2004.
2. Dr. K Ashwathappa – Human Resource Management, Tata McGraw Hill, 5th Edition, 2005.
3. Hersey and Blanchard -Management of Organization'sBehavior, Prentice Hall of India, 10th Edition –2012.
4. ArunMonappa -Industrial Relations, TMH, ISBN – 0-07-451710-8,2007

References

1. Decenoz and robbins -Personnel / Human Resource Management, PHI,2002.
2. CB Mamoria -Management of Human Resources, Himalaya Publication House,2003.
3. Jain -Industrial Acts, TMH Publications,2004.

Course outcomes (COs):

At the end of the course, student will be able to

1. Plan and organize for the manpower in the given type of organization (PO-6,9&PSO-1)
2. Use staffing Leading and controlling function for the given organization. (PO- 6,9&PSO-1)
3. Analyze and select the right recruitment / rights strategy for a given organization (PO- 6,10&PSO-1)
4. Design the appropriate training and development programme to the employee after analyzing the training needs (PO- 6,10&PSO-3)
5. Identify the performance appraisal method depending on the type oforganization.(PO- 6,10&PSO- 3)

MINI PROJECT

Course Code: IM64 **Credit :0:0 : 6:0**
Course Coordinator(s): Dr M. Shilpa / Dr. R Shobha

Course Content:

Note:

- A team of three to five members have to be formed.
- Identify the company in which project work will be carried out.
- The project can also be carried out in-house.
- Identify the problem area in order to carry out the project work.
- Expected outcomes should be clearly stated.
- Applying any one of the engineering tools and techniques to solve the problem.
- Extensive literature review can be carried out in emerging areas, identification of gaps and providing suitable suggestions to bridge the gap.
- The project report should well organized; points should be logically ordered with sharp sense of beginning and end
- Book and conference references along with reference to journal papers should be provided
- Scope for future work must be indicated
- The report should be well formatted and documented with adequate table and figure titles etc.
- Project work evaluation will be progressively carried in three stages and finally at the end of the semester through external examination.
- Project review committee comprises of internal project guide and two faculty members.

Course outcomes (COs):

At the end of the course, student will be able to

1. Identify the cross functional interdependencies in a project. (PO- 9,10&PSO-1,2)
2. Suggest / Implement the concepts of Project, financial, technology and industrial management to solve productivity and competitive issues. (PO-3,11&PSO-2)
3. Participate in cross - functional teams. (PO- 9,10&PSO- 2,3)
4. Provide suggestions to develop new systems or subsystems to solve the identified problem (PO- 3,4&PSO-2)
5. Demonstrate the ability and skill to solve industrial problems within a specific time frame. (PO- 1,2,3&PSO-2,3)

ENTERPRISE RESOURCE PLANNING

Course Code: IME05 **Credit:4:0 : 0:0**
Prerequisite: Nil **Contact Hours:56**
Course Coordinator(s): Dr C S Chethan Kumar / P R Dheeraj

Course Content:

Unit I

Introduction to Business Processes: The Functional Organizational Structure, Business Processes.
Introduction to Enterprise Systems: Enterprise Systems, Data in an Enterprise System, Reporting.

Unit II

Introduction to Accounting: Organizational Data, Master Data, Key Concepts, Processes, Reporting.
Procurement Process: Organizational Data, Master Data, Key Concepts, Process, Reporting.

Unit III

Fulfillment Process: Organizational Data, Master Data, Process, Credit Management Process, Reporting.
Production Process: Master Data, Process, Reporting.

Unit IV

Inventory and Warehouse Management Processes: Inventory Management, Organizational Data in Warehouse Management, Master Data in Warehouse Management, Processes in Warehouse Management, Reporting.
Material Planning Process: Master Data, Process, Reporting.

Unit V

Implementation Basics: Introduction, Why ERP, Technological Operational and Business Reasons for Implementing ERP, Implementation Challenges.
Implementation Life Cycle: Introduction, Objectives of ERP Implementation, Different Phases of ERP Implementation, Why Do Many ERP Implementations Fail.

