MATHEMATICAL METHODS IN ENGG. (common to MPT, MPE, MPD, MEM, MPM, MPY, & MSE)			
Course Code	20MPM11	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Errors and Simple Mathematical modeling: Error definition, round off errors and truncation errors. Mathematical modeling and Engineering problem solving: Simple mathematical model, Conservation Laws of Engineering.

Engineering Applications on :

i) Deflection of Beams
ii) Whirling of shafts
iii) Terminal velocity of a freely falling body

(RBT Levels: L1 & L2) (Text Book:1) **10Hrs**

Module-2

System of Linear Algebraic Equations And Eigen Value Problems: Gauss-Jordan Method, Cholesky Method, Partition method, Givens method for symmetric matrices, (RBT Levels: L1 & L2) (Text Book:3) **10Hrs**

Module-3

Roots of Equations: Muller's method , Graeffe's roots squaring method.

Numerical solutions of ordinary differential equations: Introduction, Picard`s method of successive approximation, first order simultaneous equations by Picard`s & Runge Kutta methods. & second order equations by Picard`s & Runge Kutta methods. (RBT Levels: L2 & L3) (Text Book:3) **10Hrs**

Module-4

Partial Differential Equations: Numerical solution of one dimensional wave equation, Heat equation,(Schmidt`s explicit formula)& Laplace equation(Gauss-Seidel process) by finite difference schemes. Illustrative examples on each method, (RBT Levels: L2 & L3) (Text Book:2). **10Hrs**

Module-5

Sampling theory: Testing of hypothesis: Chi square test and F-test. Analysis of Variance (ANOVA): one way classification, Design of experiments, RBD.
(RBT Levels: L2 & L3) (Ref. Book:1).
10Hrs

Course Outcomes:

On completion of this course, students are able to:

1. Acquire the idea of significant figures, types of errors during numerical computation.
2. Understand statistical and probabilistic concepts required to test the hypothesis and designing the experiments using RBD.
3. Learn various numerical methods to solve system of linear equations.
4. Understand the roots of algebraic/transcendental equations and solve PDE's numerically.
5. Analyze and solve PDE's related to wave equation arising in vibration analysis.

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbooks

1. Steven C Chapra and Raymond P Canale, "Numerical Methods for Engineers," 7th Ed., cGraw-Hill Edition, 2015

2. Theory of ordinary differential equations, Coddington E., Levinson N., McGraw-Hill publishing Company, TMH Edition, 9th Reprint, 1987..

3. M K Jain, S.R.K Iyengar, R K. Jain, Numerical methods for Scientific and engg computation, New Age International, 2003.

Reference books:

1.R.E, Walpole, R.H.Myres, S.L.Myres and Keying Ye, "Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson, 2012

2.Dr. B.S. Grewal, "Numerical Methods in Engineering and Science", Khanna Publishers, 1999.

3.K Shankar Rao, "Introduction to Partial Differential Equations" Prentice - Hall of India Pvt. Lt. , 1995 Edition

4. C. Ray Wylie and Louis C Barrett, "Advanced Engineering Mathematics". 6th edition, McGraw-Hill, 1995.

THEORY OF METAL CUTTING			
Course Code	**20MPM12**	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Mechanics Of Metal Cutting: Mechanism of chip formation, Orthogonal & Oblique cutting, types of chips, built-up edge, Determination of shear plane angle, forces on the chips, forces in orthogonal cutting, Merchant circle diagram and analysis, Theory of Lee & Shaffer, coefficient of friction, power & energy relationship, velocity relationship, shear-strain, factors affecting forces and power, problems

Geometry Of Cutting Tools: Single point and multi point cutting tools, tools nomenclature, tool point reference systems, tool signature, Recommended tool angles, Effect of cutting parameters on tool geometry.

10 Hrs

Module-2

Tool Materials And Their Properties: Characteristics of tool materials, types of tool materials – carbon tool steels, high speed steels, cast alloys, cemented carbides, ceramics, diamonds, SIALON, CBN, UCON, recommended cutting speeds for the above tools, discussion on die steels, air, water, oil hardening of tools and their applications

Tool Wear, Tool Life: Mechanisms of tool wear, Sudden & gradual wear, crater wear, flank wear, tool failure criteria, tool life equations, effect of process parameters on tool life, tool life tests, conventional & accelerated tool wear measurement, machinability index.

10 Hrs

Module-3

Measurement Of Cutting Forces: Reasons for measuring cutting forces, Classification of cutting force dynamometers – mechanical, hydraulic, pneumatic, optical, inductance, piezoelectric, and strain gage type dynamometers.

Dynamometers For Machine Tools:Dynamometers for lathe, drilling, grinding and milling, Calibration of dynamometers.

