UNIVERSITY OF CALICUT

SCHEME AND SYLLABUS FOR

M.Tech

in

MANUFACTURING SYSTEMS MANAGEMENT

(2010 Admission onwards)

M.Tech MANUFACTURING SYSTEMS MANAGEMENT
(PRODUCTION ENGINEERING)
SCHEME OF EXAMINATIONS

Semester - I

Code	Subject	Hours per week			Marks		Total Marks	Sem-end exam duration - Hrs	Credits
		L	T	P/D	Intl.	Sem-end			
PMS 10101	Managerial Statistics	3	1	-	100	100	200	3	4
PMS 10102	Advanced Manufacturing Systems	3	1	-	100	100	200	3	4
PMS 10103	Advanced Operations Management	3	1	-	100	100	200	3	4
PMS 10104	Total Quality Management	3	1	-	100	100	200	3	4
PMS 10105	Elective I	3	1	-	100	100	200	3	4
PMS 10106(P)	Manufacturing Systems Management Lab	-	-	2	100	-	100	3	2
PMS10107(P)	Seminar I	-	-	2	100	-	100	-	2
	Departmental Assistance	-	-	6	-	-	-	-	-
TOTAL		15	5	10			1200		24

Electives –I

PMS 10105(A) Industrial Robotics and Expert Systems
PMS 10105(B) Information Technology for GIS Data Management (Common with CEH 10105(B))
PMS 10105(C) Management Accounting and Financial Management
PMS 10105(D) Safety Engineering and Industrial Hygiene

Semester - II

Code	Subject	Hours per week			Marks		Total Marks	Sem-end exam duration-Hrs	Credits
		L	T	P/D	Intl.	Sem-end			
PMS 10201	Modelling and analysis of Manufacturing Systems	3	1	-	100	100	200	3	4
PMS 10202	Enterprise Resource Planning	3	1	-	100	100	200	3	4
PMS 10203	Integrated Product Development	3	1	-	100	100	200	3	4
PMS 10204	Elective II	3	1	-	100	100	200	3	4
PMS 10205	Elective III	3	1	-	100	100	200	3	4
PMS 10206(P)	Seminar II	-	-	2	100	-	100	-	2
PMS 10207(P)	Mini Project	-	-	2	100	-	100	-	2
	Departmental Assistance		-	6	-	-	-	-	-
TOTAL		15	5	10			1200		24

Electives –II

PMS 10204(A) Design and analysis of Experiments
PMS 10204(B) Management Information Systems (Common with MPE 10204(B) , MIT 10204(B))
PMS 10204(C) Reliability Engineering
PMS 10204(D) Markov Modelling and Queuing Theory (Common with ECS 10204(D))

Electives –III

PMS 10205(A) Industrial Marketing and Marketing Research
PMS 10205(B) Ergonomics of Manufacturing
PMS 10205(C) Strategic Management
PMS 10205(D) Reverse Engineering

Semester - III

Code	Subject	Hours per week			Marks		Total Marks	Sem-end exam duration-Hrs	Credits
		L	T	P/D	Intl.	Sem-end			
PMS10301	Elective IV	3	1	-	100	100	200	3	4
PMS10302	Elective V	3	1	-	100	100	200	3	4
PMS10303(P)	Industrial Training	-	-	-	50	-	50	-	1
PMS10304(P)	Master Research Project Phase I	-	-	22	Guide 150 / EC* 150	-	300	-	6
TOTAL		6	2	22	550	200	750		15

NB: The student has to undertake the departmental work assigned by HOD
*EC – Evaluation Committee

Electives –IV

PMS10301(A) Research Methodology (Common with CEH 10301(A), CEE 10301(A), EPE 10 301(A), EPS 10301(A) and MIT 10301(C))
PMS10301(B) Supply Chain Management systems
PMS10301(C) Computer Networking (Common with EPE 10301(C))
PMS10301(D) Advanced Optimisation Techniques

Electives –V

PMS10302(A) Industrial Energy Management (Common with MPE 10302(A))
PMS10302(B) Soft Computing Techniques (Common with EPE 10 302(B), CEH 10302 (B), MIT 10302 (B))
PMS10302(C) Advanced Maintenance Management
PMS10302(D) Product Lifecycle Management

Semester - IV

Code	Subject	Hours per week			Internal Marks		Sem-end exam.		Total Marks	Credits
		L	T	P/D	Guide	Evaluation committee	Extl. Guide	Viva-Voce		
MPE10 401(P)	*Masters Research Project (Phase - II)*	-	-	30	150	150	150	150	600	12
TOTAL				30	150	150	150	150	600	12

NB: The student has to undertake the departmental work assigned by HOD

PMS 10101: MANAGERIAL STATISTICS

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits: 4**

Objectives: To equip the students to extract information from the data and to interpret the information and draw the conclusions

Module 1 - Probability and Random Variables (13 Hours)
Probability – Random variables - Binomial, Poisson, Geometric, Uniform, Normal, Exponential distributions – Moments – Moments generating functions and their properties – Functions of Random variables.

Module 2 - Estimation Theory (13 Hours)
Correlation, Regression - Partial and Multiple correlation – Partial and Multiple regression – Estimation of parameters using maximum likelihood estimator and method of moments.

Module 3 - Testing of Hypothesis (14 Hours)
Basic definitions of statistical hypothesis – Tests based on Normal, t, Chi-square and F distributions for mean, variance and proportion.

Module 4 - Design of Experiments and Multivariate Analysis (14 Hours)
Analysis of variance – One way and Two-way Classifications – Completely randomized design – Randomised block design – Latin square design – 2 x 2 factorial design.
An overview of multivariate methods, Types of multivariate techniques – factor analysis.

References:
1. Johnson, R.J., Miller & Freund's, "Probability and Statistical for Engineers", 6th Edition, Prentice – Hall of India, Private Ltd., New Delhi (2002).
2. Gupta, S.C. and Kapoor, V.K., "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, New Delhi (2001).
3. Jay L. Devore, "Probability and Statistics for Engineering and the Sciences", Thomson and Duxbury, Singapore (2002).
4. Dallas E Johnson et al., "Applied Multivariate Methods for Data Analysis", Thomson and Duxbury press, Singapore (1998).
5. Joseph F. Hair, Jr. et al. "Multivariate data analysis", Pearson Edn. 2007

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced to students at the beginning of the semester by the teacher.

Semester end examination: 100 marks

Question pattern:
Answer ANY 5 questions by choosing at least ONE question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

PMS 10102 ADVANCED MANUFACTURING SYSTEM

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits: 4**

Objectives: The students will be exposed to the fundamental concepts and philosophy of advanced manufacturing. The paper will provide an overview of the different aspects and components of an advanced manufacturing system. This will serve as a basis for the subjects in the later semesters.

Module 1 (13 hours)

Introduction - evolution of CAD/CAM and CIM - scope of CIM - segments of generic CIM - computers and workstations - an overview of CIM software - product development through CAD and CAE - geometric modelling techniques - automated drafting - graphic standards - engineering analysis -optimization - principles of concurrent engineering

Module 2 (14 hours)

Automated process planning - general methodology of group technology - code structures variant and generative process planning methods - AI in process planning - process planning software - CNC technology - principle of numerical control - types of CNC machines - features of CNC systems - programming techniques - capabilities of a typical NC CAM software - integration of CNC machines in CIM environment - DNC - flexible manufacturing systems

Module 3 (14 hours)

Robotics and automated assembly - types of robots and their performance capabilities - programming of robots - hardware of robots - kinematics of robots - product design for robotized manufacturing - selecting assembly machines - feeding and transfer of parts - applications of robots in manufacture and assembly – sensors- automated quality control CAQC, types of CMM, in-process and post process metrology, flexible inspection systems

Module 4 (13hours)

Data communications and technology management - technology issues - configuration management - database systems - management of technology
Green and Agile manufacturing – introduction – agility through group technology, concept of failure mode effect analysis - JIT,SMED,KANBAN,KAIZEN,FMEA,SCM

Reference Books

1. David Bedworth et al., *Computer Integrated Design and Manufacturing*, McGraw Hill Book Co.
2. Radhakrishnan P., *Computer Integrated Manufacturing*, Dept. of Production Engineering, PSG College of Technology
3. Eric Teicholz & Joel Orr, *Computer Integrated Manufacturing Handbook*, McGraw Hill Book Co.
4. Ranky P.G., *Computer Integrated Manufacturing*, Prentice Hall of India
5. Mikell.P.Groover, *Automation, Production systems and Computer Integrated Manufacturing*, Pearson Education
6. Gibson P, Green Halgh G, Kerr. R. Manufacturing management Chapman & Hall
7. Jack M Wacker, Hand book of Manufacturing engineering, Marcel Deeker Inc, USA 1992

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced to students at the beginning of the semester by the teacher.

Semester end examination: 100 marks

Question pattern:
Answer ANY 5 questions by choosing at least ONE question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

PMS 10103 ADVANCED OPERATIONS MANAGEMENT

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits: 4**

Objectives: Advanced operations management is intended to introduce the new domains of operations management.