Textbooks

1. "Integrated Business Process with ERP Systems" – Simha R Magal and Jeffrey Word (John Wiley & Sons,2010)
2. "Enterprise Resource Planning" – Alexis Leon (Tata McGraw Hill,2008)

References

1. "Management Information Systems" – James O'Brien, G M Marakas& Ramesh Behl (Tata McGraw-Hill,2009)
2. "Essentials of Management Information Systems" – Laudon & Laudon (Prentice Hall,2009)

Course outcomes (COs):

At the end of the course, student will be able to

1. Identify the fundamental features of ERP. (PO- 3&PSO-1)
2. Design basic accounting and procurement systems in ERP. (PO- 3&PSO-1)
3. Design basic fulfillment and production systems in ERP. (PO- 3&PSO-1)
4. Design basic inventory and materials systems in ERP. (PO- 3&PSO-1)
5. Implement a basic ERP system in an industry. (PO- 3&PSO- 2)

ENGINEERING ECONOMY

Course Code: IME06 **Credit:4:0 : 0:0**
Prerequisite: Nil **Contact Hours:56**
Course Coordinator(s) : Dr. S. Appaiah / Dr. M. Rajesh

Course Content:

Unit I

Introduction: Engineering Decision- Makers, Engineering and Economics, Problem solving and Decision making, Intuition and Analysis, Tactics and Strategy.
Interest and Interest Factors: Interest rate, simple interest, Compound interest, Cashflow diagrams, Exercises and Discussion.

Unit II

Present Worth Comparison: Conditions for present worth comparisons, Basic Present worth comparisons, Present worth equivalence, Net Present worth, Assets with unequal lives & infinite lives, Future worth comparison, Pay – back comparison, Exercises, Discussions and problems.
Equivalent Annual Worth Comparisons: Equivalent Annual Worth Comparison methods, Situations for Equivalent Annual Worth Comparison Consideration of asset life, Comparison of assets with equal and unequal lives, Use of sinking fund method, Annuity contract for guaranteed income, Exercises, Problems.

Unit III

Rate of Return Calculations: Rate of return, Minimum acceptable rate of return, IRR, IRR misconceptions, Cost of capital concepts.
Structural Analysis of Alternatives: Identifying and Defining alternatives, IRR analysis of mutually exclusive alternatives, Capital Budget view point, Ranking criteria.

Unit IV

Estimating and Costing : components of costs such as direct material cost, direct labor cost, fixed overheads, factory costs, administrative overheads, first cost, marginal cost, selling price, profit, estimation for simple components.
Depreciation: Causes of Depreciation, Basic methods of computing depreciation charges. Depreciation calculations as per Indian Income Tax Act.

Unit V

Replacement Analysis: Deterioration, obsolescence, inadequacy, Economic life for cycle replacements. Reasons for replacements, Individual replacements of machinery or equipment with/ without value of money, Group replacement policies.
Break-Even Analysis: Basic Concepts, Linear break even analysis with problems.
Effects of Inflation: Causes, consequences and control of inflation. After tax actual cash flow comparisons, Lease/ Buy decisions.

Text Books

1. RIGGS J.L –Engineering Economy, 4th Edition, McGraw Hill,2004.
2. PAUL DEGARMO –Engineering Economy, Macmillan Pub, Co.2001.
3. Naidu, Babu and Rajendra–Engineering Economy, New Age International Pvt. Ltd. – 2006

References

1. OP Khanna –Industrial Engineering and Management, Dhanpat Rai & Sons2000
2. I M Panday–Financial Management, Vikas Publishing House2002.
3. Thuesenh.G–Engineering Economy, PHI,2002.

Course outcomes (COs):

At the end of the course, student will be able to

1. Compare and contrast the importance of engineering and economics and different types of interest and interest factors with cash flow diagrams (PO-1,2&PSO-1,2)
2. Understanding the concept of present worth, Equivalent annual worth conditions and future worth. (PO- 1,2,5&PSO-1,2)
3. Analyze about Structural analysis and its application, rate of return and itsmethods.(PO- 1,2,6&PSO- 1,2)
4. Analysis and estimate simple components with verities and depreciation with various method. (PO- 1,2,6&PSO-1,2)
5. Analyze the replacement polices and BEP analysis with leaner and non-leaner models.(PO- 1,2,6&PSO- 1,2)

DESIGN OF EXPERIMENTS

Course Code: IME07 **Credit:4:0 : 0:0**
Pre requisite : IM51 Applied Probability and Statistics **Contact Hours:56**
Course Coordinator(s): Dr. M. Shilpa / Sri. V. Vivekanand

Course Content:

Unit I

Introduction: Design of Experiments Terminology, P- diagram Taguchi Definition of quality, Taguchi's Quality philosophy, Taguchi's Quality loss function for static cases (numerical problems) off-line and on-line quality control.
Experimental designs: Completely Randomized Design, Randomized Block Design, Latin Square Designs

