RAMAIAH
Institute of Technology

CURRICULUM

for the Academic year 2019 – 2020

INDUSTRIAL ENGINEERING AND MANAGEMENT

I to IV SEMESTER M. Tech

M. Tech in INDUSTRIAL ENGINEERING (MIE)

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 304 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, a good Mentoring/Proctorial system, a fully equipped Sports department, large air conditioned library withover1,35,427 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 commenced in the year 2012. The department has been recognized as R&D center by VTU with 14 students perusing their Ph.D. The department has well modernized laboratories namely Industrial & Quality Engineering lab, Computer Lab and Metrology & Mechanical Measurement 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 28 faculty development programs, seminars & workshops for academicians, Industry personnel, students and technical staff. 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 which are conducted twice every semester for all students. Many research projects are executed which are sponsored by UGC, DST, VTU and VGST.

Focus of the Department:

The department mainly focuses on the following thrust areas which include optimization, productivity enhancement, quality control, work system design, supply chain management, Computer Integrated Manufacturing, Operations Planning and Control and other related areas. Our graduates are placed in a spectrum of manufacturing and service industries. Our focus is also on developing future entrepreneurs.

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

RIT 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 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 and Management Department shall transform the entrants of the Industrial Engineering and Management program into professionally competent engineers through innovative educational curricula, balanced research program and effective collaboration with industry and academia

M. Tech Program Educational Objectives (PEO's)

The Post Graduate of Industrial Engineering will effectively:

PEO 1: Apply the skills and competence of Industrial Engineering to interpret and solve real life problems

PEO 2: Engage, empower, build and lead the cross-functional teams to solve integrated eco-systems

PEO 3: Involve continued competitive research leading to cutting edge solutions

M. Tech Program Outcome's (PO's)

The Post Graduate of Industrial Engineering will have ability to:

PO1: Independently carry out research/investigation and development work to solve practical problems.

PO2: Write and present a substantial technical report/document.

PO3: Identify advanced engineering and IT tools to solve innovative industrial engineering challenges.

PO4: Demonstrate the importance of environmental sustenance through the application of professional ethics along with techno-social responsibilities.

PO5: Implement the principles of project management to solve societal issues.

Curriculum Course Credits Distribution Batch 2019-2020

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		5	12			2	23
Second				9	12			2	23
Third				4	4		8	4	20
Fourth							22		22
Total	0	4	0	18	28	0	30	8	88

SCHEME OF TEACHING

I SEMESTER

M.TECH - INDUSTRIAL ENGINEERING (MIE)

Sl. No.	Subject Code	Subject	L	T	P	Total
1	MIE 11	Research Methodology	**3**	**0**	**0**	**3**
2	MIE 12	Advanced Mathematics	**3**	**1**	**0**	**4**
3	MIE 13	Elective – A	**4**	**0**	**0**	**4**
4	MIE 14	Elective – B	**4**	**0**	**0**	**4**
5	MIE 15	Elective – C	**4**	**0**	**0**	**4**
6	MIE 16	Seminar – I	**0**	**2**	**0**	**2**
7	MIEL17	Work System Design and Ergonomics Lab	**0**	**0**	**1**	**1**
8	MIEL18	Supply Chain Lab	**0**	**0**	**1**	**1**
		Total				**23**

L: Lecture **T:** Tutorial **P:** Practical

Elective – A	
Subject Code	**Name of the subject**
MIE 131	Work System Design and Ergonomics
MIE 132	E-Commerce
MIE 133	CIM and Robotics
MIE 134	Marketing Management
Elective – B	
Subject Code	**Name of the subject**
MIE 141	Supply Chain Management
MIE 142	Artificial Intelligence and Expert Systems
MIE 143	Value Engineering
MIE 144	Organizational Behavior
Elective – C	
Subject Code	**Name of the subject**
MIE 151	Advanced Production Planning and Scheduling
MIE 152	Project Management for Business, Engineering & Technology
MIE 153	Modern Enterprise Systems
MIE 154	Integrated Product Development

SCHEME OF TEACHING

II SEMESTER

M.TECH - INDUSTRIAL ENGINEERING (MIE)

Sl. No.	Subject Code	Subject	L	T	P	Total
1	MIE 21	Advanced Probability and Statistics	**3**	**1**	**0**	**4**
2	MIE 22	Quality and Reliability Engineering	**3**	**0**	**0**	**3**
3	MIE 23	Elective – D	**4**	**0**	**0**	**4**
4	MIE 24	Elective – E	**4**	**0**	**0**	**4**
5	MIE 25	Elective – F	**4**	**0**	**0**	**4**
6	MIE 26	Seminar – II	**0**	**2**	**0**	**2**
7	MIEL 27	Advanced Probability and Statistics Lab	**0**	**0**	**1**	**1**
8	MIEL 28	Systems Simulation Modeling Lab	**0**	**0**	**1**	**1**
		Total				**23**

*** L :** Lecture **T :** Tutorial **P :** Practical

Elective – D	
Subject Code	**Name of the subject**
MIE 231	Systems Simulation Modeling
MIE 232	Total Quality Management
MIE 233	Innovation and Social Entrepreneurship
MIE 234	Software Quality Assurance
Elective – E	
Subject Code	**Name of the subject**
MIE 241	Lean Manufacturing Systems
MIE 242	Computer Aided Facilities Planning
MIE 243	Additive Manufacturing
MIE 244	Computational Methods for Queuing Networks
Elective – F	
Subject Code	**Name of the subject**
MIE 251	Management Accounting and Finance
MIE 252	Human Resource Management
MIE 253	Systems Reliability Engineering
MIE 254	Decision Support System

SCHEME OF TEACHING

III SEMESTER

M.TECH - INDUSTRIAL ENGINEERING (MIE)

Sl. No.	Subject Code	Subject	L	T	P	Total
1	MIE 31	Quantitative Techniques in Decision Making	**3**	**1**	**0**	**4**
2	MIE 32	Intern ship	**0**	**0**	**4**	**4**
3	MIE 33	Dissertation Preliminaries	**0**	**0**	**8**	**8**
4	MIE 34	Elective – G	**4**	**0**	**0**	**4**
		Total				**20**

Elective – G	
Subject Code	**Name of the subject**
MIE 341	Design of Experiments
MIE 342	Cyber Security
MIE 343	Data Warehousing and Data Mining
MIE 344	Data Analytics

SCHEME OF TEACHING

IV SEMESTER

M.TECH - INDUSTRIAL ENGINEERING (MIE)

Sl. No.	Subject Code	Subject	L	T	P	Total
1	MIE 41	Dissertation	**0**	**0**	**22**	**22**
		Total	**0**	**0**	**22**	**22**

I Semester

RESEARCH METHODOLOGY

Course Code: MIE 11 **Credit: 3:0:0**
Prerequisites: Nil **Contact hours: 42**
Course coordinators: Dr C S Chethan Kumar / Dr G S Prakash

Course Content:

Unit-I

Research Methodology: An Introduction-Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is done, Research process, Criteria of Good Research, Problems Encountered by Researchers in India

Unit-II

Defining the Research Problem: What is Research Problem, Selecting the problem, Necessity of Defining the problem, Technique involved in Defining a problem, an illustration, Conclusion.
Research Design: Meaning of Research Design, Need for Research Design, Features of a Good design, Importance concepts relating to Research Design, Different Research Designs, Basic principles of experimental design, Conclusion

Unit-III

Sampling Design: Census and sampling survey, Implication of a sample design, Steps in sampling design, Criteria of selecting a sampling procedure, Characteristics of a good sample design, Different types of sample design, How to select a Random sample, Random sample from an Infinite universe, Complex Random sampling designs, Conclusion
Methods of Data Collection: Collection of primary data, Observation method, Interview method, Collection of data through questionnaires, Collection of data through schedules, Different between questionnaires and schedules, some other methods of data collection, Collection of secondary data, Selection of appropriate method for data collection, Case study method

Unit-IV

Survey Research an Overview: The name of surveys, Errors in survey research, Respondent Error, Administrative Error, Rule of Thumb estimates for systematic error, what can be done to reduce survey error, Classifying survey Research methods, Total quality management and satisfaction surveys, Implement total quality management

Survey Research: Basic methods of communication with respondents

Questionnaire Design: Questionnaire design: an overview of the major decisions, What should be asked ?, Phrasing questions, The art of asking questions, What is the best question sequence, What is the best layout, How much pretesting and revising are necessary, Designing questionnaires for global research, Media used to communicate with respondents, Personal Interviews, Telephone Interviews, Self-administered questionnaires, Selecting the appropriate survey research design.

Unit-V

Intellectual Property – IPR, Copyrights, Patents, Competing Interests, Commitments, and Values. The Researcher in Society, research ethics.

Multivariate Analysis: The nature of multivariate analysis, Classifying Multivariate techniques, Analysis of dependence, Analysis of interdependence.

Interpretation and Report Writing: Meaning of interpretation, Why interpretation, Technique of interpretation, Precaution in interpretation, Significance of report writing, Different steps in writing report, Layout of the research report, Types of reports, Oral presentation, Mechanics of writing research report, Precautions for writing research reports, Conclusion

Text Books

1. C R. Kothari, Research Methodology, New Age International Publishers, 2nd edition, 2007
2. William G Zikmund, Business Research Methods, Indian edition, south western Publishers, 8th Indian Reprint – 2009.

Reference Books

1. Panneer Selvam, Research Methodology, PHI Learning Pvt. Ltd., 2007
2. Dr. B.L.Wadhera -Intellectual Property Rights, Universal Law Publishing Co. Ltd... 2002

Course Outcomes (COs):

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

1. Understand and design appropriate methodology for research. (PO-1)
2. Evaluate between various sampling procedures and their real time applications. (PO-3)
3. Analyse and interpret data collected. (PO-2)
4. Design an optimal surrey questionnaire for specific situation. (PO-2, 4)
5. Apply multi variant analysis to real time situations. (PO-5)

ADVANCED MATHEMATICS

Course Code: MIE 12 **Credit: 3:1:0**
Prerequisites: UG Mathematics **Contact Hours: 42 +28**
Course coordinators: Dr. Dinesh P A

Course Content:

Unit-I

MATLAB: Introduction – variables, arrays, functions, Plotting – 2-D plots, 3-D plots. Script files, user defined functions, Programming – solutions for ODE and PDE.

Unit-II

Linear Algebra I: Introduction to linear systems, matrix notation, Rank and Consistency, geometry of linear equations, Gaussian elimination, Gauss-Jordan elimination. Eigen values and Eigen vectors, diagonalization, Power of a matrix and solution of ODE.

Unit-III

Linear Algebra II: Symmetric matrices, properties, orthogonal diagonalization, Quadratic forms, Canonical form, Nature of Quadratic forms and SVD
Vector Spaces: Vector spaces and subspaces, linear independence, basis and dimension, Coordinate system, Kernel and Range of linear transformation.

Unit-IV

Linear Algebra III: Orthogonal sets, orthogonal projections, Gram-Schmidt process, QR factorization, least square problems, Application to linear models.

Unit-V

Differential equations: Simultaneous first order ODE by modified Euler's method and RK method, Higher order ODE by RK method, shooting method.

Text books

1. Rudra Pratap – Getting started with MATLAB: A Quick Introduction for Scientists and Engineers, Oxford University press, 7th edition, 2016.

2. David C Lay, Steven R Lay, Judi J – Linear Algebra and its applications, Pearson, 5th edition, 2014.
3. M K Jain, S R K Iyengar, R K Jain – Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, 6th edition, 2012.
4. K. W. Morton, D. F. Mayers – Numerical solution of partial differential equations, 2nd edition, Cambridge University Press, 2005.