MODULE 1 (13 Hours)
Manufacturing strategy – competitiveness, strategy and productivity – Strategy formulation process – strategic options – SWOT Analysis – world class manufacturing practices – Operations strategy in global economy

MODULE 2 (14 Hours)
System design – product and service design – process design issues – strategic capacity planning for products and services – facility location – factors affecting location – Layout – demerits of products and process layout – cellular manufacturing – flexible manufacturing and automated material handling systems

MODULE 3 (13 Hours)
Planning and control of operations – strategies for aggregate production planning – resources planning – materials requirements planning – MRP System – Capacity requirements planning – manufacturing resources planning (MRP II) – Enterprise resources planning

MODULE 4 (14 Hours)
Just in time and lean operations – Elements of JIT manufacturing – Lot size reduction – Kanban production information system - push and pull scheduling – JIT as a business philosophy - Elements of lean production-Introduction to agile manufacturing

References

1. William J Stevenson, Operations management, Tata McGraw Hill
2. S N chary, Production and Operations Management, Tata McGraw-Hill
3. B Mahadevan, Operations management, theory and practice, Pearson Education,
4. R Panneerselvam, Production and Operations Management, PHI Learning pvt Ltd
5. Norman Gaither, Greg Frazier, Operations management, South Western, CNGAGE Leaning

6. Lee Krajewsky etal., Operations Management, Processes and Value chains, Prentice Hall of India
7. Adam and Ebert, Production and Operations Management, Prentice Hall

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced to students at the beginning of the semester by the teacher.

Semester end examination: 100 marks
Question pattern:
Answer ANY 5 questions by choosing at least ONE question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

PMS 10104: TOTAL QUALITY MANAGEMENT

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits: 4**

Objectives: The survival of a manufacturing organisation depends exclusively on its ability to provide Quality products to its customers. In this context TQM plays a very important role and it provides a set of tools, techniques, principles and practices for managing quality. This course aims to provide a comprehensive knowledge in the area of TQM starting from the basic concepts to advanced concepts of TQM.

Module 1 - (13 Hours)
Basic Concept of TQM – TQM as a business strategy – Contributions of quality Gurus Deming, Juran, Crosby, Ishikawa and Feigaunbaum — Concepts of Leadership, Customer satisfaction, Employee involvement, continuous improvement and Supplier partnership.

Module 2 – (14 Hours)
Basic Tools and techniques – Quality Control Tools – Statistical process Control – Control Charts Process capability – Six Sigma Quality – DMAIC methodology – Management Tools

Module 3 – (14 Hours)
Performance measures – Quality costs – Direct costs and Indirect costs – Defectives and its significance – Traditional model and emerging model of Cost of quality - Quality Function deployment – Kaizen – Benchmarking – Taguchi's Quality Engineering

Module 4 – (13 Hours)
Quality standards and Business Excellence models – ISO 9001 Quality management systems – Elements, procedures and Quality audits – CII-Exim Bank Award Model – Rajeev Gandhi national quality Award Model – Malcolm Baldrige Criteria – Deming Prize- Software Quality management – Capability maturity model – Information Technology applications

References

1. Dale H Besterield, Total quality Management, Pearson Education
2. Kanishka Bedi, Quality Management, Oxford Higher education
3. The Essence of Total Quality Management – Bank ,J; Prentice Hall

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced to students at the beginning of the semester by the teacher.

Semester end examination: 100 marks

Question pattern:
Answer ANY 5 questions by choosing at least ONE question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

PMS 10105(A): INDUSTRIAL ROBOTICS AND EXPERT SYSTEMS

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits: 4**

Objectives: This paper will provide exposure about the robots and expert systems which are the two main components of an advanced manufacturing system. This exposure will help the student in selection, design and simulation of robots and expert systems.

Module 1. Introduction and Robot Kinematics (13 Hours)

Definition need and scope of Industrial robots – Robot anatomy – Work volume – Precision movement – End effectors – Sensors.
Robot Kinematics – Direct and inverse kinematics – Robot trajectories – Control of robot manipulators – Robot dynamics – Methods for orientation and location of objects.

Module 2. Robot sensor, drives and control (14 Hours)

Transducers and Sensors – Tactile sensor – Proximity and range sensors – Sensing joint forces – Robotic vision system – Image Representation - Image Grabbing –Image processing and analysis – Edge Enhancement – Contrast Stretching – Band Rationing - Image segmentation – Pattern recognition – Training of vision system.
Controlling the Robot motion – Position and velocity sensing devices – Design of drive systems – Hydraulic and Pneumatic drives – Linear and rotary actuators and control valves – Electro hydraulic servo valves, electric drives – Motors – Designing of end effectors – Vacuum, magnetic and air operated grippers.

Module 3. Robot Cell Design and Application (14 Hours)

Robot work cell design and control – Safety in Robotics – Robot cell layouts – Multiple Robots and machine interference – Robot cycle time analysis. Industrial application of robots.
Robot Programming, Artificial Intelligence and Expert Systems

Module 4. Methods of Robot Programming (13 Hours)

– Characteristics of task level languages lead through programming methods – Motion interpolation. Artificial intelligence – Basics – Goals of artificial intelligence – AI techniques – problem representation in AI – Problem reduction and solution techniques - Application of AI and KBES in Robots.

References

1. K.S.Fu, R.C. Gonzalez and C.S.G. Lee, "Robotics Control, Sensing, Vision and Intelligence", Mc Graw Hill, 1987.
2. Yoram Koren," Robotics for Engineers'", Mc Graw-Hill, 1987.
3. Kozyrey, Yu. "Industrial Robots", MIR Publishers Moscow, 1985.
4. Richard. D, Klafter, Thomas, A, Chmielewski, Michael Negin, "Robotics Engineering – An Integrated Approach", Prentice-Hall of India Pvt. Ltd., 1984.
5. Deb, S.R."Robotics Technology and Flexible Automation", Tata Mc Graw-Hill, 1994.
6. Mikell, P. Groover, Mitchell Weis, Roger, N. Nagel, Nicholas G. Odrey," Industrial Robotics Technology, Programming and Applications", Mc Graw-Hill, Int. 1986.
7. Timothy Jordanides et al,"Expert Systems and Robotics ", Springer –Verlag, New York, May 1991.

Web References

http://www.ifr.org/gallery/type.htm

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced to students at the beginning of the semester by the teacher.

Semester end examination: 100 marks

Question pattern:

Answer ANY 5 questions by choosing at least ONE question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

PMS 10105(B) INFORMATION TECHNOLOGY FOR GIS DATA MANAGEMENT (Common with CEH 10105(B))

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits: 4**

OBJECTIVES

To study the data base management systems and basic internet technologies for the effective introduction of Geographic Information Systems.

MODULE 1 (13 Hours)

Database Management Systems: Data - Information - Types - Database Models -Data encoding -Hardware and Software requirements -Database Management Systems - Types of

DBMS - Hierarchial, Network, Relational Models - E-R diagram - Modern DBMS - Distributed Databases - Client Server Databases -Knowledge Based Systems - Geographic Databases -GIS.

MODULE 2 (14 Hours)

File Organisation and Normalisation: File Organisation -Sequential, Indexed Sequential, Random, Multikey file Organisation - advantages and disadvantages - Relational Database Management System - Relational Algebra - Normalisation - case study for normalization using a Geographic data.

MODULE 3 (13 Hours)

Fundamentals of computer networks: Computer networks- network layers- data communication concepts- Land topology and transmission media – network security –OSI reference model

Network Security - Principles of Cryptography, Authentication, Integrity, Key Distribution and Certification

Access Control: Firewalls, Attacks and Countermeasures - Security in Many Layers: Case Studies.

MODULE 4 (14 Hours)

Web Technologies: Principles of Application Layer Protocols - The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, DNS-The Internet's Directory Service - Static Web page: Types and Issues, tiers, comparisons open source and proprietary technologies.

HTML- different tags, sections, image & pictures, listings, tables, frame, frameset, form. Dynamic WebPages: The need of dynamic web pages; an overview of DHTML, cascading style sheet (css), comparative studies of different technologies of dynamic page creation. Active Web Pages. Introduction to web2.0-characterisitcs and criticism.

References

1. Elmasri & Navathe, *Fundamentals of Database Systems*, Pearson Education, fourth
2. Keiser, G.E., Local area networks, Tata McGrawhill
3. C. J. Date, An Introduction to Database Systems, Addison Wesley, sixth edition, 1995
4. Kurose J.F. & Ross K.W, *Computer Networking: A Top -Down Approach Featuring the*
5. *Internet*, Pearson Education
6. Kenneth C. Laudon, Carol Guercio Traver, *E-Commerce-Business, Technology, Society*,
7. Pearson Education.
8. Bipin C. Desai, An Introduction to Database Systems, Galgotia Publications PVT LTD First edit 1993
9. Ramakrishnan R. & Gehrke J., *Database Management Systems*, McGraw Hill
10. O'neil P. & O'neil E., *Database Principles, Programming, and Performance*, Harcourt Asia, Morgan Kaufman
11. Silberschatz A., Korth H.F., & Sudarshan S., *Database System Concepts*, Tata McGraw Hill Ullman J.D., *Principles of Database Systems*, Galgotia Publications
12. Nalin K. Sharda, *Multimedia Information Networking*, Prentice Hall of India.