Unit II

Full factorial design: Experimentation as a learning process, traditional scientific experiments, Two factor and three factor experiments, graphical display of factor effects, replicating experiments, factor interactions, algorithm for calculating interaction effects, Two factor design
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 III

Signal – to – noise ratio: Comparing the quality of two process conditions, Identification of scaling factor, Evaluation of sensitivity to noise.
S/N ratio for static cases – Smaller-the-better, Nominal-the-best, Larger-the-better and Asymmetric cases (numerical problems)
S/N ratio for dynamic cases – Continuous to Continuous, Continuous to Digital, Digital to Digital, Digital to Continuous (No analytical treatment)

Unit IV

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, Problems (selection of OA, Data analysis, SN ratio calculations, selection of optimum levels from the SN ratiograph)

Unit V

Computer Aided Robust Design: Description of noise factors, methods of simulating the variation in noise factors, Orthogonal array based simulation of variation in noise factors, Quality characteristic and SN ratio, Tolerance Design

Comparison of Taguchi's robust design with the classical statistical experimental design.

Text Books

1. Robert H. Lochner and Joseph E. Matar-Designing for Quality, an Introduction Best of Taguchi and Western Methods or Statistical Experimental Design - Chapman and Hall Madras - 2nd edition.
2. Madhav S. Phadke -Quality Engineering Using Robust Design, Prentice Hall PTR, Englewood Cliffs, New Jersey07632.

Reference

1. D.C. Montgomery -Design and Analysis of Experiments, John Wiley and Sons , 8th edition, 2012
2. Jiju Anthony, "Design of Experiments for Engineers and Scientists", Elsevier, 2nd edition, 2014
3. Thomas B. Barker , "Quality By Experimental Design" , 3rd Edition,2005

Course outcomes (COs):

At the end of the course, student will be able to

1. Apply the knowledge of design of experiments, construct TQLF and analyze the results of simple experiments (PO- 2,3&PSO-2)
2. Conduct full factorial experiments and analyze the results (PO- 2,3&PSO-1)
3. Conduct experiments as per robust design methodology and analyze the S/Nratio.(PO- 2,4&PSO- 2)
4. Select the right orthogonal array for the given experimental situation. (PO-2,4&PSO-1)
5. Analyze how robust design experiments can be conducted using computers (PO-2,4&PSO-3)

LEAN MANUFACTURING

Course Code: IME08 **Credit:4:0 : 0:0**
Prerequisite: Nil **Contact Hours:56**
Course Coordinator(s): Dr. C.S. Chethan Kumar / S. Hamritha

Course Content:

Unit I

Race without a Finish Line: Competitive Advantage, Just-in-Time and Total Quality Management, Evolution of Manufacturing, the Quality Movement, The Imperative.
Value – Added and Waste Elimination: Value – added focus, sources of waste, JIT Principles, The meaning of JIT. 5S housekeeping Concepts, 5S auditing, Kaizen activities, Kaizen workshop, Benefits of kaizen. Casestudies.

Unit II

Elements Of Lean Production: Small-Lot Production, Lot-Size Basics, Lot Sizing, Lot- Size Reduction, Facilitating small Lot Sizes. Casestudies.
Setup-Time Reduction: Improve Setups? Why Bother? Setup-Reduction Methodology, Techniques for Setup Reduction, setup-Reduction Projects. Case studies.

Unit III

Maintaining and Improving Equipment: Equipment Maintenance, Equipment Effectiveness, Preventive Maintenance Program, Total Productive Maintenance, Implementing TPM.
Pull Production Systems: Production Control Systems, Process Improvement, How to Achieve Pull Production, Other Mechanisms for Signal and Control, To Pull or Not to Pull.

Unit IV

Focused Factories and Group Technology: Ways of Doing Work, Facilities Layout, Group Technology, Focused Factory, Establishing Product, Chapter Supplement.
Work cells and Cellular Manufacturing: Work cell Concepts, Work cell Applications, Work Design, and Workers in Cells, Equipment Issues, Implementing, and Getting Started. Case studies.

Unit V

Lean Systems: Introduction to value stream mapping, VSM Principles, VSM TOOLS, and Current Value stream mapping, Future State Mapping. Case studies.