Reference books

1. Amos Gilat – MATLAB: An introduction with applications, 6th edition, WILEY Publications, 2016.
2. Gilbert Strang –Linear Algebra and its applications, 4th edition, Cengage Learning, 2007.
3. Steven C Chapra – Applied Numerical Methods with MATLAB for Engineers and Scientists, 3rd edition, Tata Mcgraw Hill publications, 2012.
4. M K Jain, S R K Iyengar, R K Jain – Computational methods for partial differential equations, New Age International Publishers, 2nd edition, 2016.

Course Outcomes (COs):

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

1. Program and simulate engineering problems using MATLAB. (PO-5)
2. Solve system of linear equations and simultaneous ODEs by matrix method. (PO-3)
3. Diagonalize a matrix by orthogonal diagonalization and discuss the problems related to linear transformations. (PO-1)
4. Find ortho normal vectors using Gram-Schmidt process and solve problems using least square concepts. (PO-1)
5. Solve simultaneous first order ODE, higher order ODE and shooting method. (PO-1)

ELECTIVE- A

WORK SYSTEM DESIGN AND ERGONOMICS

Course Code: MIE 131 **Credit: 4:0:0**
Prerequisites: Nil **Contact Hours: 56**
Course Coordinator(s): V.Vivekanand / Dr.S.Appaiah

Course Content:

Unit- I

Introduction: Nature of work (Pyramidal Structure of work, Importance of time), **Work System**: Physical work system, Professional Practice, Types of Occupation, Productivity: Labor, Multifactor, Productive work Content,

Manual work and Worker Machine Systems: Types of Manual work, Cycle time analysis of manual work, Worker-Machine Systems: Types of worker-machine systems, Cycle time worker machine systems, Automated Systems, determination of worker and machine requirements (Set up not included and included), Machine cluster

Unit- II

Method & Motion Study: Outline Process Chart, Flow Process Chart, Two Handed Process Chart, Multiple Activity Chart, String Diagram, Travel Chart, Principles of Motion Economy, Motion Study: Therblig, Simo chart

Unit- III

Work Measurement : Types, Average worker and standard performance, allowances, Accuracy, precision and speed ratio, Direct Time study : Procedure, Determination of standard time, Determination of work cycles, Performance rating, Time study equipment, Predetermined motion time systems : procedure, Methods time measurement : MTM1, MTM2, MTM3, MOST, Work sampling : confidence interval in work sampling, Number of Observation, Determining Average task and standard times, Application of work sampling

Unit- IV

Ergonomics: Introduction, Man Machine system, Physical ergonomics: Human Physiology, Muscular effort and work Physiology, Anthropometry: variables, Principles and Application. Cognitive Ergonomics: Human Sensory System, Perception, Attention resources, Memory

Unit- V

Cognitive Ergonomics contd.: Response Selection and execution, Common cognitive tasks, Design Guidelines for cognitive work

Physical Work Environment: Visual Environment and Lighting, Auditory Environment and Noise, Climate Control in work Environment

Text books

1. M.P.Groover-Work Systems: The Methods, Measurement & Management of Work, ISBN: 978-93-325-8124-1, Pearson, 1st Edition, 2013.
2. Geroge Kanawaty - ILO -Introduction to work study, ISBN 13:9788120406025 Publisher: India Book House Pvt. Ltd, 4th Revised Edition, 2008.

References

1. Ralph M Barnes -Motion and Time study, ISBN:13:978981426182 Publisher: John Wiley, 7th edition 2009.
2. Andris Freivalds and Benjamin Niebel - Niebel's Methods, Standards, & Work Design, ISBN-13: 978-0073376318, Mc Graw Hill, 13th Edition, 2014
3. M S Sanders and E J McCormic - Human Factors in Engineering Design, ISBN: 13:9780070549012, Mc Graw Hill, 7th Edition.

Course Outcomes (COs):

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

1. Identify various types of work and provide various measures of analyzing work (PO-1,3)
2. Identify and Develop various method study techniques for solving real time problems (PO-1,3,4)
3. Develop work measurement techniques for solving real time problems (PO-1,3,4)
4. Develop, Design Analyze Man machine system using principles of anthropometry (PO-1,3,4)
5. Develop, Design various Man Machine system based on consideration of cognitive, lighting and noise aspects (PO-1,3,4)

e-COMMERCE

Course Code: MIE 132 **Credit: 4:0:0**
Prerequisites: Nil **Contact Hours: 56**
Course Coordinator(s): P R Dheeraj / Deepak Kumar

Course Content:

Unit- I

I**ntroduction** – Internet and Intranets
Building Blocks for e-commerce - Electronic Data Interchange, The UN/EDIFACT Standard, The Internet and Extranets, Identification and Tracking Tools

Unit- II

Reengineering for change - Business Process Reengineering, Management of Change

Unit- III

Concerns for e-commerce growth - Legal Issues, Cyber Security, Cyber Crimes
Creating trust in the electronic environment - Information Technology Act, 2000, Public Key Infrastructure, Electronic Payment Systems and Internet Banking

Unit- IV

Formulating an Internet Strategy in a Networked World - The Internet as a Business Solution or Pandora's Box. The Way Forward. Infomediaries and Business-to-Business Consortia. B2C, B2B, B2G, and G2B. Business-to-Government E-commerce. Government-to-Business E-commerce. Inter organizational Systems: B2C, Consortia, B2B, B2G, G2B.

Unit- V

Special topics on e-Governance

Text books

1. Schneider, E-commerce: Strategy, Technology And Implementation, Cengage Learning (Thompson), 2008

Reference books

1. K K Bajaj, et al, E-commerce: The Cutting Edge ff Business, Tata McGraw Hill, 2004
2. Robert T. Plant, e-Commerce: Formulation of Strategy, Pearson Education, 2000

Course Outcomes (COs):

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

1. Thoroughly understand of e-commerce processes. (PO-3)
2. Understand the various changes of market and designing the Business Process Reengineering. (PO-3)
3. Apply the legal issues in cyber security and cyber crimes involvement. (PO-5)
4. Create the various internet strategies in global market to provide business solutions. (PO-5)
5. Analyze the fundamentals of e-governance system in 21st century. (PO-5)

CIM & ROBOTICS

Course Code: MIE 133 **Credit: 4:0:0**
Prerequisites: Nil **Contact Hours: 56**
Course coordinators: Sri A Balakrishna/Dr. M Rajesh

Course Content:

Unit-I

Introduction: Computer in industrial manufacturing product cycle, CAD, CAM, CIM CAD/CAM Hardware
Types of systems- Mainframe based system, minicomputer based systems, microcomputer based system, and workstation based systems.
CAD CAM Software- Graphic stds, Data structure, Database, DBMS, Database coordinate system, working coordinate system, screen coordinate system modeling & viewing.

Unit-II

Geometric modeling- Requirement of geometric models, geometric construction methods, constraint based modeling, other modeling methods, curve representation, surface representation methods, rapid prototyping (RP).
CAD standards, Introduction to a drafting system, Introduction to a modeling system.

Unit- III

Introduction to CNC, CNC Hardware Basics, CNC tooling, CNC machine tools and Control systems. CNC programming – part programming fundamentals, Manual part programming methods, Preparatory functions, Miscellaneous functions, Program NO, Tool length compensation, Canned cycles, Cutter radius compensation programming exercises.

Unit-IV

Computer aided part programming – APT structure, Commands, Complete part programming in APT, Master CAM

Unit-V

Robot technology – Introduction, Structure and operation of robots, Robot specifications, Robot sensors, Robot languages

Text books

1. P.N. Rao -CAD/CAM Principles and Applications, TMH , New Delhi, 2nd edition 2004
2. Newman and sproull -Principles of Interactive Computer Graphics, TMH,1995
3. Ibrahim Zeid, Management of CAD databases

References

1. P Mikell. Groover -Automation, Production systems, and Computer – Integrated Manufacturing, PHI 2008, 2nd edition
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.

Course Outcomes (COs):

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

1. Appreciate the Computer Integrated Manufacturing systems using the knowledge of mathematics, science, engineering and IT tools (PO-1)
2. Apply modern computational, analytical, simulation tools and techniques to meet the industry requirements. (PO-3)
3. Confidently code the numerical control machines involving complex product designs. (PO-1)
4. Program and simulate the product creation process (PO-5)
5. Understand the modern manufacturing system (PO-3)

MARKETING MANAGEMENT

Course Code: MIE 134 **Credit: 4:0:0**
Prerequisites: Nil **Contact hours: 56**
Course Coordinator(s): Dr C S Chethan kumar / Dr S Appaiah

Course Content:

Unit- I

Introduction to Marketing Management, Analysing Marketing Opportunities

Unit- II

Consumer and Business buying behaviour, dealing with competition and selecting target markets

Unit- III

Marketing strategy – Positioning and differentiating the offering, shaping the market offering – Designing services, pricing strategy

Unit- IV

Branding Strategy, Managing the Sales Force

Unit- V

Managing marketing programs - Designing and Managing Value Networks and Marketing Channels, Managing Retailing, Wholesaling, and Market Logistics, Managing Advertising, Sales Promotion, Public Relations, and Direct Marketing.

Text books

1. Philip Kotler, Kevin Keller, Marketing Management, Prentice Hall, 2008

Reference Books

1. Marketing Management, David L Loudon, David Loudon, Rober Stevens, 2004

Course Outcomes (COs):

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

1. Design and develop marketing solutions for current retail environments by employing appropriate marketing strategies. (PO-1)
2. Apply knowledge of basic management skills to maximize employee productivity. (PO-2, 3)
3. Evaluate and apply marketing practices to create measurable results to meet marketing objectives (PO-3)
4. Analyze the competitors, Their Strategies, their Objectives, Strengths and weaknesses. (PO-2, 4)
5. Devising a branding strategy for Value networks. (PO-4, 5)

ELECTIVE- B

SUPPLY CHAIN MANAGEMENT

Course Code: MIE 141 **Credit: 4:0:0**
Prerequisites: Nil **Contact Hours: 56**
Course coordinators: Dr C S Chethan Kumar / P R Dheeraj

Course Content:

Unit- I

Introduction: What is Supply Chain Management? Development chain. Global optimization. Managing uncertainty and risk. Evolution of Supply Chain Management. Complexity. Key issues in Supply Chain Management.
Inventory Management and Risk Pooling: Introduction. Single stage inventory control. Risk Pooling. Centralized versus decentralized systems. Managing inventory in the supply chain. Practical issues. Forecasting.

Unit- II

Network Planning: Introduction. Network design. Inventory Positioning and logistics coordination. Resource allocation.
Supply Contracts: Introduction. Strategic components. Contracts for make-to-stock/make-to-order supply chains. Contracts with asymmetric information. Contracts for non-strategic components.

Unit- III

Value of Information: Introduction. Bullwhip effect. Information sharing and incentives. Effective forecasts. Information for coordination of systems. Locating desired products. Lead-time reduction. Information and supply chain trade-offs. Decreasing marginal value of information.
Supply Chain Integration: Introduction. Push, pull and push-pull systems. Impact of lead time. Demand-driven strategies. Impact of Internet on supply chain strategies.

Unit- IV

Distribution Strategies: Introduction. Direct shipment distribution strategies. Intermediate inventory storage PO-int strategies. Transshipment. Selecting appropriate strategy.
Strategic Alliances: Introduction. Framework for strategic alliances. Third-party logistics. Retailer-supplier partnerships. Distributor integration.

Unit- V

Procurement and Outsourcing Strategies: Introduction. Outsourcing benefits and risks. Framework for make/buy decisions. Procurement strategies. E-procurement. Global Logistics and Risk Management: Introduction. Risk management. Issues in international supply chain management. Regional differences in logistics.