13. Douglas E. Comer, *Computer Networks and Internets with Internet Applications*, PearsonEducation
14. Stallings, *Computer Networking with Internet Protocols*, Pearson Education Asia.
15. Goncalves M., *Firewalls: A Complete Guide*, Tata McGraw Hill.
16. Kalakota R. & Whinston A.B., *Frontiers of Electronic Commerce*, Addison Wesley.
17. Schneider G.P. & Perry J.T., *Electronic Commerce, Course Technology*, McGraw Hill, NewDelhi, 2003.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced to students at the beginning of the semester by the teacher.

Semester end examination: 100 marks

Question pattern:

Answer ANY 5 questions by choosing at least ONE question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

PMS 10105(C) MANAGEMENT ACCOUNTING & FINANCIAL MANAGEMENT

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits: 4**

Objectives:

- ***To provide basic knowledge about the costs related to the various resources that have been deployed and the impact of the decisions on the performance of the enterprise***
- ***To give an exposure to various concepts of financial management and accounting***
- ***To understand financial management as a business language***

Module 1. Financial Accounting: (13 Hours)

Salient features of Balance sheet and Profit & Loss Statement, Cash Flow and Fund Flow Analysis, Working Capital management, Inventory valuation, Financial Ratio analysis – Depreciation.

Module 2. Cost Accounting (14 Hours)

Cost accounting systems: Job costing, Process costing, Allocation of overheads, Activity based costing, differential cost and incremental cost, Variance analysis.

Module 3. Budgeting (13 Hours)

Requirements for a sound budget, fixed budget-preparation of sales and production budget, flexible budgets, zero base budgeting and budgetary Control.

Module 4. Financial Management (14 Hours)

Investment decisions – Capital Investment process, types of investment proposals, investment appraisal techniques – pay back period method, Accounting rate of return, net present value method, internal rate of return and profitability index method.

Financial decisions: Cost of Capital – Capital structure – Dividend Policy – Leasing.

References:

1. Bhattacharya, S.K. and John Deardon, "Accounting for Management – Text and Cases", Vikas Publishing House, New Delhi, 1996.
2. Charles, T.Horn Green – "Introduction to Management Accounting", Prentice Hall, New Delhi, 1996.
3. James, C.Van Horne, "Fundamental of Financial Management", Pearson Education, 12th Edition, 2002.
4. Pandey, I.M., "Financial Management", Vikas Publishing House, New Delhi, 8th Edition, 2004.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced to students at the beginning of the semester by the teacher.

Semester end examination: 100 marks

Question pattern:

Answer ANY 5 questions by choosing at least ONE question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

PMS 10105(D) SAFETY ENGINEERING AND INDUSTRIAL HYGIENE

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits: 4**

Objectives

To impart an awareness about the importance of safety in industrial operations and to understand various techniques available for ensuring safety in industries

Module 1 (14 hours)

Importance of safety in industrial operations- House keeping, safety standards in industry, Protection devices, accident precautions -Safety information systems-Accident information and reporting-safety performance and reporting-safety education and training.

Module 2 (14 hours)

Hazards-physical-chemical-electrical-biological-ergonomic hazards-risk analysis-map method-tabular method-fault tree analysis-HAZOP analysis - OSHA standards of safety- Environmental management systems and ISO 14001

Module 3 (13 hours)

Fire protection systems-Fire chemistry-industrial fire protection system-water sprinkler-fire hydrant, alarm and detection system-explosion protection system-suppression system-carbondioxide system foam system-halon system-portable extinguisher

Module 4 (13 hours)
Safety in engineering industry-safety in metal working machinery-principles of machine guarding-Guarding during maintenance, Zero Mechanical State (ZMS), Definition, Policy for ZMS – guarding of hazards - point of operation protective devices, machine guarding, types, fixed guard, interlock guard, automatic guard, trip guard, electron eye, positional control guard, fixed guard fencing- guard construction- guard opening.

References:

1. Gupta R.S., Handbook of fire technology,Orient Longman
2. James D.,Fire Prevention Handbook, Butterworths,london 1996
3. N.V. Krishnan, Safety in industry, Jaico publishing house
4. Welding institute, U.K., Health and Safety in welding and Allied processes,high Tech. Publishing ltd.,London
5. John V.Grimaldi and Rollin H. Simonds,Safety management, All India Travellers Book, Seller,New Delhi

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced to students at the beginning of the semester by the teacher.

Semester end examination: 100 marks
Question pattern:
Answer ANY 5 questions by choosing at least ONE question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

PMS10 106(P): MANUFACTURING SYSTEMS MANAGEMENT LABORATORY

Teaching scheme: 2 hours practical per week **Credits: 2**

Objectives
Manufacturing organisations use a number of computer software tools for managerial decision making related to their operations management related issues. By undergoing this lab course it is aimed to acquire familiarisation with some advanced software tools used in manufacturing organisations.

Experiments

Familiarisation and application of the following softwares for solving manufacturing systems management related problems

1. Manufacturing Simulation software
2. Computer Aided Design/Computer Aided Manufacturing/ Computer Aided Engineering
3. Machine vision systems
4. Statistical Analysis Software
5. Manufacturing Automation
6. Quality Management

Internal Continuous Assessment (Maximum Marks-100)

Regularity	30%
Record	20%
Test/s, Viva-voce	50%

PMS10 107(P): SEMINAR I

Teaching scheme: 2 hours per week **Credits: 2**

Objective: To assess the debating capability of the student to present a technical topic. Also to impart training to a student to face audience and present ideas and thus creating self esteem, self confidence and courage that are essential for an engineer.

Individual students are required to choose a topic of their interest from Manufacturing Systems Management related topics preferably from outside the M.Tech syllabus or an extension of syllabus and give a seminar on that topic for about 30 minutes. The Seminar can also be a case study from a manufacturing organisation. A committee consisting of at least three faculty members shall assess the presentation of the seminar and award marks to the students. Each student shall submit two copies of a write up of his / her seminar topic. One copy shall be returned to the student after duly certifying it by the Chairman of the assessing committee and the other will be kept in the departmental library. Internal continuous assessment marks are awarded based on the relevance of the topic, presentation skill, quality of the report and participation.

Internal continuous assessment: 100 marks

Evaluation shall be based on the following pattern:

Report	=	50 marks
Concept/knowledge in the topic	=	20 marks
Presentation	=	30 marks
Total marks	=	100 marks

PMS 10201: MODELING AND ANALYSIS OF MANUFACTURING SYSTEMS

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits: 4**

Objectives: To acquaint the student with the various methods of modelling and analysis of manufacturing systems.

Module 1. Manufacturing Systems and Models (13 Hours)

Introduction to manufacturing models- types and principles of manufacturing system, manufacturing models - types and uses- physical models, mathematical models, model uses, model building

Module 2. Assembly Lines (14 Hours)

Introduction- line balancing algorithms- COMSOL Random sequence generation, Ranked positional weight heuristics, optimal solutions- practical issues - mixed models – sequencing- unpaced lines-

Shop scheduling with many products, Order release, flow shop sequencing – single and two machine flow shops- job shop scheduling- Dispatching rules and Schedule generation

Module 3. Flexible Manufacturing Systems (14 Hours)

Introduction - Components of FMS – Machines, Part movement system, work stations, system controller. Planning and control hierarchy- System design, system set up, scheduling and control.
Flexible assembly system.- Group technology – principles, coding schemes, assign machines to groups- production flow analysis, binary ordering algorithm. Assigning parts to machines
Introduction- types, principles of material handling – Equipment selection, conveyor analysis, closed loop conveyor- AGV systems – Design and operation of AGV, vehicle requirements analysis- pallet sizing and loading Use of Petrinets.

Module 4. Ware Housing – Storage and Retrieval Systems (13 Hours)

Introduction – ware house components – ware house design, stacking pattern, location in ware houses – dedicated storage, open storage, class base storage, storing complementary items- Order picking – forming pick list, pick sequencing

References:

1. Ronald G. Askin and Charles R. Standridge, "Modeling and analysis of manufacturing systems" John Wiley & Sons, Inc. 2000
2. Groover M.P., "Automation, Production Systems and Computer Integrated Manufacturing", Prentice-Hall of India Pvt. Ltd., New Delhi, 1996.
3. Jha, N.K., "Handbook of Flexible Manufacturing Systems", Academic Press Inc., 1991.
4. Kalpakjian, "Manufacturing Engineering and Technology", Addison-Wesley Publishing Co., 1995.
5. Taiichi Ohno, Toyota, "Production System Beyond Large-Scale production", Productivity Press (India) Pvt.Ltd., 1992.