Text Books

1. John M Nicholas -Competitive Manufacturing Management, TMH, Edition-2001.
2. Ronald G Askin and Jeffrey B Goldberg, Design and Analysis of Lean, John Wiley – 2001.

References

1. Pascal Dennis -Lean Production Simplified: A Plain-Language Guide to the World's Most Powerful Production System, Second Edition,ISBN
2. John Miltenburg-Manufacturing Strategy, ISBN, Second Edition.
3. Don Tapping,TomLuyster and Tom Shuker-Value Stream Management, Productivity Press.

Course outcomes (COs):

At the end of the course, student will be able to

1. Appreciate Value added activities and eliminate non value added processes to improve organizational efficiency (PO- 4&PSO-1)
2. Identify and evaluate various processes through lean tools. (PO- 5,2,3&PSO-1,2)
3. Apply and evaluate pull production system. (PO- 2&PSO-1,2)
4. Design workcells and calculate OEE. (PO- 1,2&PSO-2)
5. Design and implement value stream mapping. (PO- 3&PSO- 2,3)

OPERATIONS PLANNING AND CONTROL LAB

Course Code: IML65 **Credit: 0:0 : 1:0**
Prerequisite: Nil **Contact Sessions :14**
Course Coordinator(s): Dr G S Prakash / Dr. M. Shilpa

Course Content:

Laboratory Exercises

1. Enter supplier information.
2. Confirm supplier information.
3. Approve supplier information.
4. Generating BOM: entry and item master.
5. Generating BOM: report.
6. Vendor management.
7. Inventory model: entry and dispatch.
8. Inventory model: receipt.
9. Inventory model: report.
10. MRP: entry.
11. MRP: run &generation.
12. Supply chain: invoice, report and sales.
13. Optimization problems using OR package.
14. Creating PO.
15. Creating quotation process.

Note: At least 12 experiments have to be conducted from the above list of experiments

Suggested Software Packages

1. Statistical Packages : SYSTAT / MINITAB and such others
2. ERP Packages : OPTIMIIZER 10.6
3. Preactor – Scheduling Software OR Packages : Lindo /Lingo

Text Books

1. Monks J.G -Operations Management, McGraw-Hill International, Editions - 1987.
2. Pannerselvam. R -Production and Operations Management, PHI, 2ndedition.
3. Adam & Ebert -Production and Operation Management, PHI, 5thedition

References

1. Buffa-ModernProduction/OperationsManagement,WielyIndiaLtd.-4thedition.
2. CharyS.N-Production andOperationsManagement,Tata-McGrawHill.-3rdedition
3. Chase, Aquilano& Jacobs- Production and Operations Management, Tata-McGraw Hill. – 8th edition

Course outcomes (COs):

At the end of the course, student will be able to

1. Select the appropriate ERP software based on different criteria like customer order processing, Purchase order, Inventory transactions. (PO- 3,5&PSO- 1,2,3)
2. Develop bill of materials for engineering design, dispatch slip and payment reconciliation.
   (PO- 3,5&PSO- 1,2,3)
3. Analyze and interpret the results of optimizations problems. (PO- 3,5&PSO- 1,2,3

QUALITY ASSURANCE AND RELIABILITY LAB

Course Code: IML66 **Credit:0:0 : 1:0**
Prerequisite: Nil **Contact Sessions :14**
Course co-ordinator(s): Sri. A. Balakrishna/ Dr. M. Shilpa

Course Content:

Lab experiments

1. Construction of X bar- R chart using SPC software
2. Construction of X bar- R chart using SYSTAT software
3. Construction of X bar- R chart using Multifunctional Vernier height gauge
4. Construction of X bar- R chart using SQC display unit
5. Construction of X bar- S chart using MS Excel
6. Process capability analysis using Normal Probability Paper method
7. Process capability analysis using Multifunctional Vernier height gauge
8. Process capability analysis using SPC software
9. Process capability analysis using SYSTAT software
10. Process capability analysis using SQC display unit
11. Construction of P- chart using MS Excel
12. Construction of n P- chart using MS Excel
13. Conduction of full factorial experiment – 2 factors and 2levels
14. Conduction of full factorial experiment – 2 factors and 3levels
15. Conduction of GRR study
16. Conduction of single sampling plan experiment
17. Conduction of Deming's funnel experiment
18. Experimentation on DMAIC approach of Six Sigma

Note: Any 12 experiments from the above list of experiments to be conducted in a semester and the same should be indicated in the lesson plan.