Text book

1. Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies – David Simchi-Levi (McGraw Hill, 2008)

References

1. Supply Chain Management: Strategy, Planning, and Operation – Sunil Chopra (Pearson, 2015)
2. Operations and Supply Chain Management - Robert Jacobs (McGraw Hill, 2013)

Course Outcomes (COs):

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

1. Understand the fundamentals of supply chain management and inventory management. (PO-1)
2. Execute network planning and design supply contracts. (PO-3)
3. Design integrated supply chains by using information. (PO-3)
4. Implement distribution strategies and strategic alliances. (PO-3)
5. Design procurement and outsourcing strategies. (PO-3)

ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

Course Code: MIE 142 **Credit: 4:0:0**
Prerequisites: Nil **Contact Hours: 56**
Course coordinators: Sri. A Balakrishna / Dr. M. Shilpa

Course Content:

Unit- I

Introduction to Artificial Intelligence: Historical Backdrop, what is intelligence? Turing Test, Intelligent Decisions, Intelligent agent and model of world, symbolic reasoning in AI, model of cognitive agent

Unit- II

Communication and Integration: Multiple agents, interacting agents, models of other agents, modal logic of knowledge

Unit- III

State Space Search: Introduction, Generate and Test, Simple search 1, Depth First Search, Breadth first search, Comparison of DFS and BFS

Unit- IV

Heuristic Search: Heuristic functions, Best First Search, Hill Climbing, Local Maxima, Solution Space search, variable neighborhood descent, Beam search, peak to peak method

Unit- V

Expert Systems: Introduction, representing and using domain knowledge, Expert system shells, Explanation, Knowledge acquisition

Textbooks

1. Deepak Khemani, A First Course in Artificial Intelligence, McGraw Hill Education Pvt. Ltd., 2013
2. Elaine Rich, Kevin Knight, Shivashankar B Nair, “Artificial Intelligence” 3rd edition, Tata McGraw Hill Publication, New Delhi.

Reference books

1. Nils J. Nilsson, Nils Johan Nilsson, Artificial Intelligence: A New Synthesis, MK Publishers, California, 2000
2. Stuart Jonathan Russell, Peter Norvig, John Canny, Artificial intelligence, Prentice Hall, 2003

Course Outcomes (COs):

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

1. Identify intelligent decisions taken up by AI and understand symbolic reasoning in AI (PO-2)
2. Establish communication and integration models among the AI agents (PO-1)
3. Conduct different searches under State Space Search (PO-1)
4. Analyze different searches under heuristic functions (PO-2)
5. Identify how expert systems work and how they acquire knowledge. (PO-3)

VALUE ENGINEERING

Course Code: MIE 143 **Credit: 4:0:0**
Prerequisites: Nil **Contact Hours: 56**
Course Coordinator(s): Dr C S Chethan Kumar / Prof A Balakrishna

Course Content:

Unit-I

Introduction to Value Analysis: Definition of Value Analysis, Value Engineering, Value management, Value Analysis Value Engineering, Value Analysis versus Traditional cost reduction techniques, uses, Applications, advantages and limitations of Value analysis. Symptoms to apply value analysis, Coaching of Champion concept.

Type of Values: Reasons for unnecessary cost product, Peeling cost Onion concept, unsuspected areas responsible for higher cost, Value Analysis Zone, attractive features of value analysis, Meaning of value, types of value & their effect in cost reduction. Value analysis procedure by simulation. Detailed case studies of simple products.

Unit-II

Functional Cost and its Evaluation: Meaning of Function and Functional cost, Rules for functional definition, Types of functions, primary and secondary functions using verb and Noun, Function evaluation process, Methods of function evaluation. Evaluation of function by comparison, Evaluation of Interacting functions, Evaluation of function from available data, matrix technique, MISS technique, Numerical evaluation of functional relationships and case studies.

Unit-III

Problem Setting & Solving System: A problem solvable is stated half solved, Steps in problem setting system, Identification, Separation and Grouping of functions, Case studies.
Problem Setting & Solving System: Goods system contains everything the task requires various steps in problem solving, case studies.

Unit-IV

Value Engineering Job Plan: Meaning and Importance of Value Engineering Job plan. Phases of job plan proposed by different value engineering experts information phase, Analysis phase, Creative phase, Judgment phase, Development planning phase, and case studies. Cost reduction programs, criteria for cost reduction program, Value analysis change proposal.

Value Engineering Techniques: Result Accelerators or New value Engineering Techniques, Listing, Role of techniques in Value Engineering, Details with Case examples for each of the Techniques.

Unit-V

Advanced Value Analysis Techniques: Functional analysis system technique and case studies, Value analysis of Management practice (VAMP), steps involved in VAMP, application of VAMP to Government, University, College Hospitals, School Problems etc., (Service type problems).

Application of Value Analysis: Application of Value analysis in the field of Accounting, Appearance Design, Cost reduction, Engineering, manufacturing, Management, Purchasing, Quality Control, Sales, marketing Material Management Etc., Comparison of approach of Value analysis &- other management techniques.

Text books

1. Techniques of Value Engineering and Analysis - Lawrence D. Miles McGraw Hill Book Co., 2010
2. Value engineering for COST REDUCTION and PRODUCT IMPROVEMENT - M.S. Vittal, Systems Consultancy Services Edn 1993.

Reference books

1. Value Management, Value Engineering and Cost Reduction - Edward D. Heller, Addison Wesley Publishing Company 1971.
2. Value Analysis for Better Management-Warren J. Ridge American Management Association 2011.
3. Getting More at less cost (The value engineering way) G Jagannathan, Tata Mcgraw Hill Pub. Comp. Edn 1995.

Course Outcomes (COs):

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

1. Thoroughly understand the value engineering processes. (PO-3)
2. Understand the various changes of functional cost and its evaluation. (PO-3)
3. Apply the tools and techniques of problem solving (PO-5)
4. Create the various cost reduction programmers' involving value engineering. (PO-5)
5. Analyze and apply value analysis to societal issues. (PO-5)

ORGANIZATIONAL BEHAVIOUR

Course Code: MIE 144 **Credit: 4:0:0**
Prerequisites: Nil **Contact Hours: 56**
Course Coordinator(s): V.Vivekanand

Course Content:

Unit-I

Introduction to Organizational Psychology: Definition, History and Development, Current and Future of Organizational Psychology

Research methods in Organizational Psychology: Social Science Research Methods, Major Research Designs: Experimental Method, Quassi Experiments, The Co relational Method, Complex Co relational Designs, Meta-analysis, Case Study Method, And Measurement of variables: Observational Techniques, Self-report techniques, Issues, Measuring work outcomes, Interpreting and using research results

Unit-II

Motivation: Need Theory of Motivation: Basic Need theory, McClelland's Achievement

Motivation Theory, Behavior Based Motivation : Reinforcement Theory, Extrinsic versus Intrinsic Motivation, Goal-setting Theory, Job design Theories of Motivation : Herzberg's Two-factor Theory, Job Characteristics Model, Cognitive Theories of Motivation : Equity Theory of Motivation, Expectancy Theory of Motivation,

Unit-III

Employee Attitude, Behavior & Worker Stress: Employee Engagement, Job Satisfaction, Organizational commitment, Employee Attitude and Attendance, Increasing Employee Engagement, Job Satisfaction and Organizational Commitment, Positive employee behavior,

Worker Stress: Sources, Measurement, effects, coping with stress, negative behavior

Unit-IV

Communication and Group Process in Organization: Communication Process, Flow of communication in organization, Organization communication and work outcomes, Defining work groups, Basic Group Process, group decision making process, team and team work.

Unit-V

Leadership: Definition, Behavioral Theories: Ohio State studies, University of Michigan studies, managerial grid, Contingency Theories: Fiedler Models, Hershey and Blanchard Situational Theory, Charismatic and Transformational Leadership.

Influence Power & Politics : Definition, Influence : The use of Social Control, Power : Power Sources, Power Dynamics in organization, Organizational Politics : Employee Perception, Types of Political Behavior, Causes, consequences and managing Organizational Politics, Consequence of organizational Politics

Text books

1. Ronald .E. Riggo - Introduction to Industrial/Organizational Psychology, Pearson Education Publications, ISBN 13: 978-0-205-25499-6, 6th Edition, 2013
2. Stephen P Robbins -Organizational Behavior, Pearson Education Publications, ISBN–81–7808–561-5, 9th Edn. 2012.

References

1. Fred Luthans -Organizational Behavior, Mc Graw Hill International Edition, ISBN–0–07– 20412–1, 11th Edn. 2006.
2. Hellriegel, Srocum and woodman, Thompson Learning -Organisation Behavior, Prentice Hall India, 9th Edition -2001.
3. Aswathappa -Organizational Behavior, Himalaya Publishers. 2001.
4. Organizational Behavior- (Human behavior at work) John Newstron / Keith Davis 9th Edition 2002.

Course Outcomes (COs):

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

1. Identify areas where behavioral research can be done and applied in organization (PO-1,4 & PEO2,3)
2. Identify the different motivational factors which can be applied to reach the organization's goal. (PO-4)
3. Develop Positive Attitude and Minimize stress for growth of organization (PO-1,4),
4. Develop sound communication skills and team work. (PO-1,4)
5. Develop Leadership skills and understand how Power Politics have implications in organizations. (PO-1,4)

ELECTIVE – C

ADVANCED PRODUCTION PLANNING AND SCHEDULING

Course Code: MIE 151 **Credit: 4:0:0**
Prerequisites: Nil **Contact Hours: 56**
Course coordinators: Dr. G S Prakash / Dr. R. Shobha

Course Content:

Unit-I

Introduction: Introduction to operations and production Planning & Control, Historical evolution, Latest Trends in Decision Making in business, Operations Management, Competitiveness, strategy and Productivity, Case study/exercise problems

Unit-II

Forecasting: Introduction, Features common to all forecasts, Elements of forecast, Steps in forecasting process, Approaches to forecasting, Forecast based on judgment and opinion, forecasts based ion time-series data, Associative forecasting technique, Accuracy & control of forecast, Choosing of right forecasting technique, exercise problems

Unit-III

System Design: Product redesign, Global product design concepts, Phases in product design and development, Designing for Manufacture, Quality Function Deployment, The Kano Model, Service Design for operations strategies, Defining and Measuring capacity, Determinants of Effective Capacity, Forecasting Capacity requirements, Challenges of Planning service capacity, Developing Capacity alternatives and evaluating the alternatives, Case study/Exercise problems

Unit-IV

Aggregate Planning: Nature and importance of Inventories in Industry, Requirement for Effective inventory management, Quantity models, Techniques for Aggregate Planning, Use of strategies for meeting uneven demand, Master Scheduling Process, overview of Material Resource Planning(MRP), MRP inputs, processing and outputs, MRP-II, Capacity Requirement planning(CRP), Enterprise resource Planning (ERP), Distribution Requirement Planning. Production Activity Control (PAC), Exercise problems

Unit-V

Just in Time (JIT) & Scheduling: Introduction, The Toyota Approach, supporting goals and building blocks, JIT in services, JIT-II, Scheduling operations, Scheduling in Low-Volume systems, Scheduling services, Operations strategy used in scheduling, case study/exercise problems.

Text books

1. Operations Management, William J Stevenson, Tata McGraw Hill, 9th Edition, 2009**.**

Reference books

1. Operations Management for competitive advantage, Richard B Chase/F Robert Jacobs/ Nicholas J Aquilano, McGraw-Hill International edition, Eleventh edition, 2006.