Web Reference

http://www.engineeringtalk.com/news/lvd103.htm

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced to students at the beginning of the semester by the teacher.

Semester end examination: 100 marks

Question pattern:
Answer ANY 5 questions by choosing at least ONE question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

PMS 10202 ENTERPRISE RESOURCES PLANNING

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits: 4**

Objectives:
Modern organisations are having their operations in different countries and their customers are also spread across the world. ERP deals with the management of such organisations. ERP envisages a coordinated system spanning through all functions and operations of the organisations. This course provides a basic understanding of ERP, design and operation of ERP systems in the organisation.

Module 1 (14 hours)
Introduction to Enterprise Resource Planning (ERP) – History of ERP – Requirements generation to Material Requirement Planning (MRP) – Closing the MRP loop – Manufacturing Resources Planning (MRP II) – Just – In – Time to Lean manufacturing – ERP – Internet's impact on ERP – Supply chain management.

Module 2 (14 hours)
Systems and technology background – ERP systems background – ERP data input – ERP output capabilities – Reengineering – How does ERP create value – Why investigate ERP systems.

Module 3 (13 hours)
ERP Life Cycle – Deciding to go ERP – Choosing an ERP system – Designing ERP systems – Should prune processes or ERP software be changed – Choosing standard model – Artifacts and processes.

Module 4 (13 hours)
Implementing ERP systems – Big bang versus phased – After going live – training – ERP and electronic commerce – ERP Risks – Successes and failures.

References.

1. Garg, V. K., and Venkitakrishnan, N.K., Enterprise Resource Planning: Concepts and Practice, Prentice – Hall of India Private Limited, New Delhi, 1998.
2. O'Leary, D.E., Enterprise Resources Planning Systems: System, Life cycle, Electronic Commerce and Risk, John Wiley & Sons, 2001.
3. Ptak, C.A., and Eli, S., ERP Tools, Techniques and Applications for Integrating the Supply Chain, St. Lucie Press/ APICS Series on Resource Management, 2000.
4. Wallace, T.F., and Kremzar, M.H., ERP: Making it Happen: The Implementer's Guide to Success with Enterprise Resource Planning, John Wiley & Sons, 2001.

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced to students at the beginning of the semester by the teacher.

Semester end examination: 100 marks
Question pattern:
Answer ANY 5 questions by choosing at least ONE question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

PMS 10203: INTEGRATED PRODUCT DEVELOPMENT

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits: 4**

Objectives:

To build an awareness on modern product development process. To acquaint the student with the application of IT and computer technology for integrating various domains.

MODULE 1
PRODUCT DEVELOPMENT PROCESS AND ORGANIZATION (14 Hours)
Introduction - Product Development in the changing global world- stages of product development – early design, detailed design, prototyping, manufacturing, servicing, discard /recycle
Product development organization – Concurrent engineering - Definition – CE Design Methodologies – CE organization – collaborative product development - co-design - Requirement definition- product requirement and definition

MODULE 2
INTEGRATION OF PRODUCT DEVELOPMENT PHASES (14 Hours)
CAD/CAM data exchange – data exchange standards, IGES, STEP ISO - Product data management – Concept – function – 3 tire architecture- product structure – product process – configuration management – Engineering change management, Document management.
Product lifecycle – definition - Types of integration- file transfer, middle ware, and database

MODULE 3
TOOLS FOR INTEGRATION (13 Hours)
IT enabled product development, Web based PDM architecture, CAD – PDM integration, Integration approaches - feature based integration, Meta data based integration. Internet Standards HTML,XML. Visualisation of CAD data, VRML
Information system development – Object oriented approach, UML class diagram, usecase diagram, component diagram

MODULE 4
DIGITAL MANUFACTURING (13 Hours)
Definitions – Functions in Digital manufacturing- Manufacturing simulation and validation – Producibility strategy for design for manufacture, Reliability, Testability for design for test and inspection

References

1. Product Development and design for manufacturing John W. Priest and Jose M. Sanchez – Marcel Dekker Inc.
2. Product Design and Development, by Karl T. Ulrich and Steven D. Eppinger, 3rd Edition, McGRAW-Hill, 2003.
3. PDM: Product Data Management, by Rodger J. Burden.
4. Andrew Kusaik, "Concurrent Engineering: Automation Tools and Technology", Wiley, JOhn and Sons Inc., 1992.
5. CAD/CAM Theory and Practice Ibrahim Zeid, McGraw-Hill Science/Engineering/Math; 1 edition (1991)

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced to students at the beginning of the semester by the teacher.

Semester end examination: 100 marks

Question pattern:

Answer ANY 5 questions by choosing at least ONE question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

PMS 10204(A): DESIGN AND ANALYSIS OF EXPERIMENTS

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits: 4**

Objectives: Design of experiments plays a vital role in manufacturing organisations for arriving at optimal combinations of operational parameters. This course covers fundamental aspects pertaining to design of experiments

Module 1 - Introduction, Factorial Experiments (13 Hours)

Planning of experiments, terminology, ANOVA rationale, basics of quality by design, loss function. Single factor and multi factor experiments, tests on means, EMS rules. 2K and 3K designs, Yate's algorithm.

Module 2 - Special Experimental Designs (13 Hours)

Latin square design, confounding, fractional factorial design, nested designs.

Module 3 - Orthogonal Experiments (14 Hours)

Comparison of classical and Taguchi's approach, Selection and application of orthogonal arrays for design, Conduct of experiments, collection and analysis of simple experiments, Modifying orthogonal arrays, multi response data analysis.

Module 4 - Robust Design (14 Hours)

Variability due to noise factors, classification of quality characteristics and parameters, objective functions, parameter design, optimization using S/N ratios, attribute data analysis.

REFERENCES:

1. Phillip J.Rose, "Taguchi techniques for quality engineering", McGraw Hill, 1996.
2. D.C. Montgomery, "Design and Analysis of experiments", John Wiley and Sons, 2003.
3. Nicolo Belavendram, "Quality by Design: Taguchi techniques for industrial experimentation", Prentice Hall, 1995.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced to students at the beginning of the semester by the teacher.

Semester end examination: 100 marks

Question pattern:

Answer ANY 5 questions by choosing at least ONE question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

PMS 10204 (B) MANAGEMENT INFORMATION SYSTEMS (COMMON WITH MPE 10204(B), MIT 10204(B))

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits:** 4

Objectives:- *To provide knowledge on different types of Information systems and their applications in industry.*

Module – 1 (13 Hours)

The Concept of MIS - Role of MIS - Characteristic of MIS - Functional Subsystems - Activities Subsystems Pre-requisites of MIS-Contemporarily Approaches to MIS-Technical Approach, Behavioral Approach,-Socio-technical Approach, Technical Approach-Information as Strategic Resource-Use of Information for Complete Advantage.

Module – 2 (14 Hours)

Evolution of Computers-Computer Hardware-Generation of Computers-Complete Categories - Software - System Software, Application Software-Data Communication - Data Processing-Transaction Processing-Data Processing Modes-Data Transmission-Functions of Telecommunication-Communication-Transmission Channel- Characteristic of Communication Channel- Network - Topologies, Types of Networks, OSI, TCP/IP-Internet -Internal, External, ISDN - Multimedia-IT Enabled Services - SPO, Call Centers, MT, GIS-Information.

Module – 3 (14 Hours)

Management-Decision Making - Decision Types, Decision Making Process,-Decision Making Tools, Principle of Rationality, Principle of Logic & Interaction-Decision Making Models - Classical Model, Administrative-Model, Herbert, Simon Model-Information - Sources of Information, Types of Information, Information requirements, Techniques for Assessing-Information Requirements - Systems Analysis and Design-System- Types, Characteristics-Control- Control Process, Requirements of Good Control-System, Control System-Law of Requisite Variety-Systems Development-System Analysis, System Design, System Implementation, System Development Process-System Development Life Cycle-Rapid System Development Tools - Prototyping, CASE Tools, Object Oriented Systems 4 Decision Support System-The Decision Support System - Components, Characteristics, Structure -Group Decision Support System-Configuration, Features-Executive Information System / Executive Support System-Definition, Characteristic, Capabilities, Benefits-Expert System-Artificial intelligence Database Management System-DBMS Components-Database Model.

Module – 4 (13 Hours)

Data Warehousing & Data Mining-Data Warehousing Definition, Structure / Architecture-Data Mining - Information Security and Control-Information System Security Threats-External & Internal Threats Information System and Quality-Quality Assurance-Software Quality Assurance-Management Role in Software Quality Assurance -Quality Assurance Methods - Quality Profile Model, Construction Quality Model, Tick IT, Initiative-Functional applications of MIS -Stores & Purchase Management-Accounts Payable System-Inventory Management-Production Management System -Marketing Service System-Applications in Service Sector-MIS Application in Service Industry-Airlines, Hospital, Banking.