10 Hrs

Module-4

Thermal Aspects In Metal Cutting: Heat sources in metal cutting, temperature in chip formation, temperature distribution, and experimental determination of tool temperatures.

Cutting Fluids: Basic actions of cutting fluids, properties of cutting fluids, selection of cutting fluids, application of cutting fluids, filtration of fluids, recommended cutting fluids.

10 Hrs

Module-5

Economics Of Machining: Introduction, elements of total production cost, optimum cutting speed and tool life for minimum cost, optimum cutting speed and tool life for maximum production, problems.

Advanced Machining Techniques: Cryo machining & high speed machining. Causes of vibration and chatter in machining, and their remedy.

10 Hrs

Course outcomes:

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

1. Understand and analyze the fundamentals of different cutting tool and materials.
2. Understand and analyze Mechanics of metal cutting.
3. Understand and analyze cutting force and its measurements using dynamometers and temperature distrubution during metal cutting.
4. Understand and analyze tool wear and tool life- mechanisms and effects.
5. Understand and analyze the Thermal Aspects and selection of cutting fluids and Optimum cutting speed and cost. techniques.

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbooks

(1)Fundamentals of metal cutting & Machine Tools - B.L.Juneja& G.S – Sekhar - Wiley Eastern.

(2)Metal Cutting Principles - M.C. Shaw - Oxford Publication

Reference Books

(1)Metal Cutting - V.C.Venkatesh&S.Chandrasekhanan - Pantice Hall

(2)Metal Cutting - Dr. B.J.Ranganath -Vikas Publications.

(3)Theory of Metal Cutting - Black – McGraw Hill

LEAN MANUFACTURING SYSTEMS			
Course Code	**20MPM13**	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Just in time production system. JIT Logic -Pull system Japanese approach to production elimination of waste - JIT implementation requirements JIT application for job shops, Case studies.

10 Hrs

Module-2

Kanban system:-Kanban rules supplier Kanban and sequence schedule used by supplier. Monthly information & daily information. Later replenish system by Kanban sequenced withdrawal P system by sequence schedule table - problems & counter measures in applying Kanban system to subcontractors - Supplier Kanban circulation in the paternal manufacturer - structure of supplier Kanban sorting office.

10 Hrs

Module-3

The rise of lean production: - Birth place, concrete example, company as community, Final assembly plant, product development and engineering. Changing customer demand, dealing with the customer, future of lean production.

Shortening of production lead times: reduction of setup times, practical procedures for reducing setup time.

10 Hrs

Module-4

Standardization of operations: Machine layout, multi function workers and job rotation. Improvement activities to reduce work force and increase worker morale -foundation for improvements.

Elements of lean production viz G M Framingharn: Toyota Takaoka Mass Production V /s lean production, diffusing lean production.

10 Hrs

Module-5

Managing lean enterprise:-Finance, Career ladders, geographic spread and advantages of global enterprise.

Prospects for catching up. Simplicity in the natural state: institutional factors -life time employment -educational commodities -quality & productivity in full circle.

10 Hrs

Course outcomes:

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

1. To understand issues & challenges in implementing & developing lean manufacturing techniques from TPS & its contribution for improving organizational performance.
2. Apply lean techniques to bring competitive business culture for improving organization performance .
3. Analyze how lean techniques can be applied to manufacturing & service industry
4. Developing lean management strategy for Supply chain management.
5. Analyzing how lean technique can create value generation for organization

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Reference Books

1. Productions and Operations Management-ChaselAquilino– Dreamtechlatestedition.

2. Toyoto Production System -An integrated approach to Just in Time – YasuhiroMonden - Engineering aild Management Press -Institute of Industrial EngineersNorcross Georgia -1983.

3. The Machine that changed the World. The Story of Lean Production - James PWomack - Daniel TJones - and Daniel Roos -Harper Perennial – editionpublished 1991.

COMPUTER INTEGRATED MANUFACTURING & AUTOMATION			
Course Code	20MPM14	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Introduction ToCim: Manufacturing - Types, Manufacturing Systems, CIM Definition, CIM wheel, CIM components, Evolution of CIM, needs of CIM, Benefits of CIM. High Volume Production System: Introduction Automated flow line-symbols, objectives, Work part transport-continuous, Intermittent, synchronous, Pallet fixtures, Transfer Mechanism-Linear-Walking beam, roller chain drive, Rotary-rack and pinion, Ratchet & Pawl, Geneva wheel.

10 Hrs

Module-2

Analysis Of Automated Flow Line & Line Balancing: General terminology and analysis, Analysis of Transfer Lines without storage-upper bound approach, lower bound approach and problems, Analysis of Transfer lines with storage buffer, Effect of storage, buffer capacity with example problem, Partial automation-with numerical problem example, Manual Assembly lines line balancing problem.