Course Outcome (COs):

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

1. Appreciate the role of PPC in enabling the enterprise to respond to the dynamic business environment. (PO-1, 3)
2. Acquire sufficient theoretical knowledge and analytical skills to forecast demand for production / service operations. (PO-3)
3. Asses and formulate decision making strategies to address operating issues, capacity requirements and developing capacity alternatives. (PO-2, 3)
4. Develop analytical skills in the area of sales and operating planning, ERP, MRP, CRP and PAC. (PO-3)
5. Implementing JIT concepts to minimize the inventory and to produce with minimum time and cost using scheduling techniques. (PO-4, 5)

PROJECT MANAGEMENT FOR BUSINESS, ENGINEERING AND TECHNOLOGY

Course Code: MIE 152 **Credit: 4:0:0**
Prerequisites: Nil **Contact Hours: 56**
Course coordinators: Dr. M R Shivakumar / Sudheer D Kulkarni

Course Content:

Unit-I

Philosophy and concepts: Functions and views of management, Project view Point and traditional management, Evaluation of project management, Where is project management appropriate, Management by project: A common approach, different forms of project management, Project environments, Project management by industrial settings, Project management in the industrial setting, Project management in the service sector, Project and program management in government and the public sector.
Systems thinking, definition of system, systems concepts and principles, Human organizations, Systems approach, Systems engineering, Relevancy of the systems approach to project management.

Unit-II

Systems development cycle: Systems life cycle, System development cycle, Phase A: Conception, Project feasibility, project charter, the project proposal, project contracting. Phase B: Definition.
Systems and Procedures for planning and control: Planning steps, the project master plan, Scope and statement of work, work definition, Project organization and responsibilities, Scheduling, Planning and scheduling charts, Line of balance, procurement management.

Unit-III

Project time planning and Networks: Network diagrams, the critical path, Gantt and calendar schedules, Management schedule reserve, precedence diagramming method, Scheduling with resource constraints, Criticism of network methods.
Advanced project network analyses and Scheduling: CPM and time –cost tradeoff, variability of activity duration, PERT, Theory of constraints and critical chain method, Allocating resources and multiple project scheduling, Theory of constraints methods for allocating resources to multiple projects.

Unit-IV

Cost estimation and Budgeting: Cost estimating, Cost escalating, Cost estimating and the systems development cycle, Life cycle costs, Cost estimating process, Elements of budgets and estimates, Project cost accounting systems, Budgeting using control (cost) accounts, Cost summaries, Cost schedules and forecasts.
Project quality management: The concepts of quality, the processes of project quality management, Techniques for quality assurance during system development, Processes and techniques for quality control.
Managing risks in projects: Risk concepts, Risk identification, Risk assessment, risk response planning, risk tracking and response, Project management is risk management.

Unit-V

Project Execution and Control: Phase C: Execution, Design stage, Production and /Build stage, The control process, Project monitoring, Internal and external project control, Traditional cost control, Cost- accounting systems for project control, Work package and control accounts, Project control emphasis, Performance analysis, Forecasting "To complete" and "At completion", Monitoring performance indexes and variances, Controlling changes, Contract administration, Control problems.
Project evaluation, Communication, implementation and closeout: project evaluation, Communication plan, Project review meetings, Reporting, Project management information systems, Web-enabled project management, PMIS in the project life cycle, Informal communication, Implementation stage, project terminating and closeout, Closing contract, Project summary evaluation, After project-Phase-D: operation.

Text books

1. John M Nicholas and Herman Steyn- Project management for Business, Engineering and Technology, Elsevier India Private Ltd. -2011.
2. James P Lewis – Project planning scheduling and control, Tata McGraw Hill-2001.

References

1. Harold Kerzner -Project management - A Systems approach to planning, scheduling and controlling, CBS Publishers and distributors, 2004.
2. David I Clelnad -Project Management –Strategic design and Implementation, McGraw Hill, 1999.

Course Outcomes (COs):

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

1. Understand the philosophy and concepts of systems engineering. (PO-1, 5)
2. Analyze the system development and procedure for planning and control. (PO-2, 5)
3. Estimate project time planning. (PO-3, 5)
4. Develop estimate and budgeting, controlling quality and managing risks of a project. (PO-3, 5)
5. Apply technique for execution, control, evaluation, communication, implementation of a project. (PO-3, 5)

MODERN ENTERPRISE SYSTEMS

Course Code: MIE 153 **Credit: 4:0:0**
Prerequisites: Nil **Contact Hours: 56**
Course coordinators: 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, 2015

References

1. Enterprise Systems for Management – Luvai Motiwalla & Jeffrey Thompson (Pearson, 2010)
2. Enterprise Systems Integration – Judith M. Myerson (Auerbach Publications, 2009)

Course Outcomes (COs):

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

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

INTEGRATED PRODUCT DEVELOPMENT

Course Code: MIE 154 **Credit: 4:0:0**
Prerequisites: Nil **Contact Hours: 56**
Course coordinators: Prof A Balakrishna / Dr R Shobha

Course Content:

Unit-I

Fundamentals of product development: Global Trends Analysis and Product decision – Social Trends – Technical Trends- Economical Trends – Environmental Trends – Political/Policy Trends – Introduction to Product Development Methodologies and Management – Overview of Products and Services – Types of Product Development – Overview of Product Development methodologies – Product Life Cycle – Product Development Planning and Management.

Unit-II

Requirements and system design: Requirement Engineering – Types of Requirements – Requirement Engineering – traceability Matrix and Analysis – Requirement Management – System Design & Modeling – Introduction to System Modeling – System Optimization – System Specification – Sub-System Design – Interface Design.

Unit-III

Design and testing: Conceptualization – Industrial Design and User Interface Design – Introduction to Concept generation Techniques – Challenges in Integration of Engineering Disciplines – Concept Screening & Evaluation – Detailed Design – Component Design and Verification – Mechanical, Electronics and Software Subsystems – High Level Design/Low Level Design of S/W Program – Types of Prototypes, S/W Testing- Hardware Schematic, Component design, Layout and Hardware Testing – Prototyping – Introduction to Rapid Prototyping and Rapid Manufacturing – System Integration, Testing, Certification and Documentation

Unit-IV

Sustenance engineering and end-of-life (eol) support: Introduction to Product verification processes and stages – Introduction to Product Validation processes and stages – Product Testing Standards and Certification – Product Documentation – Sustenance -Maintenance and Repair – Enhancements – Product EoL – Obsolescence Management – Configuration Management – EoL Disposal

Unit-V

Business dynamics – engineering services industry: The Industry – Engineering Services Industry – Product Development in Industry versus Academia –The IPD Essentials – Introduction to Vertical Specific Product Development processes - Manufacturing/Purchase and Assembly of Systems – Integration of Mechanical, Embedded and Software Systems – Product Development Trade-offs – Intellectual Property Rights and Confidentiality – Security and Configuration Management.

Textbooks

1. Karl T Ulrich and Stephen D Eppinger, "Product Design and Development", Tata McGraw Hill, Fifth Edition, 2015.
2. John W Newstorm and Keith Davis, "Organizational Behavior", Tata McGraw Hill, Eleventh Edition, 2012.

References

1. Hiriyappa B,- Corporate Strategy Managing the Business, Author House, 2013.
2. Peter F Drucker, People and Performance Butterworth – Heinemann [Elsevier], Oxford, 2004.
3. Vinod Kumar Garg and Venkita Krishnan N K, ―Enterprise Resource Planning – Concepts, Second Edition, Prentice Hall, 2012.
4. Mark S Sanders and Ernest J McCormick, "Human Factors in Engineering and Design", McGraw Hill Education, Seventh Edition, 2013

Course Outcomes (COs):

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

1. Define, formulate and analyze a problem
2. Solve specific problems independently or as part of a team
3. Gain knowledge of the Innovation & Product Development process in the Business Context
4. Work independently as well as in teams
5. Manage a project from start to finish

SEMINAR - I

Course Code: MIE 16 **Credit: 0:2:0:0**
Prerequisites: Nil

Course Content:

Seminar will be evaluated based on:

- Literature Review of best practices in chosen area
- At least one case study review that demonstrates student ability to related theory to application
- Project/ Paper Write-up
- Presentation

Course Outcomes (COs):

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

1. Identify emerging technological areas/tools in engineering. (PO-3)
2. Collect data from reputed peer revived international journals and interpret them. (PO-4)
3. Prepare an effective Power Point presentation. (PO-1, 2)
4. Construct a feasible technical report and document (PO-2)

WORK SYSTEM DESIGN AND ERGONOMICS LAB

Course Code: MIEL17 **Credit: 0:0:1**
Prerequisites: Nil **Contact Hours: 14**
Course Coordinator (s): V.Vivekanand / Dr.S.Appaiah

Course Content:

List of Experiments

1. Construction of Outline Process Chart for simple assembly
2. Recording the given activity using Flow Process Chart
3. Recording the given activity using Multiple Activity Chart
4. Constructing the String Diagram for a shop-floor activity
5. Construction of Two Handed Process Chart for pin board / Nut and Bolt assembly.
6. Rating practice using walking simulator
7. Rating practice for dealing a deck of cards
8. Determination of standard time/ rating of pin board assembly using centi-minute stop watch.
9. Determination of standard time for simple operation using Timer Pro Software
10. Measurement of parameters (heart beat rate, calorie consumption) using walking simulator
11. Measurement of parameters (heart beat rate, calorie consumption, revolutions per minute) using ergometer
12. Conduction of work sampling in office environment to determine standard time.
13. Effect of noise, light and heat on human efficiency in work environment.

Text books

1. M.P.Groover-Work Systems : The Methods, Measurement & Management of Work, ISBN : 978-93-325-8124-1, Pearson, 1st Edition, 2013.
2. Geroge Kanawaty - ILO -Introduction to work study, ISBN 13:9788120406025 Publisher: India Book House Pvt. Ltd, 4th Revised Edition, 2008.

References

1. Ralph M Barnes -Motion and Time study, ISBN:13:978981426182 Publisher: John Wiley, 7th edition 2009.
2. Andris Freivalds and Benjamin Niebel - Niebel's Methods, Standards, & Work Design, ISBN-13: 978-0073376318, Mc Graw Hill, 13th Edition, 2014
3. M S Sanders and E J McCormic - Human Factors in Engineering Design, ISBN: 13:9780070549012, Mc Graw Hill, 7th Edition.

Course Outcomes (COs):

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

1. Identify areas where work study tools and techniques can be applied. (PO-3)
2. Apply the tools and techniques to various simulated scenarios and real life problems in industry and society. (PO-1,3)
3. Create novel designs of work place and other areas where improvement can be applied with perspective of various constraints faced in real life situation at society and industry level. (PO-1,3)

SUPPLY CHAIN LAB

Course Code: MIEL18 **Credit: 0:0:1**
Prerequisites: Nil **Contact Hours: 14**
Course Coordinator(s): Dr C S Chethan Kumar / Deepak Kumar

Course Content:

List of Experiments

PART – 1

1. Exercises on designing supply chain networks: Facility location models, Network optimization models.
2. Exercises on planning demand and supply in a supply chain: Demand forecasting using time series methods, Aggregate planning problem.
3. Planning supply chain and sensitivity analysis: Cycle inventory, Safety inventory and product availability, Inventory aggregation.

PART – 2

1. Exercises on transportation design: Transportation cost and inventory cost trade-off, Customer response and transportation cost trade-off, Routing and scheduling.
2. Exercises on designing marketing campaign, Customer service and Customer order processing.
3. Demonstration exercises on beer game, illustrating bullwhip effect, Risk Pool game, Auctions.
4. Demonstration exercises using SCM simulator.
5. Software packages: MS Excel, SCM simulator, OR packages, OPEN TAPS.

Note: Any 12 experiments to be conducted.