References:

1. Jerome Kanter – Managing with Information
2. Gordon B. Davis and Alson – Management Information Systems
3. Robert C Murdick Joel E Ross and James R Clagget – Information Systems for Modern management
4. Henry c Lucas Jr. – The Analysis Design and Implementation of Management Information Systems.
5. Kickson and Wheterbe – Management Information Systems.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced to students at the beginning of the semester by the teacher.

Semester end examination: 100 marks

Question pattern:

Answer *ANY* 5 questions by choosing at least *ONE* question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

PMS 10204 (C) RELIABILITY ENGINEERING

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits: 4**

Objectives:

- ***To provide a basic knowledge in the concept of reliability engineering***
- ***To give an exposure to the various techniques for reliability assessment and specification which are essential for product management***

Module 1 - Concepts of Reliability (13 Hours)

Definition of reliability - definition of failure - classification of failures - measures of reliability - failure rate, Mean Time Between Failures (MTBF), Mean Time to Failure (MTTF) - derivation of the reliability function – reliability specifications.

Module 2 - Failure Patterns and Fitting Curves (14 Hours)
The bath tub curve - early failure period, constant failure period, the wear out failure period -the Weibull distribution - the Weibull distribution to describe the bath tub curve - estimation of Weibull parameters, Weibull probability plot.

Module 3 - Cost, Performance and other related factors: (13 Hours)
Factors related to reliability - availability - utilization factor - system effectiveness - reliability and maintenance costs - factors affecting reliability and maintenance costs - eight basic stages in the achievement of reliability

Module 4 - Design and Manufacture for Reliability (14 Hours)
Customer or market specifications for reliability - the reliability of parts and components- basic rules, parts in series - design for system reliability - blocks or units in series, dealing with variations in parts, the use of value analysis redundancy, types, application.

References:
1. Rowland Caplan, "A Practical Approach to Reliability", 1982
2. Govil A,K., "Reliability Engineering", 1989. /
3. Carter A.D,S, "Mechanical Reliability", 1989.

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced to students at the beginning of the semester by the teacher.

Semester end examination: 100 marks
Question pattern:
Answer ANY 5 questions by choosing at least ONE question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

PMS 10204 (D) MARKOV MODELLING ANG QUEUING THEORY (Common with ECS 10204(D))

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits: 4**

Objectives: This course is a thorough treatment of Markov Chain and Markov Models of the systems. It also deals with essential queuing theory and application of Markov models in the analysis of queuing networks.

Module 1 (14 Hours)
Stochastic Processes: Renewal Processes - Reward and Cost Models, Poisson Process; Point Processes; Regenerative Processes; Renewal Theorems.

Module 2 (14 Hours)
Markov Models: Discrete Time Markov Chain - Transition Probabilities, Communication Classes, Irreducible Chains; Continuous Time Markov Chain - Pure-Jump Continuous-Time Chains, Regular Chains, Birth and Death Process, Semi-Markov Processes.

Module 3 (13 Hours)
Single Class & Multi-class Queuing Networks: Simple Markovian queues; M/G/1 queue; G/G/1 queue; Open queuing networks; Closed queuing networks; Mean value analysis; Multi-class traffic model; Service time distributions; BCMP networks; Priority systems.

Module 4 (13 Hours)
Time Delays and Blocking in Queuing Networks: Time delays in single server queue; Time delays in networks of queues; Types of Blocking; Two finite queues in a closed network; Aggregating Markovian states.

References:

1. Ronald W. Wolff, Stochastic Modeling and The Theory of Queues, Prentice-Hall International.
2. Peter G. Harrison and Naresh M. Patel, Performance Modeling of Communication Networks and Computer Architectures, Addison-Wesley.
3. Gary N. Higginbottom, Performance Evaluation of Communication Networks, Artech House.
4. Anurag Kumar, D. Manjunath, and Joy Kuri, Communication Networking: An Analytical Approach, Morgan Kaufman Publ.
5. D. Bertsekas and R. Gallager, Data Networks, Prentice Hall of India.
6. Ross, K.W., Multiservice Loss Models for Broadband Telecommunication Networks, Springer-Verlag.
7. Walrand, J., An Introduction to Queueing Networks, Prentice Hall.
8. Cinlar, E., Introduction to Stochastic processes, Prentice Hall.
9. Karlin, S. and Taylor, H., A First course in Stochastic Processes, 2nd edition Academic press.

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced to students at the beginning of the semester by the teacher.

Semester end examination: 100 marks
Question pattern:
Answer ANY 5 questions by choosing at least ONE question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

PMS 10205 (A) INDUSTRIAL MARKETING AND MARKETING RESEARCH

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits: 4**

Objectives: Marketing is the link between society's material requirements and its economic patterns of response. This subject imparts a market oriented thinking which is a necessity in today's competitive world. It gives an exposure to various aspects o marketing management viz. environment, consumer behaviour, product management, pricing, promotion and placing decisions.

Module 1 - Understanding Marketing Management (12 Hours)
Core concept - marketing concept - selling concept and marketing process – marketing mix, analyzing market opportunities, designing marketing strategies, planning marketing programmes, organizing, implementing and controlling the marketing effort, marketing planning, current marketing situation, opportunity and issue analysis, action programmes, profit and loss statement.

Module 2 - Researching and Selecting Target Markets (12 Hours)
Concepts in demand measurement, estimating future demand, market segmentation, general approach to segmenting a market, patterns of market segmentation, market segmentation procedures, base for segmenting customer markets and industrial markets, market targeting - evaluating the market segments, selecting the market segments.

Module 3 - Product Design and Pricing Strategies (15 Hours)
New product development, effective organizational arrangements. Idea generation, idea screening, concept development and testing, product development, market testing, commercialisation. consumer adoption process, product life cycle - introductory stage, growth stage, maturity stage and decline stage.
Managing product lines, brands and packaging, product mix decisions, product line decisions. brand decisions, packaging and labelling decisions, managing service businesses and ancillary services - classification of services, marketing strategies for service firms, managing product support services, pricing strategies and programs - setting the price. Adapting the price, initiating and responding to price changes.

Module 4 - Market Placing and Promotion Strategies (15 Hours)
Nature of marketing channels, channel design decision, channel management decisions, channel dynamics, channel co-operation, conflict and competition retailing, wholesaling and distribution systems, nature and importance of retailing. Types of retailers, wholesaling, physical distribution.
The communication process, steps in developing effective communication, measuring promotion results, managing the sales force, designing the sales force, principles of personal selling.

References:

1. Philip Kotler., "Marketing Management Analysis, Planning, Implementation and Control", Prentice Hall of India Pvt. Ltd., 7th edition, New Delhi, 1992.
2. Rajan Saxena, “Marketing Management”, Tata McGraw Hill Publication Co.
3. Ramanuj Majumdar. "Marketing Research", Wiley Eastern Ltd, 1991.
4. Stanton & William., "Fundamentals of Marketing", McGraw Hill, Tokyo, 1995.
5. Boyd & Kapoor., "Readings in Marketing Management", McGraw Hill Book Co. Ltd., 1989. .
6. EkzelM. J. &WalkarB. J. "Marketing", McGraw Hill, 1997. I'

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced to students at the beginning of the semester by the teacher.

Semester end examination: 100 marks
Question pattern:
Answer ANY 5 questions by choosing at least ONE question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

PMS 10205 (B): ERGONOMICS OF MANUFACTURING

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits: 4**

Objectives:

- *To study the relation between man and his environment, occupation, equipment*
- *To apply anatomical, physiological, psychological knowledge to solve the problems arising between man and machine interface.*
- *To manage the products for optimizing their performance*

Module 1 (13 Hours)

Introduction and Human performance - Interdisciplinary nature of ergonomics, modern ergonomics. Information input and processing, factors affecting human performance, physical work load and energy expenditure, heat stress, manual lifting.

Module 2 (14 Hours)

Work Space Design - Anthropometry, Workspace designs for standing and seated workers, arrangement of components within a physical space, interpersonal aspect of workplace design.

Module 3 (14 Hours)

Design of Equipments - Ergonomic factors to be considered, design of displays and controls, design for maintainability.

Module 4 (13 Hours)

Design of Environment - Illumination – climate – Noise – motion.

References

1. Martin Helander, “A guide to Ergonomics of Manufacturing”, TMH, 1996.
2. Bridger, R.S., “Introduction to Ergonomics”, McGraw Hill, 1995.
3. McCormick, J., “Human Factors in Engineering and Design”, McGraw Hill, 1992.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced to students at the beginning of the semester by the teacher.

Semester end examination: 100 marks

Question pattern:
Answer ANY 5 questions by choosing at least ONE question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

PMS 10205 (C) STRATEGIC MANAGEMENT

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits: 4**

Objectives: The success of a manufacturing organisation depends on its ability to identify and analyse it's, organisational strengths and weakness, together with environmental opportunities and threats, and formulate and implement suitable strategies. This course on strategic management aims to provide concepts related to corporate strategy, analysis of organisation and its environment, formulation of suitable strategies and its implementation along with certain strategic enablers.