Text Books

1. Montgomery -Introduction to Statistical Quality Control, John Wiley and Sons - 2007.
2. Grant and Leavenworth -Statistical Quality Control,McGraw-Hill.-2008
3. Juran and Gryna-Quality Planning and Analysis, 3rd edition,TMH.4thEdision-2001
4. NVR Naidu, KM Babu, and G Rajendra-Total Quality Management, NewAge International Pvt.Ltd-2006

References

1. Dale H. Besterfield-Quality control, Prentice-Hall International; 1998.-HardCover- 2003
2. Kesavan R -Total Quality Management, IK International, NewDelhi-2007

Course outcomes (COs):

At the end of the course, student will be able to

1. Construct quality control charts and assess the capability of the process. (PO-3,4&PSO-1,2)
2. Conduct experiments using principles of design of experiments and analyze theresults(PO- 3,4&PSO-1,2)
3. Design the sampling plan and determine producer's and consumer's risks (PO-3,4&PSO-1,2)
4. Conduct experiments on GRR, Six Sigma and variability studies and analyze theresults(PO- 3, 4, 5&PSO-1,2)

FACILITIES PLANNING AND DESIGN LAB

Course Code: IML67 **Credit:0:0 : 1:0**
Prerequisite: Nil **Contact Sessions :14**
Course Coordinator(s): Dr. M. Rajesh / Dr. M. Shilpa

Course Content:

Lab experiments

1. Design of plant layout using Muther's systematic layout planning
2. Design of plant layout using Sequence demand non-directional method
3. Design of plant layout using Sequence demand straight line method
4. Design of plant layout using CORELAP
5. Design of plant layout using ALDEP
6. Design of plant layout using CRAFT
7. Design a suitable material handling equipment for a factory.
8. Identify the flaws and propose a suitable layout of a facility.
9. Perform line balancing.
10. Building a simple layout with given floor thickness, wall width and height
11. Placing windows, columns and beams for given specifications in a layout
12. Constructing mezzanine floor and inserting cabinets on the mezzanine floor
13. Building the stairs in a layout
14. Modifying mezzanine floor by changing height and hence modifying the cabinets
15. Incorporating different machines, workbenches in a layout
16. Laying the conveyor of required length and putting a safety fence

Note: At least 12 experiments have to be conducted from the above list of experiments

Text Books

1. James M Apple -Plant Layout and Material handling, 2nd Edition, John Wileyand Sons.
2. Francies, R.L. and White, J.A -Facility layout and Location, Mc Graw Hill, 2nd edition.
3. Tompkins J A, White, Bozer and Tanchoco-A Facilities planning, John Wiley&Sons; 4th edition, 2010

References

1. Muther Richard -Practical layout, Mc GrawHill-1955.
2. SundereshHeragu-Facilities Design, PWS Publishing Company, ISBN-0-534-95183.
3. James M Moore -Plant Layout Design, Mac Millan Co.1962 LCCCN61-5204.

Course outcomes (COs):

At the end of the course, student will be able to

1. Identify the optimal layout from the alternatives.(PO- 2,11 &PSO-1)
2. Compare and contrast the different types of modern material handling equipment's for their use in the industry.(PO- 3,4&PSO-2)
3. Enhance productivity of the organization by efficient usage of men, materials and equipment(PO-1,11&PSO-2)

INTERNSHIP

Course Code: IM IN **Credit:0:0:4:0**
Prerequisite: Nil **Contact Duration: 1 Month**
Course Coordinator(s): Dr. M Rajesh / Sudheer D Kulkarni/P R Dheeraj

Course Content:

Students should undergo industrial training in the form of Internship for one month in reputed industries.

Assessment and Evaluation

Note: Students have to undergo one month internship in an industry between 4th and 5th or 6thand 7th semester. The student has to compulsorily submit a report in his/her 7th semester and the evaluation will be done by a committee constituted by the HOD. Each student must give a presentation for about 30 minutes, comprisingof:

- Company Profile
- Recording of information/observations
- Short comings noticed during the internship
- Application of industrial engineering techniques
- Conclusions

Course outcomes (COs):

1. Identify the products of the company and its customers and draw the appropriate plant layout of the industry (PO- 1,2,3&PSO 1)
2. Construct the process map for some of the important products of the industry (PO- 1,2,3&PSO 1,2)
3. Identify some of the problems present in the industry and apply industrial engineering techniques to provide suitable suggestions to overcome them (PO-1,2,3&PSO2,3)