Textbook

1. Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies – David Simchi-Levi (McGraw Hill, 2008)

References

1. Supply Chain Management: Strategy, Planning, and Operation – Sunil Chopra (Pearson, 2015)

2. Operations and Supply Chain Management - Robert Jacobs (McGraw Hill, 2013)

Course Outcomes (COs):

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

1. Evaluate alternative supply and distribution network structures using optimization models. (PO-2)
2. Develop optimal sourcing and inventory Policies in the supply chain context. (PO-3)
3. Select appropriate information technology frameworks for managing supply chain processes. (PO-

II SEMESTER

ADVANCED PROBABILITY & STATISTICS

Course Code: MIE 21 **Credit: 3:1:0**
Prerequisites: Nil **Contact Hours: 42L+14T**
Course Coordinator(s): V.Vivekanand / Dr M.Shilpa

Course Content:

Unit-I

Introduction: Introduction to probability theory, Discrete and Continuous Random Variables, Distribution of Random Variables: Binomial, Poisson, Hypergeometric, Multinomial, Normal, Gamma, Exponential, Chisquare, F, t. Mathematical Expectation of Random Variables

Unit-II

Moment Function and Conditional Probability: Moment Generating Functions, Limit Theorems, Jointly Distributed Random Variables, Conditional Probability (simple problems), Bayes Theorem (Simple Problems)

Unit-III

Markov Chains: Introduction to Stochastic Process, Discrete time Markov Chains: Introduction, Chapman Kolmogorov Equation, Transient and Steady State Analysis, Classification: Transient, Recurrent, Absorbing States, First passage times

Unit-IV

Hypothesis testing: Introduction to Statistical Inference, Sampling Distribution, Point and Interval Estimation. Hypothesis Testing on Means: One Univarate and Two Univariate Populations, ANOVA (Single Factor)

Unit-V

Regression Analysis: Introduction, Scatter Plot, Simple Linear Regression: Least square estimators, Estimating coefficients Statistical inference on regression parameters, Coefficient of Determination and Sample Correlation Coefficient, Analysis of Residue for simple linear model, Multiple linear regression model : Estimating coefficients, properties of least squares estimators

Text books

1. Sheldon M Ross: Introduction to Probability and Statistics for Engineers and Scientist, 5th Edition, Elsevier, 2014
2. Walpole, R.E., Myers, R.H., Myers, S.L., Ye, K.Y. Probability and Statistics for Engineers and Scientists, Macmillan, Pearson, 9th Edition, 2016.
3. Douglas C. Montgomery, George C. Runger : Applied Statistics & Probability, 6thEdition, Wiley, 2013

Reference Books

1. Sheldon M Ross: Introduction to Probability models 10th Edition, Academic Press, 2009
2. Richard I. Levin, David S. Rubin, Statistics for Management, 7th Edition, 2008
3. Jay L. Devore, Probability and Statistics for Engineering and the Sciences, 8th Edition, 2008, Cengage Learning

Course Outcomes (COs):

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

1. To Identify, develop various types of distribution and understands its parameters (PO-1,3)
2. To Derive and Obtain the various parameters of distribution, develop conditional probability models (PO-1,3)
3. To solve real time problems using Markova chain methods (PO-1,3)
4. To conduct statistical inference on various real time problems (PO-1,3)
5. Develop Regression model for real time data (PO-1,3)

QUALITY AND RELIABILITY ENGINEERING

Course Code: MIE 22 **Credit: 3:0:0**
Prerequisites: Nil **Contact Hours: 42**
Course coordinators: Dr. G S Prakash / Dr. M.Rajesh

Course Content:

Unit-I

Introduction to Quality and Reliability, Basic statistics, Evolution of Quality, Quality and Reliability Mathematics, Statistical Process Control, Introduction and TQC Tools

Unit-II

Control Charts variable control chart, Attribute Control Charts, X bar-R chart, X bar-S chart, p – Chart, np- Chart, C – Chart.

Unit-III

Quality by Design: Product Development flow, Rationale for implementation, Benefits, Design for Six Sigma, Product Development tools.
Taguchi's Quality Engineering: Taguchi's definition of quality loss, loss functions, Types of TQLF

Unit-IV

Software Quality - Quality in Health Care –Quality Control in Health Care – Quality Control in the Textile Industry – Quality Control in the Food Industry, case studies involving quality problems

Unit—V

Introduction to sampling plans: Acceptance Sampling: Introduction, Types of sampling plans, Operating Characteristics Curve, Single S.P., Double sampling plan. Reliability Engineering Concepts - Bathtub Hazard Rate Concept and Reliability Basic Formulas, Reliability Evaluation of Standard Configurations, Reliability Analysis Methods, component reliability and system reliability.

Text books

1. Montgomery – Introduction to SQC, John Willey & sons – 2007.
2. Dhillon, B.S, Applied Reliability and Quality- Fundamentals, Methods and Procedures Series: Springer Series in Reliability Engineering, 2007

3. Besterfield Dale H, Total Quality Management, Revised Third Edition, Pearson Education, 2011
4. Sigmund Halper, The assurance sciences: introduction to quality and reliability PHI 33

Reference books

1. Hoang Pham, Recent Advances in Reliability and Quality in Design, Springer Series in Reliability Engineering, 2008
2. Bentley John P, Introduction to Reliability and Quality Engineering, Addison – Wesley, 1999

Course Outcomes (COs):

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

1. Appreciate the role and importance of statistical quality control and reliability in modern industry. (PO-1)
2. Analyze the effects of variation on processes and utilize SPC tools for process control and improvement. (PO-3)
3. Apply Quality by design using product development tools and analyze different types of quality losses. (PO-1)
4. Understand the application of Quality Engineering in various streams. (PO-5)
5. Understand the concept of reliability analysis methods and quality analysis methods. (PO-4)

ELECTIVE – D

SYSTEMS SIMULATION MODELING

Course Code: MIE 231 **Credit: 4:0:0**
Prerequisites: Nil **Contact Hours: 56**
Course Co-ordinator: Dr C S Chethan Kumar

Course Content:

Unit-I

Introduction - Review of Basic Probability and Statistics –Simulation components, State of a system, Simulation procedure, Simulation inventory models, queuing models, Reliability models and lead time demand models.

Unit-II

Random number generators, tests for random numbers, Generating Random Variates, Acceptance rejection techniques, selecting input probability distributions.

Unit-III

Output Data Analysis for a Single System, Basic Simulation Modeling of terminating and non-terminating systems- selecting simulation software, features of Arena Simulation Software

Unit-IV

Comparing Alternative System Configurations, Independent sampling with equal and unequal variances, correlated sampling.
Variance-Reduction Techniques like antithetical variables, common random numbers, control variates.

Unit-V

Experimental Design, Sensitivity Analysis, and Optimization via simulation.
Simulation of Manufacturing Systems, material handling systems.

Text books

1. Banks, J., J. S. Carson, and B. L. Nelson. 1996. Discrete event system simulation. 2nd edition,. Upper Saddle River, New Jersey: Prentice-Hall.

Reference Books

1. Averill M. Law, Michael G. McComas, SIMULATION OF MANUFACTURING SYSTEMS, Proceedings of the 1997 Winter Simulation Conference ed. S. Andradóttir, K. J. Healy, D. H. Withers, and B. L. Nelson, 1997
2. Law, A. M. 1997. How to select simulation software. Tucson, Arizona: Averill M. Law & Associates.

Course Outcomes (COs):

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

1. Understand and appreciate the concepts of simulation modelling. (PO-3)
2. Apply the principles of random numbers to practical situations through various simulation models. (PO-1, 3)
3. Conduct output analysis for termination and steady state simulations. (PO-2)
4. Evaluate alternative system designs. (PO-5)
5. Analyze various manufacturing applications using Arena Simulation software. (PO-3, 5)

TOTAL QUALITY MANAGEMENT

Course Code: MIE 232 **Credit: 4:0:0**
Prerequisites: Nil **Contact Hours: 56**
Course Coordinator(s): Sri Sudheer D. Kulkarni/Sri A. Balakrishna

Course Content:

Unit-I

Understanding quality: Quality, competitiveness and customers, Understanding and building the quality chains, managing quality, Quality starts with understanding the needs, Quality in all functions
Models and frameworks for total quality management: Early TQM frameworks, Quality award models, the four Ps and three Cs of TQM – a new model for TQM,
Leadership and commitment: The total quality management approach, commitment and Policy, Creating or changing the culture, Effective leadership, Excellence in leadership

Unit-II

Policy, strategy and goal deployment: Integrating TQM into the Policy and strategy, the development of Policies and strategies,
Partnerships and resources: Partnering, Role of purchasing in partnerships, Just-in-time (JIT) management, Resources
Design for quality: Design, innovation and improvement, the design process, Quality function deployment (QFD) – the house of quality, Specifications and standards, Design in the service sector, Failure mode, effect and criticality analysis (FMECA), the links between good design and managing the business

Unit-III

Performance measurement frameworks: Performance measurement and the improvement cycle, Costs of quality, the process model for quality costing, a performance measurement framework, and the implementation of performance measurement systems
Self-assessment, audits and reviews: Frameworks for self-assessment, Methodologies for self-assessment, Securing prevention by audit and review of the management system, Internal and external management system audits and reviews

Benchmarking: The why and what of benchmarking, the purpose and practice of benchmarking, the role of benchmarking in change, Communicating, managing stakeholders and lowering barriers, choosing benchmarking-driven change activities wisely

Unit-IV

Process management: Process management vision, Process Classification Framework and process modeling, Process flowcharting, Leadership, people and implementation aspects of process management

Process redesign/engineering: Re-engineering the organization? What is BPR and what does it do? Processes for redesign, the redesign process, BPR – the people and the leaders,

Quality management system: Why a quality management system? Quality management system design, Quality management system requirements, other management systems and models, Improvements made to quality management systems,

Unit-V

Continuous improvement: A systematic approach, Some basic tools and techniques, Statistical process control, Some additional techniques for process design and improvement, Taguchi methods for process improvement, Six sigma, The 'DRIVE' framework for continuous improvement

Culture change through teamwork: The need for teamwork, Running process management and improvement teams, Teamwork and action-centered leadership, Stages of team development, Personality types and the MBTI, Interpersonal relations – FIRO-B and the Elements

Implementing TQM: TQM and the management of change, planning the implementation of TQM, Sustained improvement

Case Studies

Text books

1. Total Quality Management text with cases, Third edition, John S. Oakland, Butterworth-Heinemann An imprint of Elsevier
2. Shoji Shiba, Alan Graham and David Walden -A New American TQM Four Practical Revolutions in Management, Productivity Press, Portland (USA) - 2001.

References

1. N Logothetis -Management for Total Quality, Prentice Hall of India, New Delhi - 2002.
2. Roger C Swanson - The Quality Improvement Hand Book, Publisher Vanity Books International, New Delhi, 9th Edition, 1995
3. William C Johnson and Richard J Chavla, -Encyclopaedia of Total Quality Management, New Delhi, 1995

4. N.V.R Naidu, K.M.Babu, G. Rajendra - Total Quality Management, New Age International Publishers-2008 edition, ISBN-10: 812241799X
5. Kesavan R -Total Quality Management, I K International Publishing house Pvt. Ltd – 2008.

Course Outcomes (COs):

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

1. Understand and apply the concepts of quality and leadership (PO-1)
2. Develop Policies, strategies and partnerships to design quality (PO-1)
3. Measure and assess the performance and identify benchmark. (PO-3)
4. Manage and redesign a process & implement quality management systems (PO-3)
5. Apply tools for continuous improvement and implement TQM (PO-3)

INNOVATION AND SOCIAL ENTREPRENEURSHIP

Course Code: MIE 233 **Credit: 4:0:0**
Prerequisites: Nil **Contact Hours: 56**
Course Coordinator(s): Dr. Chethan Kumar C S/ Sri Deepak Kumar

Course Content:

Unit-I

Innovation: Concepts, Types of innovation, Linear, Cyclic and Network models of innovation,
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, To Innovate or Not to Innovate, New R&D strategies, Core competencies and business strategy.