Module 1 (13 Hours)
Basic Concepts of corporate strategy – Mission – Vision – Objectives – goals - The Seven S Framework – Corporate governance – Board of Directors – Top management -CEO – Corporate Social Responsibility – Social Audit - philanthropy

Module 2 (14 Hours)
SWOT - External Environmental Analysis – Environmental scanning – competition analysis – Generic Strategies – impact of opportunities and threats – Internal Corporate analysis – various Formats to analyse strengths and weaknesses

Module 3 (13 Hours)
Strategy formulation – Strategic factors analysis – Strategic alliances – Diversification – Expansion – Integration – Portfolio analysis – functional strategy – Strategy implementation – mergers and acquisitions – TQM – MBO – Evaluation and control – strategy audit

Module 4 (14 Hours)
Strategic Enablers – R&D Strategy and development – Innovation and creativity – developing innovation and creativity - IT and strategy – IT Strategy components – Knowledge management – Strategies for KM and E-Commerce – Technology management

References:

1. R Srinivasan , Strategic Management – The Indian Context, Third Edition – Prentice Hall of India Private limited
2. Fred R David, 2007, Strategic Management, Concepts and Cases, Prentice Hall, Eleventh Edition
3. Michael A Hitt, R Duane Ireland, Robert E. Hoskisson, 2001, Strategic Management – Competitiveness and Globalization, South Western, Thomson Learning, Ch. 5487
4. Paul Joyce, Adrian Woods, Strategic Management – A Fresh approach to developing skills, Knowledge and creativity, Kogan page Limited, UK
5. David, Strategic Management, Pearson Education

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced to students at the beginning of the semester by the teacher.

Semester end examination: 100 marks

Question pattern:
Answer ANY 5 questions by choosing at least ONE question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

PMS 10205 (D) REVERSE ENGINEERING

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits: 4**

Objectives: This paper will provide the conceptual framework and methodologies used in re-engineering. The students will understand the necessity of translating the free-form design into necessary relevant engineering design details.

Module 1 - (14 Hours)
History of Reverse Engineering – Scope and tasks of RE - Preserving and preparation for the four stage process – Evaluation and Verification- Technical Data Generation, Data Verification, Project Implementation

Module 2 - (13 Hours)
Domain analysis- process of duplicating - Tools -for RE Functionality- dimensional- developing technical data - digitizing techniques - construction of surface model - solid-part material-characteristics evaluation -software and application- prototyping - verification

Module 3 - (14 Hours)
Data reverse engineering – Three data reverse engineering strategies – Definition – organization data issues - Software application – Finding reusable software components – Recycling real-time embedded software – Design experiments to evaluate a reverse engineering tool – Rule based detection for reverse engineering user interfaces – Reverse engineering of assembly programs: A model based approach and its logical basics

Module 4 - (14 Hours)
Cognitive approach to program understated – Integrating formal and structured methods in reverse engineering – Integrating reverse engineering, reuse and specification tool environments to reverse engineering -–coordinate measurement – feature capturing – surface and solid members

Reference:

1. T J Biggerstaff, IEEE Corpn., “Design Recovery for Maintenance and Reuse”, July 1991
2. White paper on RE, S. Rugaban, “Technical Report”, Georgia Instt. of Technology, 1994
3. www.cs.usask.ca/homepages.grads/moa135/856/RE/RE.html
4. Katheryn, A. Ingle, “Reverse Engineering”, McGraw-Hill, 1994
5. Aiken Peter, “Data Reverse Engineering”, McGraw-Hill, 1996
6. Linda Wills, “Reverse Engineering”, Kluiver Academic Publishers, 1996
7. Donald R. Honsa, ISBN 1555897, “Co-ordinate Measurement and reverse engineering”, American Gear Manufacturers Association

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced to students at the beginning of the semester by the teacher.

Semester end examination: 100 marks

Question pattern:

Answer ANY 5 questions by choosing at least ONE question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

PMS 10 206 (P): SEMINAR II

Teaching scheme: 2 hours per week **Credits: 2**

Objective: To assess the debating capability of the student to present a technical topic. Also to impart training to a student to face audience and present ideas and thus creating self esteem, self confidence and courage that are essential for an engineer.

Individual students are required to choose a topic of their interest from Manufacturing Systems Management related topics preferably from outside the M.Tech syllabus or an extension of syllabus and give a seminar on that topic for about 30 minutes. The Seminar can also be a case study from a manufacturing organisation. A committee consisting of at least three faculty members shall assess the presentation of the seminar and award marks to the students. Each student shall submit two copies of a write up of his / her seminar topic. One copy shall be returned to the student after duly certifying it by the Chairman of the assessing committee and the other will be kept in the departmental library. Internal continuous assessment marks are awarded based on the relevance of the topic, presentation skill, quality of the report and participation.

Internal continuous assessment: 100 marks

Evaluation shall be based on the following pattern:

Report	=	50 marks
Concept/knowledge in the topic	=	20 marks
Presentation	=	30 marks
Total marks	=	100 marks

PMS 10207 (P) MINI PROJECT

Teaching scheme: 2 hours per week **Credits: 2**

Objectives:
To train students in identification, analysis, finding solutions and execution of live engineering and managerial problems. It is also aimed to enhance the capabilities of the students for group activities.

Individual students are required to choose a topic of their interest. The subject content of the mini project shall be from emerging / thrust areas, topics of current relevance having research aspects or shall be based on industrial visits. Students can also choose live problems from manufacturing organisations as their mini project. At the end of the semester, the students should submit a report duly authenticated by the respective guide, to the head of the department.

Mini Project will have internal marks 50 and Semester-end examination marks 50. Internal marks will be awarded by respective guides as per the stipulations given below.

Attendance, regularity of student (20 marks)
Individual evaluation through viva voce / test (30 marks)
Total (50 marks)

Semester end examination will be conducted by a committee consisting of three faculty members. The students are required to bring the report completed in all respects duly authenticated by the respective guide and head of the department, before the committee. Students individually will present their work before the committee. The committee will evaluate the students individually and marks shall be awarded as follows.

Report	= 25 marks
Concept/knowledge in the topic	= 15 marks
Presentation	= 10 marks
Total marks	= 50 marks

PMS10301(A) RESEARCH METHODOLOGY
(Common CEH 10301(A), CEE 10301(A), EPE 10 301(A), EPS 10301(A) and MIT 10301(C))

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits: 4**

Objective: To impart knowledge about various methodologies followed in engineering research, formulation of research problems and to apply the same in project work. To make students aware of the problems faced by Indian researchers.

MODULE 1 (13HOURS)

Research Concepts – concepts – meaning – objectives – motivation. Types of research – descriptive research – conceptual research – theoretical research – applied research – experimental research. Research process – Criteria for good research – Problems encountered by Indian researchers.

MODULE 2 (13HOURS)

Formulation of Research Task – Literature Review – Importance & Methods – Sources – Quantification of Cause Effect Relations – Discussions – Field Study – Critical Analysis of Generated Facts – Hypothetical proposals for future development and testing, selection of Research task

MODULE 3 (14HOURS)

Mathematical modelling and simulation – Concepts of modelling – Classification of mathematical models – Modelling with – Ordinary differential equations – Difference equations – Partial differential equations – Graphs – Simulation – Process of formulation of model based on simulation.

MODULE 4 (14HOURS)

Interpretation and report writing – Techniques of interpretation – Precautions in interpretation – Significance of report writing – Different steps in report writing – Layout of research report – Mechanics of writing research report – Layout and format – Style of writing – Typing – References – Tables – Figures – Conclusion – Appendices.

REFERENCES

1. J.W Bames, Statistical Analysis for Engineers and Scientists, McGraw Hill, N.York
2. Schank Fr., Theories of Engineering Experiments, Tata Mc Graw Hill Publication.

3. C. R. Kothari, Research Methodology, New Age Publishers.
4. Willktnsion K. L, Bhandarkar P. L, Formulation of Hypothesis, Himalaya Publication.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to students' right at the beginning of the semester by the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

PMS 10301 (B) SUPPLY CHAIN MANAGEMENT SYSTEMS

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits: 4**

Objectives: ***In today's business scenario, fulfilment of customers' requirements is possible only through the coordination and involvement of the suppliers of the organisation. Proper design of the supply chain is of paramount importance in order to achieve this. This course provides the basic knowledge of the key issues of the supply chains, its design and operation.***

Module 1 (13 hours)

Supply chain management – global optimization – managing uncertainty – key issues. Logistics network configuration - data collection – model an data validation – solution techniques – key features of a network configuration DSS.

Module 2 (14 Hours)

Inventory management and risk pooling – single warehouse – risk pooling – centralized and decentralized systems – managing inventory in supply chains – practical issues. Value of information – bullwhip effect – effective forecasts – information for coordination systems – locating products – lead time reduction – information and supply chain trade offs.