10 Hrs

Module-3

Automated Process Planning: Group Technology, Part families, Part classification and coding, Production flow analysis, Machine cell design, Applications and Benefits of Group Technology, Structure of a Process Planning, Process Planning function, CAPP - Methods of CAPP, CAD based Process Planning.

10 Hrs

Module-4

Monitoring And Quality Control: Types of production monitoring system, process control & strategies, direct digital control - Supervisory computer control - computer aided quality control - objectives of CAQC, QC and CIM, contact, non-contact inspection methods, CMM and Flexible Inspection systems.

10 Hrs

Module-5

Flexible Manufacturing Systems: FMS concept, Components of FMS, FMS Layouts, FMS planning and implementation. Tool Management systems-Tool monitoring, Work holding devices-Modular fixturing, flexible fixturing,, flexibility, application and benefits of FMS, automated material handling system –AGVs, Guidance methods, AS/RS.

10 Hrs

Course outcomes:

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

1. Understand the effect of manufacturing automation strategies.
2. Analyze computer aided quality control methods and techniques.
3. Analyse CIM planning system and computer network for manufacturing.
4. Understand and analyse the flow lines and transfer mechanisms.
5. Understand and analyse Automated material Handling Storage system.

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbooks

1. Mikell P. Groover, Automation, Production system & Computer IntegratedManufacturing, Prentice Hall India Learning Private Limited,3rdEdition, 2008

2. Kant Vajpayee. S., Principles of Computer Integrated Manufacturing, Prentice Hallof India, 1999.

Reference Books

1. James A. Rehg& Henry W Kraebber, Computer Integrated Manufacturing, PearsonPrentice Hall, 2005

2. YoremKoren, Computer Control of Manufacturing Systems, Mc. Graw Hill, 1983.

(3) 3. P. Radhakrishnan, S. Subramanyan and V.Raju, CAD / CAM / CIM, New Age International Publishers, 2008.

NON-TRADITIONAL MACHINING PROCESSES			
Course Code	20MPM15	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Introduction: Definition and need for NTM process, difference between NTM and TM, Classification of NTM, Process selection and comparative study of different processes.Ultrasonic Machining (USM) – Introduction, Mechanism of metal removal, elements of process, Tool feed mechanism, Effect of process parameter, Advantages, Disadvantages and Applications.Abrasive Jet Machining (AJM): Introduction, working Principles, Effect of Process parameters /Variables, Advantages, Disadvantages and Applications.

10 Hrs

Module-2

Electric Discharge Machining (EDM)- Introduction and mechanism of metal removal, types of EDM, basic EDM circuitry-spark erosion generators – Relaxation generator or R-C circuit, material removal rate in relaxation circuits, critical resistance, Die electric fluids, Flushing, Electrodes and its material selection, surface finish and machining accuracy, Advantages, Disadvantages and Applications. Electro Discharge Grinding (EDG) and Wire EDM.

10 Hrs

Module-3

Electro Chemical Machining: Definition and working principal, Elements of ECM process, Chemistry of the ECM process, Process parameters, determination of the metal removal rate, Advantages, Disadvantages and Applications. Electro Chemical Grinding. Chemical Machining: Introduction and mechanism of metal removal, Elements of process – Maskants or Resists and Etchants, Advantages, Disadvantages and Applications.

10 Hrs

Module-4

Plasma arc Machining: Introduction, Plasma, Generation of Plasma and equipment, Mechanism of metal removal, PAM parameters, type of torches. Electron Beam Machining (EBM): Introduction and working principle of EBM, Equipment for production of Electron beam (Electron gun), Theory of electron beam machining - Thermal & Non thermal types, Advantages, Disadvantages and Applications.

10 Hrs

Module-5

Laser Beam Machining (LBM): Introduction and working principle of LBM, generation of laser, Laser Equipment (Apparatus), Types of Lasers, Process characteristics, Advantages, Disadvantages and ApplicationsHigh Velocity Forming (HVF) process: introduction, Advantages of HVF process, Types of high velocity forming methods - explosive forming, electromagnetic forming.

10 Hrs

Course outcomes:

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

1. Compare conventional and non-conventional manufacturing process and understand the mechanism of USM and AJM.
2. Understand EDM concept and operating characteristic.
3. Distinguish ECM with other operations and various application and understand the usage of various chemical and maskants in CHM.
4. Understand the generation of plasma, electron beam, laser and their machining characteristics.
5. Understand the formation of ion beam and this application and various high velocity forming process.

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbooks

1.Modern Machining Process - P.C Pandy& H.S. Shan - Tata McGraw Hill - ISBN: 0070965536 - Publishing Date: Feb-80.

Reference Books

1.Production Technology - HMT - Tata McGraw Hill - ISBN-10; 0070964432.