Unit-II

Innovation Planning Process, Factors that aid Innovation Planning, Management of technological innovation, Dynamics of innovation process, Organizational roles for innovation, Facilitators and impediments of innovation, Strategic issues in innovation management, developing a Climate for Innovation, Case study, Building innovation culture in organizations, Key Initial Questions for Implementation, Challenges and opportunities, Case study.

Unit-III

Entrepreneurship: Importance of entrepreneurship in an economy, Concepts of social entrepreneurship, Characteristics of successful entrepreneur, Entrepreneurial development models, Serial entrepreneur VS Portfolio entrepreneur, Myths of entrepreneurship, Role of social entrepreneurship, Leadership and Leadership styles, Decision making: Importance and limitations of rational decision making, Communication Process, Barriers and breakdowns in communications, Effective communication Motivation and motivators.

Unit-IV

Social Entrepreneurial problems and capacity building measures, Entrepreneurship v/s Entrepreneurship, Fostering entrepreneurship in corporations, Cases of successful and unsuccessful entrepreneurs, Nature and activities of an entrepreneur, Techniques of coordination,

Institutions Supporting Small Business Enterprises: Introduction, Some important central-level and State-level institutions and non-governmental agencies, Permanent registration certificate, Effect of WTO.

Unit-V

Setting up of an Enterprise: Business opportunities in various sectors, Biasness plans, Formalities for setting up a small business enterprise, Project selection, Constitution, Registration, State clearances, Requirements of land & building, plant & machinery and infrastructure, Stages in the organization life cycle, Preparation of project report, Securing financial support for project and implementation. Salient features of goof project report, Need and significance of good project report.

Text Books

1. P.N.Rastogi, Management of Technology and Innovation, Sage Publications, new Delhi, 1995
2. Poornima M Charantimath, Entrepreneurship Development and Small Business Enterprises, Pearson Education, 2006.
3. Dr. NVR Naidu and T. Krishna Rao- Management and Entrepreneurship, I K International Publishing House Pvt. Ltd, New Delhi 2008
4. Management of Technology and Innovation – White &Bruton, Cengage Learning, 2011

Reference Books

1. Harold Koontz, H. Weihrich, and A.R. Aryasri, Principles of Management, Tata McGraw-Hill, New Delhi, 2004.
2. M. White and G.D. Bruton, The Management of Technology and Innovation, Cengage learning, 2007
3. Cynthia L. Greene, Entrepreneurship, Cengage Learning, 2006.

Course Outcomes (COs):

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

1. Understand the global industrial competition to adopt the new technology to build the relationship bridge between business strategy and technology strategy. (PO-3)
2. Apply the various innovation concepts and models in organization to their strategic issues in innovation management. (PO-5)
3. Analyze the trends in Innovation Management, New R&D strategies to build innovation culture to strengthen the activities of entrepreneurs. (PO-5)
4. Evaluate and forecast the entrepreneurial problems to train the successful entrepreneurs and avoid upcoming unsuccessful entrepreneurs. (PO-9)
5. 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-6)

SOFTWARE QUALITY ASSURANCE

Course Code: MIE 234 **Credit: 4:0:0**
Prerequisites: Nil **Contact Hours: 56**
Course Co ordinator: Dr M Rajesh

Course Content:

Unit-I

Quality assurance context - Challenges of software quality - IS quality - Define software quality

Unit-II

Define a software quality model - Software Quality Assurance - Describe components of a software quality assurance system

Unit-III

Software quality plans -Relate software quality to the software development life-cycle - SQA management

Unit-IV

Describe process controls - Agile, MSF, & CMMI - Quality metrics -Quality costs - SQA economics -SQA standards - Describe common standards - IEEE standards

Unit-V

SQA tools & techniques – Testing - Quality procedures - Runtime assurances, requirements monitoring - Open source

Text books

1. Software Quality Assurance: From Theory to Implementation, Daniel Galin, Addison Wesley, 2003

Reference Books

1. Implementing the Capability Maturity Model by James R. Persse John Wiley & Sons © 2001

Course Outcomes (COs):

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

1. Identify the unique characteristics of software as a product and as production process that justify separate treatment of its quality issues. (PO-3)
2. Understand the steps of software product development and identify the challenges and opportunities of software quality assurance(PO-5)
3. Recognize the characteristics of the environment where professional software development and maintenance take place. (PO-5)
4. Explain the standards governing the software development process. (PO-4)
5. Aware of tools and techniques used for software product testing. (PO-3)

ELECTIVE – E

LEAN MANUFACTURING SYSTEMS

Course Code: MIE 241 **Credit: 4:0:0**
Prerequisites: Nil **Contact Hour: 56**
Course Co ordinator: Dr C S Chethan Kumar/ P R Dheeraj

Course Content:

Unit-I

Introduction to lean manufacturing systems and cell design, Steps to lean production

Unit-II

Manufacturing system design, Axiomatic design principles, manned interim manufacturing and assembly cells

Unit-III

Setup reduction, integrated quality control, integrated reliability

Unit-IV

Refining lean production, Production and inventory control, making the vendors lean

Unit-V

Ergonomics in cell design, Automation and auto nomation, Simulation, The Toyota production system today

Text Book

1. Ronald G. Askin, Jeffrey B. Goldberg, Design And Analysis Of Lean Production Systems, Wiley, 2007

Reference Book

1. JT Black, Steve L. Hunter, Steve L. Hunter, Lean Manufacturing Systems and Cell Design, Society of Manufacturing Engineers, 2003

Course Outcomes (COs):

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

1. Understand the fundamentals of lean manufacturing. (PO-1, 3)
2. Design a basic lean manufacturing system. (PO-1, 2)
3. Integrate a lean system into an industry. (PO-3, 4)
4. Refine a lean manufacturing system. (PO-2, 3)
5. Design a basic automation system. (PO-3, 4)

COMPUTER-AIDED FACILITIES PLANNING

Course Code: MIE 242 **Credit: 4:0:0**
Prerequisites: Nil **Contact Hours: 56**
Course Co ordinator: Dr M Rajesh

Course Content:

Unit-I

Defining Requirements – Introduction - Product, Process, and Schedule Design - Flow, Space, and Activity Relationships.

Unit-II

Developing Alternatives: Concepts and Techniques - Material Handling - Layout Planning Models and Design Algorithms.

Unit-III

Facility Design for Various Functions - Warehouse Operations, Manufacturing Systems, Facilities Systems.

Unit-IV

Developing Alternatives: Quantitative Approaches - Quantitative Facilities Planning Models

Unit-V

Evaluating, Selecting, Preparing, Presenting, Implementing, and Maintaining - Evaluating and Selecting the Facilities Plan - Preparing, Presenting, Implementing, and Maintaining the Facilities Plan.

Text books

1. Tompkins, James A; White John A; et al; Facilities Planning, Wiley, 2008

Reference Books

1. Andrew A. Signore, Terry Jacobs, Good Design Practices For GmpPharmaceutical Facilities, Taylor & Francis Group, 2005
2. Orin Flanigan, Underground Gas Storage Facilities: Design and Implementation, Gulf Professional Publishing, 1995

Course Outcomes (COs):

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

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

ADDITIVE MANUFACTURING

Course Code: MIE 243 **Credit: 4:0:0**
Prerequisites: Nil **Contact Hours: 56**
Course Co ordinator: Dr Shobha / Hamritha. S

Course Content:

Unit-I

Introduction, the Basic Principles, Additive Manufacturing Processes, Personal Printer Revolution, AM Process Work flow A Closer Look at Rep-Rap Machines Preparing Files for 3D Printing Choosing the Right Materials

Unit-II

Extrusion Systems Extrusion Systems Sheet Lamination Jetting Direct-Write Bio printing Sintering Overview Powder Bed Fusion Directed Energy Deposition Photo Polymerization

Unit-III

Software & Methods, Designing for Additive Manufacturing (DfAM), Software Tools vs. Requirements Pre- & PO-st-processing 3D Scanning & the Scanning Process Sculpting & Repairing Data AM File Formats STEP File Format More Detail on NURBS Model Validation Working with DICOM Files for 3D Printing Medical Imagery

Unit-IV

Materials Choosing, Materials for Manufacturing, Multiple Materials, Metal AM Processes & Materials Composite Materials Biomaterials, Hierarchical Materials & Bio-ceramics Shape-Memory Materials, 4D Printing & Bio-active materials Advanced AM Materials

Unit-V

Key Related Processes, Choosing the Right Manufacturing Process, Applications of AM Direct Digital Manufacturing, Distributed Manufacturing, Mass Customization, Biomedical Applications, Aerospace & Automotive Applications and Architectural Engineering. Intellectual Property, Commercialization, Trends, Business Opportunities & Future Directions

Text books

1. Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, 2nd Ed. (2015) , Ian Gibson, David W. Rosen, Brent Stucker
2. Chua C. K., Leong K. F., and Lim C. S., "Rapid Prototyping: Principles and Applications", Second Edition, World Scientific Publishers (2003)
3. Patri K. Venuvinod, Weiyin Ma "Rapid Prototyping: Laser-Based and Other Technologies" Springer, 2004

Reference Books

1. Peter D. Hilton, Hilton/Jacobs, Paul F. Jacobs, "Rapid Tooling: Technologies and Industrial Applications", CRC Press, 2000.
2. Burns. M, "Automated fabrication", Prentice-Hall, 1993.

Course Outcomes (COs):

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

1. Demonstrate the knowledge of Additive Manufacturing and Rapid Prototyping technologies. (PO-1)
2. Demonstrate comprehensive knowledge of the broad range of AM processes, devices, capabilities and materials that are available (PO-3)
3. Describe different RP techniques and fundamentals of Reverse Engineering. (PO-1)
4. Understand the various software tools, processes and techniques that enable advanced/additive manufacturing and personal fabrication (PO-5)
5. Understand the latest trends and business opportunities in AM, distributed manufacturing and mass customization. (PO-3)

COMPUTATIONAL METHODS FOR QUEUING NETWORKS

Course Code: MIE 244 **Credit: 4:0:0**
Prerequisites: Nil **Contact Hours: 56**
Course Co ordinator's: V.Vivekanand / Dr M.Shilpa

Course Content:

Unit-I

Introduction -Modelling Automated Manufacturing Systems - Performance Modeling Tools. Markov Chain Models - Memoryless Random Variables - Stochastic Processes in Manufacturing - Discrete Time Markov Chain Models - Continuous Time Markov Chain Models - - Absorbing States and Modeling of Deadlocks - Semi-Markov Processes in Manufacturing

Unit-II

Queuing Models - Queues: Notation and Examples - The M/M/1 Queue - The M/M/m Queue - Batch Arrival Queuing Systems - Queues with General Distributions - Queues with Breakdowns

Unit-III

Queuing Networks - Open Queuing Networks - Closed Queuing Networks - Product Form Queuing Networks - Queuing Networks with Blocking. Analysis of Queues - Approximate Analysis of Queuing Systems - Analysis of a Flexible Machine Centre - Per formability Analysis

Unit-IV

Petri Net Models - Classical Petri Nets - Stochastic Petri Nets - Generalized Stochastic Petri Nets - Deadlock Analysis using Petri Nets - Extended Classes of Petri Nets - Integrated Petri Net - Queuing Network Models

Unit-V

Applications - Automated Manufacturing Systems - Performance Measures - Computer Controlled Machines - Material handling Systems - Plant Layout-Flexible Manufacturing Systems - Computer Control Systems - Modeling of Kanban Systems

Text books

1. Viswanadham N, Narahari Y, Performance Modeling of Automated Manufacturing Systems, Prentice Hall of India Pvt Ltd, 2005

Reference Books

1. Computer systems performance evaluation and prediction, Paul J Fortier, 2006

Course Outcomes (COs):

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

1. Analyze discrete time and continuous time marker chain models in manufacturing. (PO-3)
2. Analyze different types of queues along with their breakdowns. (PO-3)
3. Conduct perform ability analysis for different types of queue networks. (PO-3)
4. Identify the type of Petri Net models and analyze the same. (PO-3)
5. Analyze the queues in manufacturing, material handling systems. (PO-3, 4)

ELECTIVE – F

MANAGEMENT ACCOUNTING AND FINANCE

Course Code: MIE 251 **Credit: 4:0:0**
Prerequisites: Nil **Contact Hours: 56**
Course co ordinator: Dr NVR Naidu/ Dr Shobha R

Course Content:

Unit-I

Basic records, Preparing financial statements Financial Accounting Conventions, trading account, profit and Loss account and Balance sheet concepts.