Module 3 (13 Hours)

Supply chain integration – push, pull and push-pull systems – demand driven strategies – impact of the internet on supply chain strategies – distribution strategies – centralized versus decentralized control – central versus local facilities. Strategic alliances – framework for strategic alliance – third party logistics – retailer supplier partnerships – procurement and outsourcing strategies – benefits and risks – e-procurement – frameworks

Module 4 (14 hours)

Coordinated product and supply chain design – design for logistics – supplier integration into new product development – mass customization. IT for supply chain management – goals of supply chain information technology, standardization, information technology infrastructure – supply chain management system components – integrating supply chain information technology – Decision support systems for SCM – challenges – structure of DSS – supply chain DSS- selecting a supply chain DSS.

References:

1. Simchi-Levi, D., Kaminsky, P. and Simchi-Levi, E, 'Designing and managing the supply chain – concepts, strategies and case studies', 2nd Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2004

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced to students at the beginning of the semester by the teacher.

Semester end examination: 100 marks

Question pattern:

Answer ANY 5 questions by choosing at least ONE question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

PMS 10301(C) COMPUTER NETWORKING
(Common with EPE 10301(C))

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits: 4**

Objective: To impart knowledge about techniques and terminologies regarding computer networking so that power engineering students can apply them in applications like distributed computing, parallel computing, SCADA, WAPS, WAM etc

MODULE 1(13HOURS)

General: Structure of networks and the internet, circuit, packet and message switching, routing, physical media, types of delay, internet protocol stack, internet backbone, NAPs (Network Access Points) and ISPs

Application Layer: Structure of networking applications, Web and Web caching, FTP (File Transfer Protocol), Electronic mail, DNS (Domain Name Service), socket programming

MODULE 2(13HOURS)

Transport layer: Transport layer principles, multiplexing and demultiplexing, UDP (User Datagram Protocol), principles of reliable data transport, TCP (Transmission Control Protocol), flow control, principles of congestion control, TCP congestion control

MODULE 3(14 HOURS)

Network Layer: Network layer services, datagram and virtual circuits, routing principles, link state routing algorithms, distance vector routing algorithms, hierarchical routing, Internet Protocol (IP), IP addressing, IP transport, fragmentation and assembly, ICMP (Internet Control Message Protocol), routing on the internet, RIP (Routing Information Protocol), OSPF (Open Shortest Path First), router internals, IPv6

MODULE 4(14 HOURS)

Link Layer: Link layer services, error detection and correction, multiple access protocols, LAN addressing and ARP (Address Resolution Protocol), Ethernet, CSMA/CD multiple access protocol, Hubs, Bridges, and Switches, Wireless LANs, PPP (Point to Point Protocol), Wide area protocols

Selected topics from multimedia networking, network security and real-life networks.

REFERENCES

1. Computer Networking, A top down approach. James F. Kurose and Keith W. Ross, Addison Wesley, 2003.

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be a minimum of two tests per subject. The assessment details are to be announced to students' right at the beginning of the semester by the teacher.

End semester Examination: 100 marks

Question pattern
Answer any 5 questions by choosing at least one question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

PMS 10301 (D) ADVANCED OPTIMIZATION TECHNIQUES

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits: 4**

Objectives: Decision making in manufacturing involves application of a variety of quantitative techniques. This course attempts to give an exposure to some of the techniques.

Module 1 Nonlinear Optimization (13 Hours)
Introduction - one-dimensional optimization – Elimination methods - unrestricted search, exhaustive scare Fibonacci and Golden section methods - interpolation methods: quadratic and cubic interpolations, direct root methods.

Module 2 Unconstrained Nonlinear Optimization (14 Hours)
Direct search methods – Random search methods - Pattern search methods - Method of rotating coordinates - Descent methods - steepest descent, conjugate gradient, Quasi-Newton, and variable metric methods.

Module 3 Constrained Nonlinear Optimization (13 Hours)
Direct methods - the complex method, cutting plane method, methods of feasible directions - Indirect methods – transformation techniques, interior and exterior penalty function methods.

Module 4 Dynamic Programming and non traditional Optimisaton (14 Hours)
Bellman's principle of optimality, examples on the application on routing problem, inventory problem, simplex problem, marketing problem.
Introduction to Genetic Algorithms, Simulated Annealing, Tabu Search, and Neural Networks.

References:

1 Singiresu S. Rao, "Engineering Optimization: Theory and Practice", Wiley-Interscience, 3rd Edition, 1996.
2. Kalyanmoy Deb, " Optimization for engineering design", Printice-Hall India (Pvt) Ltd., New Delhi, 2000.
3. David E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Addison-Wesley Co., 1989
4. Dimitri P. Bertsekas, "Dynamic Programming: Deterministic and Stochastic Models ", Prentice Hall, 1987.
5. Harvey M.Salkin, "Integer Programing", Addison-Wesley Pub. Co., 1975,
6. Stephen C. Nash and Ariela Sofer, "Linear and Nonlinear Programming", McGraw Hill College Div., 1995.
7. Fred Glover, Manuel Laguna, and Fred Laguna, "Tabu Search", Kluwer Academic Publishers, 1997.
8. Cihan H.Dagli, "Artificial Neural Networks for Intelligent Manufacturing", Chapman & Hall, London 1994.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced to students at the beginning of the semester by the teacher.

Semester end examination: 100 marks
Question pattern:
Answer ANY 5 questions by choosing at least ONE question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

PMS10302(A) INDUSTRIAL ENERGY MANAGEMENT (COMMON WITH MPE 10302 (A))

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits:** 4

Objectives : To understand the concept of energy engineering, electrical system optimization, energy conservation, energy economics and environmental aspects of energy utilization.

Module 1(14 hrs)
Energy Engineering- World energy outlook. Application of Non Conventional and Renewable Energy Systems - Use of Energy Efficient Technologies -Solar energy –solar energy collectors and energy storage-applications of solar energy. Wind energy-basic components of a wind energy conversion

system-performance of wind machines-applications of wind energy. Energy from biomass – biomass conversion technologies-types of biogas plants-Energy conservation schemes-case studies.

Module 2 (14 hrs)
Electrical system optimization-Importance of power factor-Power factor correction-Energy efficient motors –lighting basics-energy efficient light sources-domestic, commercial or industrial lighting. Energy conservation in lighting schemes-case studies.
Energy conservation in HVAC system, energy conservation by cogeneration scheme-boiler efficiency improvement-waste heat recovery –case studies

Module 3 (13 hrs)
Energy economics-payback analysis-energy auditing and accounting-types-energy use profiles-the energy survey-Sankey diagram for energy audit- Energy Audit Instruments- Thermal Energy Efficiency & Audits - Electrical Energy Efficiency - Audits -case studies
Energy management- Maintenance management-Preventive maintenance schedule-Energy management organization.

Module 4 (13 hrs)
Energy and Environment. Environmental aspects of energy utilization-public health issues related to environmental pollution. Methods to measure pollution in industries-air pollution & water pollution. Compliance with standards-International Environmental Policy. Energy recovery by solid waste management. Environmental auditing-case studies.

References:

2. A.P.E.Thumann, *Fundamentals of Energy*, Engineering,Prentice Hall,1984.
3. A.P.E.Thumann, *Plant Engineers and Managers Guide to Energy Conservation*, 7e,UNR,1977.
4. W.F.Kenney, *Energy Conservation in the Process Industries*, Academic press,1984
5. M.H.Chiyogioji, *Industrial Energy Conservation*, Marcel Dekker,1979
6. C.B. Smith, *Energy Management Principles*, Pergamon Press, New York, 1981.
7. Amit Tyagi, *Handbook on Energy Audit and Management*, TERI, New Delhi, 2000
8. *Environmental Considerations in Energy Development*, Asian Development Bank (ADB) publication,Manila, 1991

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced to students at the beginning of the semester by the teacher.

Semester end examination: 100 marks

Question pattern:

Answer *ANY* 5 questions by choosing at least *ONE* question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

PMS 10302 (B) SOFT COMPUTING TECHNIQUES
(COMMON WITH EPE 10 302(B), CEH 10302 (B), MIT 10302 (B))

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits: 4**

Objective*: *To acquaint the students with soft computing methodologies such as neural networks, fuzzy logic, genetic algorithms and hybrid algorithms and enable the students to implement real time intelligent and adaptive systems.

MODULE 1(13Hours)

Introduction to Fuzzy logic: Fuzzy sets- Fuzzy set operations- Fuzzy relations-Cardinality of Fuzzy relations-Operations on Fuzzy relations-Properties of Fuzzy relations-Membership Functions-Features of Membership functions- Fuzzification-Methods of Membership value Assignments- Fuzzy Rule Base-Defuzzification-Deffuzzification methods- Fuzzy logic controller(Block Diagram)

MODULE 2(14Hours)

Artificial Neural Networks: Basic concepts-Neural network Architectures-Single layer feed forward network-Multilayer feed forward network-Recurrent Networks-Characteristics of Neural Networks-Learning methods. Perceptron networks-Back Propagation networks-Radial base function network-Hopfield network- Kohonen Self organizing maps-ART

MODULE 3(13Hours)

Fundamentals of genetic algorithms: Basic concepts- working principle – encoding – different methods – fitness function – reproduction-different methods. Genetic modelling-inheritance-Crossover mutation-convergence of genetic algorithm.