Unit-II

Balance sheet concepts with Adjustment entries, Inventory valuation financial ratios, Sources of funds, Cash Flow statements

Unit-III

Cost accounting, Cost classification, Allocation and absorption of cost, relevant costs, Allocation joint costs. Design of historical and standard costing systems, Overhead cost control Managerial Economics concept, process costing.

Unit-IV

Working capital management New Trends in Managerial Accounting.

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

1. Guruprasad Murthy, Financial Accounting, Himalaya, 2009
2. Anthony A. Atkinson, Robert S. Kaplan, S. Mark Young, Ella Mae Matsumura, Management Accounting, Prentice Hall, 2007.

Reference Books

1. Hansen Don R, Mowen M Maryanne, Management Accounting, Cengage Learning, 7th Edition, 200742.

Course Outcomes (COs):

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

1. Demonstrate the concept of accounting principles for obtaining comprehensive Solutions in accounting. (PO-1, 5)
2. Apply the accounting ratios knowledge to solve industrial problems. (PO-1, 5)
3. Exhibit knowledge about the cost of product, process and their controlling factors to solve industrial problems. (PO-1, 5)
4. Apply the knowledge of working capital requirement and its management in industry (PO-1, 5)
5. Demonstrate the importance of budgeting and its methods to control finance in industry. (PO-1,5)

HUMAN RESOURCE MANAGEMENT

Course Code: MIE 252 **Credit: 4:0:0**
Prerequisites: Nil **Contact Hours: 56**
Course Coordinator(s): Dr. S. Appaiah / Dr. M Shilpa

Course Content:

Unit-I

Introduction: Evolution of HRM, Objectives, Functions and Policies.
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

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-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

1. Dr. K Ashwathappa -Human Resources Management, Tata McGraw Hill, 4th Edition, 2005.

2. Hersey and Blanchard -Management of Organizations Behavior, Prentice Hall of India, 10th Edition – 2012.
3. Arun Monappa -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 the student will be able to

1. Plan for manpower for a given type of organization (PO-1,4)
2. Analyze and select the right recruitment / selection strategy for a given Organization (PO-2, 3)
3. Design the appropriate training and development to the employee after analyzing the training needs (PO-4)
4. Design the right induction procedure for the new entrant in the organization (PO-1,3)
5. Identify the performance appraisal method depending on the type of organization (PO-2)

SYSTEMS RELIABILITY ENGINEERING

Course Code: MIE 253 **Credit: 4:0:0**
Prerequisites: Nil **Contact Hours: 56**
Course Coordinator(s): Dr. G.S.Prakash/V.Vivekanand

Course Content:

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

1. L. S. Srinath -Concepts of Reliability Engineering, Affiliated East West Press Pvt. Ltd -2005
2. Dr. Balaguru Swamy -Reliability Engineering, Tata McGraw Hilll , 2010.
3. Charles E Ebeling -An introduction to Reliability and Maintainability, Waveland Press, 2010

References

1. Ireson and Grant -Reliability Hand Book,1995
2. E E Lewis -Introduction to Reliability Engineering, John Wiley & Sons - 2nd edition, 1995

Course Outcomes (COs):

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

1. Understand various types of distribution and reliability function (PO-1, 3)
2. Develop simple and complex reliability systems for real life problems (PO-1, 3)
3. Design various reliability model for complete systems (PO-1, 3)
4. Analyze and develop down time and repair time data (PO-1, 3)
5. Analyze failure data for real life problem (PO-1, 3)

DECISION SUPPORT SYSTEMS

Course Code: MIE 254 **Credit: 4:0:0**
Prerequisites: Nil **Course Hours: 56**
Course coordinators: V Vivekanand / P R Dheeraj

Course Content:

Unit-I

Introduction: Meaning of DSS, Uses of a Decision Support System.
Decision Making: Rational Decisions, Nature of Managers, Appropriate Decision Support, Appropriate Data Support, Group Decision Making, Intuition, Qualitative Data, and Decision Making, Business Intelligence and Decision Making, Analytics, Competitive Business Intelligence.

Unit-II

Data Component: Specific View toward Included Data, Characteristics of Information, Databases, Database Management Systems, Data Warehouses.
Model Component: Models and Analytics, Options for Models, Problems of Models, Data Mining, Model-Based Management Systems.

Unit-III

Intelligence and Decision Support Systems: Programming Reasoning, Uncertainty.
User Interface: Goals of the User Interface, Mechanisms of User Interfaces, User Interface Components.

Unit-IV

International Decision Support Systems: Information Availability Standards, Cross-Cultural Modeling, Effects of Culture on Decision Support System.
Designing a Decision Support System: Planning for Decision Support Systems, DSS Design and Reengineering.

Unit-V

Object-Oriented Technologies and DSS Design: Kinds of Development Tools, Benefits of Object-Oriented Technologies for DSS.
Implementation and Evaluation: Implementation Strategy, Implementation and System Evaluation.

Textbook

1. Decision Support Systems for Business Intelligence – Vicki Sauter (Wiley, 2011)

References

1. Decision Support Systems – George Marakas (Prentice Hall, 2002)
2. Decision Support Systems – Douglas Schwartz (Clanrye International, 2015)

Course Outcomes (COs):

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

1. Understand the fundamentals of decision support systems. (PO-5)
2. Design and implement data and model components. (PO-3)
3. Design and implement user interface. (PO-3)
4. Design a decision support system. (PO-3)
5. Implement a decision support system. (PO-5)

SEMINAR - II

Course Code: MIE 26 **Credit: 0:2:0**
Prerequisites: Nil

Course Content:

Seminar will be evaluated based on:

- Literature Review of emerging work in chosen area. Emphasis will be on modeling and other Industrial Engineering tools and techniques
- At least one case study review that demonstrates student ability to related theory to application
- Project/ Paper Write-up
- Presentation

Course Outcomes (COs):

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

1. Identify emerging technological areas/tools in engineering. (PO-3)
2. Collect data from reputed peer revived international journals and interpret them. (PO-4)
3. Prepare an effective Power Point presentation case study discussion. (PO-1, 2)
4. Construct a feasible technical report / project document. (PO-2)

ADVANCED PROBABILITY AND STATISTICS LAB

Course Code: MIEL 27 **Credit: 0:0:1**
Prerequisites: Nil **Contact Hours: 28**
Course Co ordinator's: V.Vivekanand / Dr M.Shilpa

Course Content:

Laboratory exercises

List of experiments

1. Determination of Basic Statistics
2. Graphical Interpretation of Data Using Histogram
3. Scatter Plot and Correlation Analysis
4. Hypothesis Testing of Single Sample with Known variance
5. Hypothesis Testing of Single Sample with unknown variance
6. Hypothesis Testing of Two Samples with Known variance
7. Hypothesis Testing of Two Sample with unknown variance
8. Testing the goodness of fit for Poisson Distribution
9. Testing the goodness of fit for Normal Distribution
10. Development of Markov Chain and analyzing Markova chain for a gambler ruin problem
11. Conduction of Simple Linear Regression Analysis
12. Conduction of Multiple Linear Regression Analysis
13. Determination of Principal components, Factor analysis: Case Study
14. Conducting Discriminate analysis: Case Study

Suggested Software Packages: SYSTAT Version 11/12, MS Excel, Statistical, Minitab

Text Books

1. Sheldon M Ross: Introduction to Probability and Statistics for Engineers and Scientist, 5th Edition, Elsevier, 2014
2. Walpole-le, R.E., Myers, R.H., Myers, S.L., Ye, K.Y. Probability and Statistics for Engineers and Scientists, Macmillan, Pearson, 9th Edition, 2016.
3. Douglas C. Montgomery, George C. Runger: Applied Statistics & Probability, 6thEdition, Wiley, 2013

Reference Books

1. Sheldon M Ross : Introduction to Probability models 10th Edition, Academic Press, 2009
2. Richard I. Levin, David S. Rubin, Statistics for Management, 7th Edition, 2008
3. Jay L. Devore, Probability and Statistics for Engineering and the Sciences, 8th Edition, 2008, Cengage Learning

Course Outcomes (COs):

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

1. Develop Various Probability Models from real time data. (PO-1, 3)
2. Analyze various real time problems through probability & statistical techniques (PO-1, 3)
3. Develop and Evaluate Various Univariate and Multivariate Models for various real life scenarios. (PO-1, 3)

SYSTEMS SIMULATION MODELING LAB

Course Code: MIEL 28 **Credit: 0:0:1**
Prerequisites: Nil **Course Hours: 28**
Course coordinators: Dr C S Chethan Kumar / Dr M Shilpa

Course Content:

Laboratory Exercises

List of experiments

1. Introduction to Simulation Packages
2. Understanding the Simulation Package
3. Identifying probability distributions for given data
4. Building simulation models for manufacturing operations (Electronic assembly –With Basic templates)
5. Building simulation models for manufacturing operations (Electronic assembly –With Common templates)
6. Building simulation models for manufacturing operations with transport System
7. Building simulation models for manufacturing operations with layout
8. Building simulation models for manufacturing operations with layout and Transport System
9. Building simulation Models for Banking service (Bank teller problem)
10. Building simulation Models for Mortgage application problem
11. Building simulation Models for food processing problem
12. Building simulation Models for Post office animation
13. Statistical Analysis of Simulation models (input analysis)
14. Statistical Analysis of Simulation models (output analysis)

Text books

1. Law, A. M., and W. D. Kelton, Simulation modeling and analysis. Tata McGraw Hill, 2007

Reference books

1. Averill M. Law, Michael G. McComas, SIMULATION OF MANUFACTURING SYSTEMS, Proceedings of the 1997 Winter Simulation Conference ed. S. Andradóttir, K. J. Healy, D. H. Withers, and B. L. Nelson, 1997

2. Banks, J., J. S. Carson, and B. L. Nelson. 1996. Discrete event system simulation. 2nd edition,. Upper Saddle River, New Jersey: Prentice-Hall.
3. Law, A. M. 1997. How to select simulation software. Tucson, Arizona: Averill M. Law & Associates.

Course Outcomes (COs):

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

1. Create Simulation Model for various real time scenarios (Manufacturing, Servicing Industry, Health Care, Retail Sectors) using Arena. (PO-3)
2. Conduct Analysis for various real time scenarios using Arena software (PO- 3)
3. Evaluate alternative system designs using Arena Software (PO-3)

III SEMESTER

QUANTITATIVE TECHNIQUES IN DECISION MAKING

Course Code: MIE 31 **Credit: 3:1:0**
Prerequisites: None **Contact hours: 42L+14T**
Course coordinators: Dr M Shilpa / P R Dheeraj

Course Content:

Unit-I

Introduction to Decision Making and Quantitative Techniques: Complexity of Real-life problems, Models, Mathematical modeling process, Classification of mathematical models, Solution procedures, Advantages and limitations, Role of Human Judgment.
Linear Programming: Introduction, Formulation and Graphical Solution

Unit-II

Linear Programming (Continued): Simplex Method, Big-M Method, Two-phase simplex method.
Specially structured linear program: Transportation problems and assignment problems

Unit-III

Sensitivity Analysis – Algebraic
Integer programming – Cutting plane method (Gomory cut)

Unit-IV

Network models: PERT, CPM, Crashing Network economically, Resource leveling, Minimal spanning tree algorithm

Unit-V

Waiting Line models: Single and multi-server models
Goal programming: Formulation of goal programming problems
Introduction to software packages for solving optimization problems

Text Book

1. Taha, Hamdy A. Introduction to Operations Research, PHI Pvt Ltd., New Delhi 2003.
2. Anderson D.R., D.J. Sweeney and T.A Williams, Quantitative Methods for Business, Cengage learning, 2006.