MODULE 4(14Hours)

Hybrid systems: Neural network, fuzzy logic and genetic algorithm hybrids – Neuro fuzzy hybrids-neuro genetic hybrids-Fuzzy genetic hybrids-Genetic algorithm based back propogation network-Fuzzy back propagation networks -fuzzy logic controlled genetic algorithms.

REFERENCES

1. S.Rajasekharan, G.A.Vijayalakshmi Pai, Neural Network, Fuzzy Logic and Genetic Algorithms Synthesis and Applications, Prentice Hall India.
2. S.N.Sivanandam, S.N.Deepa, Principles of Soft Computing, Wiley India.
3. Timothy J Ross, Fuzzy logic with Engineering Applications, Mc Graw Hill ,New York.
4. S.Haykins, Neural Networks a Comprehensive foundation,Pearson Education.
5. D.E.Goldberg, Genetic Algorithms in Search Optimisation and Machine Learning, Pearson Education.
6. Recent literature

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced to students at the beginning of the semester by the teacher.

Semester end examination: 100 marks

Question pattern:
Answer ANY 5 questions by choosing at least ONE question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

PMS 10302 (C) ADVANCED MAINTENANCE MANAGEMENT

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits: 4**

Objectives: To build-up effective technical competencies in maintenance management in engineering organisations. To expose the students to scientific and proactive approaches in maintenance.

Module 1 - Maintenance Concepts (14 Hours)
Maintenance objectives – Maintenance functions – Maintenance costs – Five zero concept – Maintenance Models - Maintenance policies – Imperfect maintenance – Choice between PM and breakdown maintenance – Optimal PM schedule and product characteristics – Inspection decisions – Condition monitoring – Replacement models - Tero technology.

Module 2 - Failure Data Analysis (13 Hours)
Mortality curve – useful life – Evaluating data for failure rate estimation – Analysis using probability plotting: Exponential Weibull – Design life – System Reliability: Decomposition method – Cut and tie sets – FTA – Standby system – Maintainability prediction – MTTR – System availability.

Module 3 - Maintenance Logistics (14 Hours)
Maintenance planning and scheduling – Spare parts management – Classification – Breakdown, Capital, Insurance and rotable spares - Maintenance staffing – Use of learning curves and simulation – Human factors in maintenance – Maintenance manuals – Queuing theory applications – Shutdown planning – Computer Applications in maintenance management.

Module 4 - Total Productive Maintenance (13 Hours)
Overall Equipment Effectiveness – Chronic and sporadic losses – Autonomous maintenance – Maintenance prevention – Reliability cantered maintenance (RCM).

References
1. Lindley R.Higgins & R.Keith Mobley, “Maintenance Engineering Handbook”, McGraw Hill, 2002.
2. Charles E.Ebeling, “An introduction to Reliability and Maintainability engineering”, Tata McGraw Hill, 2000.
3. K Venkataraman, Maintenance Engineering and Management, Prentice Hall of India, 2007.

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced to students at the beginning of the semester by the teacher.

Semester end examination: 100 marks

Question pattern:

Answer ANY 5 questions by choosing at least ONE question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

MS 10302 (D) PRODUCT LIFECYCLE MANAGEMENT

Teaching scheme: 3 hours lecture and 1 hour tutorial per week **Credits: 4**

Objectives: This paper will provide an insight into the concept of product centric approach to product development. It gives an idea about different tools and methodologies used for product lifecycle management.

MODULE 1- (13 Hours)

Product design and development – Definition, phases of Product development-collaborative product development- PLM definition – Product centric approach - Corporate challenges-

Product Data – Design data, form, function, behavior- Product data management – definition, architecture- web based tools for PDM- Product structure – Examples - Document management

MODULE 2 - (14 Hours)

Product lifecycle management systems – System architecture – Deployment of PLM systems – Functionality of PLM system – Vertical integration – Product development and engineering – Production – after sales – sales and marketing – sub contracting - procurement – configuration management and customizable products.

Integration of PLM with other application – Types of integration – Transfer file – Database integration – System roles – ERP – CAD – Product configurators – Enterprise Application Integration

MODULE 3 - (14 Hours)

Deployment of PLM system – stages of deployment – Leading a PLM project – objectives, system, realization , startup, steering group, project group, project manager –

Business benefits to PLM – Business benefits measurement – material cost – reducing inventory – cost of quality – data ware housing – PLM software –

MODULE 4 - (13 Hours)

Challenges of product management in manufacturing - – Product management in collaborative business management

Product management strategy, Time to market, Time to react, Time to volume, Time to service E-business, Electronic business, Product management as a part of business

References :

1. Antti Saaksvuori Anselni Immonen, 'Product Lifecycle Management, Springer New York
2. Stark, J., Product Lifecycle Management - 21st Century Paradigm for Product Realisation, Springer-Verlag, London, 2005

Web reference

www.cimdata.com
www.aberdeen.com

Internal continuous assessment: 100 marks
Internal continuous assessment is in the form of periodical tests, assignments, seminars or a combination of all whichever suits best. There will be minimum of two tests per subject. The assessment details are to be announced to students at the beginning of the semester by the teacher.

Semester end examination: 100 marks
Question pattern:
Answer ANY 5 questions by choosing at least ONE question from each module.

Module 1	Module 2	Module 3	Module 4
Q No. 1: 20 Marks	Q No. 3: 20 Marks	Q No. 5: 20 Marks	Q No. 7: 20 Marks
Q No. 2: 20 Marks	Q No. 4: 20 Marks	Q No. 6: 20 Marks	Q No. 8: 20 Marks

PMS10 303 (P): INDUSTRIAL TRAINING

Teaching scheme: 1 hour per week **Credits: 1**

The students have to undergo an industrial training of minimum two weeks in an industry during the semester break after second semester and complete within 15 calendar days from the start of third semester. The students have to submit a report of the training undergone and present the contents of the report before the evaluation committee constituted by the department. An internal evaluation will be conducted for examining the quality and authenticity of contents of the report and award the marks at the end of the semester.

Internal continuous assessment: Marks 50

PMS10 304 (P): MASTERS RESEARCH PROJECT (PHASE – I)

Teaching scheme: 22 hours per week **Credits: 6**

Objective:

To improve the professional competency and research aptitude by touching the areas which otherwise not covered by theory or laboratory classes. The project work aims to develop the work practice in students to apply theoretical and practical tools/techniques to solve real life problems related to industry and current research.

The project work can be a design project, experimental project, computer simulation project or an empirical study involving data collection and analysis from manufacturing organisations. The topic should be on Manufacturing Systems Management or any of the topics related with Manufacturing stream. The project work is allotted individually on different topics. The students shall be encouraged to do their project work in the parent institute. If found essential they may be permitted to continue their project outside the parent institute subject to the conditions in clause 10 of M.Tech regulations. Department will constitute an Evaluation Committee to review the project work. The Evaluation committee consists of at least three faculty members of which internal guide and another expert in the specified area of the project shall be two essential members.

The student is required to undertake the masters research project phase-I during the third semester and the same is continued in the 4th semester (Phase-II). Phase-I consists of preliminary thesis work, two

reviews of the work and the submission of preliminary report. First review would highlight the topic, objectives, methodology and expected results. Second review evaluates the progress of the work, preliminary report and scope of the work which is to be completed in the 4th semester.

Internal Continuous assessment:

First Review:		
	Guide	50 marks
	Evaluation Committee	50 marks
Second review:		
	Guide	100 marks
	Evaluation Committee	100 marks
Total		300 marks

PMS10 401(P): MASTERS RESEARCH PROJECT (PHASE-II)

Teaching scheme: 30 hours per week **Credits: 12**

Objectives:
To improve the professional competency and research aptitude by touching the areas which otherwise not covered by theory or laboratory classes. The project work aims to develop the work practice in students to apply theoretical and practical tools/techniques to solve real life problems related to industry and current research.

Masters Research project phase-II is a continuation of project phase-I started in the third semester. Before the end of the fourth semester, there will be two reviews, one at middle of the fourth semester and other towards the end. In the first review, progress of the project work done is to be assessed. In the second review, the complete assessment (quality, quantum and authenticity) of the thesis is to be evaluated. Both the reviews should be conducted by guide and Evaluation committee. This would be a pre qualifying exercise for the students for getting approval for the submission of the thesis. At least one technical paper is to be prepared for possible publication in journal or conferences. The technical paper is to be submitted along with the thesis. The final evaluation of the project will be external evaluation.

Internal Continuous Assessment:

First review:		
	Guide	50 marks
	Evaluation committee	50 marks
Second review:		
	Guide	100 marks
	Evaluation committee	100 marks

Semester end Examination:

Project evaluation by external examiner:	150 marks
Viva-voce by internal and external examiner:	150 marks (75 marks each)