Reference books

1. M P Gupta and R B Khanna, Quantitative Techniques for Decision Making, PHI, 2011.
2. Anderson, Sweeney and Williams, quantitative Methods for business, Lengage Learning, 2006.
3. Ravindran, Philips and Solberg, Operations research Principles and Practice, John Wiley and Sons, 1987.

Course Outcomes (COs):

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

1. Formulate the mathematical models for real life problems and use human judgment to make informed decisions. (PO-3)
2. Arrive at optimum solutions to practical problems by solving linear programming problems. (PO-3)
3. Conduct sensitivity analysis to aid in decision making and also obtain solutions to integer programming problems. (PO-3)
4. Represent the project in the form of a network and analyze the same to arrive at better project management decisions. (PO-5)
5. Analyze various queuing systems and also formulate the multi objective problems as goal programming problems. (PO-3)

INTERNSHIP

Course Code: MIE 32 **Credit: 0:4:0**
Pre requisite: Nil **Course duration: 1 Month**
Course Coordinator(s): Dr C S Chethan Kumar / Dr G S Prakash

Course Content:

Students are Subjected to industrial training in the form of Internship for one month in reputed industries.

Course objectives

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

Assessment and Evaluation vis-à-vis Course Outcomes
Note: Students have to undergo one month internship in an industry. The student has to compulsorily submit a report and the evaluation will be done by a committee constituted by the HOD. Each student must give a presentation for about 30 minutes, comprising of:

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

Course outcomes (COs):

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

1. Identify the products of the company and its customers and draw the appropriate plant layout of the industry (PO-1)
2. Construct the process map for some of the important products of the industry (PO-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-2,3)

DISSERTATION PRELIMINARIES

Course Code: MIE 33 **Credit:0:0:8**
Prerequisites : Nil
Course Coordinator(s): Dr C S Chethan Kumar / Dr G S Prakash

Course Content

The Project preparatory work will be evaluated based on:

- Company Information
- Appreciating the different aspects of the business
- Narrowing down to the specific problem
- Its importance and relevance / significance
- Project problem definition
- Scope – In Scope, Out of Scope
- Assumptions
- Project Plan

Course Outcomes (COs):

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

1. Identify engineering problems area. (PO-1,2)
2. Define project methodology/approach. (PO-2,3)
3. Evaluate various engineering tools / techniques. (PO-4, 5)

ELECTIVE – G

DESIGN OF EXPERIMENTS

Course Code: MIE 341 **Credit: 4:0:0**
Prerequisites: Nil **Course Hours: 56**
Course coordinator: V Vivekanand/ Dr Shilpa M

Course Content:

Unit- I

Experiments with a Single Factor: The Analysis of Variance, Randomized Blocks, Latin Squares, and Related Designs.

Unit- II

Introduction to Factorial Designs, the 2^k Factorial Design.

Unit- III

Blocking and Confounding in the 2^k Factorial, Two-Level Fractional Factorial Designs.

Unit- IV

Fitting Regression Models, Response Surface Methods: Method of Steepest Ascent, Analysis of Second Order response Surface, Characterizing Response Surface.

Unit- V

Random Effects Model: Single Random factor, Nested Design: Two Stage Nested Design, M Stage Nested Design (3 stages). Split Plot Design with Two Factors.

Text books

1. Douglas C. Montgomery, Design And Analysis Of Experiments, 8th Edition, 2012, Wiley

Reference books

1. Angela Dean, Daniel Voss, Design And Analysis Of Experiments, Springer, 2006
2. Douglas C. Montgomery, George C. Runger : Applied Probability&Statistics, 5th Edition, Wiley, 2010

Course Outcomes (COs):

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

1. Develop and Analyze Single Factor Model, Latin Square Designs. (PO-3)
2. Develop and Analyze Two Level Design and Apply to real time Scenarios (PO-3)
3. Develop and Design fractional factorial models and conduct analysis (PO-3)
4. Develop Reponses surface models (PO-3)
5. Analyze complex designs such as Random factors, Nested and Split Designs (PO-3)

CYBER SECURITY

Course Code: MIE 342 **Credit: 4:0:0**
Prerequisites: Nil **Course Hours: 56**
Course coordinator: P R Dheeraj

Course Content:

Unit- I

Security Concepts and Mechanisms -Networking Concepts Overview -Information Security Concepts -Security Threats and vulnerabilities.

Unit- II

Cryptography -Security Management -Security Management Practices

Unit- III

Network Security -Access Control and Intrusion Detection -Server Management and Firewalls - Security for VPN and Next Generation Networks

Unit- IV

System and Application Security - Security Architectures and Models - System Security - OS Security

Unit- V

Security Laws and Standards - Cyber Laws

Text books

1. Cyber Security Essentials - James Graham (Editor), Ryan Olson (Editor), RickHoward (Editor)Auerbach Publications; 1 edition, 2010

Reference Books

1. Cyber Security And Global Information Assurance: Threat Analysis And Response Solutions (Hardcover) by Kenneth J. Knapp (Editor) Publisher: Information Science Publishing, 2010
2. Cyber Laws, Shikha Singh, Global India Publications Pvt Ltd., 2011

Course Outcomes (COs):

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

1. Apply to knowledge of basic security and networking concepts to real time problems (PO-1,3)
2. Apply knowledge of Security Management principles to Real Life Problems (PO-1,3)
3. Develop Network Security Systems and Future Systems for various Problems (PO-1,3)
4. Create Security System Architecture and Models (PO-1,3)
5. Apply Knowledge of Security Laws for Various Real time problems (PO-1,3)

DATA WAREHOUSING AND DATA MINING

Subject Code: MIE 343 **Credits: 4 : 0 : 0**
Prerequisites: Nil **Course Hours: 56**
Course Coordiantor : V.Vivekanand/P.R.Dheeraj

Course Content:

Unit- I

DW methodology - DW architectures - The DW development processes: Logical and physical DW

Unit- II

DW data modeling - ETL, Data access, Data quality - DM - Query tools

Unit- III

State-of-the-art in DM tools and technologies

Unit- IV

DM and Business intelligence – From findings to application

Unit- V

From research to a mature technology – technological artifact - DW, DM and beyond.

Text books

1. Berry, M.J.A. and Linoff G.S. (2004). Data Mining Techniques: For Marketing, Sales, and Customer Relationship Management (paperback), 2nd Edition. ISBN: 0-471-47064-3, Wiley

Reference Books

1. Sperley, Eric. (1999) the Enterprise Data Warehouse: The Planning, Building & Implementation Volume I: 1st Edition. ISBN 0139058451, Prentice Hall.

Course Outcomes (COs):

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

1. Identify the data ware housing and methodologies and architecture.(PO-3)
2. Understand data modelling and data mining quarry tools (PO-3)
3. Application of state of the arts in mining tools and technologies. (PO-3)
4. Aware of business intelligence from findings to applications. (PO-4)
5. Apply various data modelling techniques to any given business process. (PO-4)

DATA ANALYTICS

Course Code: MIE 344 **Credits: 4 : 0 : 0**
Prerequisite: Advanced Probability and Statistics **Course Hours: 56**
Course Coordinator(s): V.Vivekanand / Dr M.Shilpa

Course Content:

Unit- I

Introduction : Basic Concepts of Mutlivariate Analysis, Classification of Multivariate Analysis, Preparing for Multivariate analysis : Graphical Examination of data (Univariate, Bivariate Profiling), Missing Data, Outliers : Detecting and Handling Outliers, Testing assumption of multivariate analysis : : Q-Q Plot for Multivariate Normality,KS test, ShaipiroWilks test, Homoscedastic, Data Transformation : Power Transformation, logit transformation, fisher transformation, Transformation of multivariate observation

Unit- II

Data Reduction technique: Principal components methods: Procedure for computation of principal components (Non Analytical Treatment), Summarizing Sample Variation by principal components: Variance of Components, Scree Plot; Standardization of Principal Components
Factor Analysis: Assumptions of factor analysis, Orthogonal factor model: Common Factors, specific factors, factor loading, Estimation of Parameters of model using PCA (Non analytical methods (Only Procedure)), Communalities, Factor Rotation (Varimax method), and Estimation of Factor Scores

Unit- III

Predictive analytics (Supervised Learning Methods): Multiple Linear Regression Analysis for Non Categorical variables and Categorical variables: Building a regression model, multi co linearity, variable selection procedure (Non analytical): Stepwise, forward and backward regression. Classification Accuracy, k-Nearest Neighbors (Simple Problems), Classification and Regression Trees

Unit- IV

Unsupervised Learning: Cluster Analysis (Simple Problems): Measures of Association for Continuous Variables (Euclidean Distance, Canberra Metric, Czekanowski Coefficient), Measures of Association for Binary Variables: Similarity coefficients for clustering items; Agglomerative Hierarchical Clustering: single linkage, complete linkage, average linkage; Cluster Description; Non Hierarchical Clustering Methods: K means method (Simple Problems)

Unit- V

Discriminant Analysis & Logistic Regression: Classification of Two & Multiple Populations, Evaluation of Classification function, Fisher Method of Discriminating, Logistic Regression: Logit Model, analysis and Classification

Text Books

1. Applied Multivariate Statistical Analysis (6th Edition) 6th Edition Richard A. Johnson (Author), Dean W. Wichern (Author), Eastern Economy Edition.
2. Essentials of Business Analytics 1st Edition, by Jeffrey D. Camm (Author), James J. Cochran (Author), Michael J. Fry (Author), Jeffrey W. Ohlmann (Author), David R. Anderson (Author), Jan 2014.
3. Multivariate Data Analysis : Joseph F. Hair Jr (Author), William C. Black (Author), Barry J. Babin (Author), Rolph E. Anderson (Author), Pearson Education Limited, 2013.

References

1. Statistical and Machine-Learning, Data Mining Techniques for Better Predictive Modeling Techniques and Analysis of Big Data: Bruce Ratner, Second Edition, CRC Press Taylor & Francis Group.
2. The Elements of Statistical Learning, Data Mining, Inference, and Prediction, Trevor Hastie, Robert Tinsirani, Jerome Friedman.

Course Outcomes (COs):

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

1. To Identify, Classify, conduct test on various types of data set (PO-1,3)
2. To classify multivariate variate data into various components (PO-1,3)
3. Develop Regression model for real time data (PO-1,3)
4. To classify and analyse real time data set into various clusters by clustering methods (PO-1,3)
5. develop discriminate and logistic regression models for real time data (PO-1,3)

IV SEMESTER

DISSERTATION

Subject Code: MIE 41 **Credits: 0 : 0 : 22 : 0**
Prerequisites: MIE 11

Course Content:

Final Project work will be evaluated based on

- Project problem definition
- Scope – In Scope, Out of Scope
- Assumptions
- Project Plan
- Project Preparatory Work and
- Data Gathering
- Inferences
- Literature Survey
- IE Concepts and Methodology used
- Recommendations
- Analysis including CBA
- Implementation Methodology
- Results
- Original Contribution of the project
- Project Report Depth and Quality
- Project Presentation

Course Outcomes (COs):

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

1. Collect and Interpret engineering data. (PO-1)
2. Implement engineering tools / techniques. (PO-2)
3. Validate the results obtained. (PO-3, 4)
4. Develop a technical report. (PO-2)