2.High Velocity Forming of Metals - F.M Wilson - ASTME Pretice Hall.

3.Modern Manufacturing Method - Adithan - New Age International (p) Limited -ISBN: 8122408176, 2007.

LABORATORY – I			
Course Code	20MPML16	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	0:4:0	SEE Marks	60
Credits	02	Exam Hours	03

Sl. NO	Experiments
1	Part Modeling, Machining and Simulation for Turning (Min. of 2 Exercises
2	Part Programing and Simulation for Turning (Min. of 2 Exercises)
3	Part Modeling, Machining and Simulation for Milling (Min. of 4 Exercises)
4	Part Programing and Simulation for Milling (Min. of 2 Exercises)
PART - B Robot Programming	
Design and Write a Robot program using Teach pendent and Offline programming to perform the following operations	
1	Pick and place operation (Min. of 2 Exercise)
2	Sorting Operation (Min. of 2Exercise).
3	Automated Storage and Retrieval System (Min. of 2Exercise).
PART - C (Only for Demo)	

Course outcomes:

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

1. Able to write the part programme to machine the component as per the part specification.
2. Students will be equipped with Robot programming.
3. Able to understand the trajectory planning concepts on a single-link robotic manipulator.
4. Students will be familiarized with the use of a Vision system

Conduction of Practical Examination:

Question paper pattern:

The SEE questions will be set for **100** marks:

1. Two experiments for **80** marks.
2. Viva voce for **20** marks.

RESEARCH METHODOLOGY AND IPR			
Course Code	20RMI17	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	1:0:2	SEE Marks	60
Credits	02	Exam Hours	03

Module-1

Research Methodology: 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, and Problems Encountered by Researchers in India.

Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration. **05Hrs**

Module-2

Reviewing the literature: Place of the literature review in research, Bringing clarity and focus to your research problem, Improving research methodology, Broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed.

Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs. **05Hrs**

Module-3

Design of Sampling: Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs.

Measurement and Scaling: Qualitative and Quantitative Data, Classifications of Measurement Scales, Goodness of Measurement Scales, Sources of Error in Measurement Tools, Scaling, Scale Classification Bases, Scaling Technics, Multidimensional Scaling, Deciding the Scale.

Data Collection: Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method. **05Hrs**

Module-4
Testing of Hypotheses: Hypothesis, Basic Concepts Concerning Testing of Hypotheses, Testing of Hypothesis, Test Statistics and Critical Region, Critical Value and Decision Rule, Procedure for Hypothesis Testing, Hypothesis Testing for Mean, Proportion, Variance, for Difference of Two Mean, for Difference of Two Proportions, for Difference of Two Variances, P-Value approach, Power of Test, Limitations of the Tests of Hypothesis. **Chi-square Test:** Test of Difference of more than Two Proportions, Test of Independence of Attributes, Test of Goodness of Fit, Cautions in Using Chi Square Tests. **05Hrs**
Module-5
Interpretation and Report Writing: Meaning of 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 a Research Report, Precautions for Writing Research Reports. **Intellectual Property:** The Concept, Intellectual Property System in India, Development of TRIPS Complied Regime in India, Patents Act, 1970, Trade Mark Act, 1999,The Designs Act, 2000, The Geographical Indications of Goods (Registration and Protection) Act1999, Copyright Act,1957,The Protection of Plant Varieties and Farmers' Rights Act, 2001,The Semi-Conductor Integrated Circuits Layout Design Act, 2000, Trade Secrets, Utility Models, IPR and Biodiversity, The Convention on Biological Diversity (CBD) 1992, Competing Rationales for Protection of IPRs, Leading International Instruments Concerning IPR, World Intellectual Property Organisation (WIPO),WIPO and WTO, Paris Convention for the Protection of Industrial Property, National Treatment, Right of Priority, Common Rules, Patents, Marks, Industrial Designs, Trade Names, Indications of Source, Unfair Competition, Patent Cooperation Treaty (PCT), Advantages of PCT Filing, Berne Convention for the Protection of Literary and Artistic Works, Basic Principles, Duration of Protection, Trade Related Aspects of Intellectual Property Rights(TRIPS) Agreement, Covered under TRIPS Agreement, Features of the Agreement, Protection of Intellectual Property under TRIPS, Copyright and Related Rights, Trademarks, Geographical indications, Industrial Designs, Patents, Patentable Subject Matter, Rights Conferred, Exceptions, Term of protection, Conditions on Patent Applicants, Process Patents, Other Use without Authorization of the Right Holder, Layout-Designs of Integrated Circuits, Protection of Undisclosed Information, Enforcement of Intellectual Property Rights, UNSECO. **05Hrs**

Course outcomes:

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

- Discuss research methodology and the technique of defining a research problem
- Explain the functions of the literature review in research, carrying out a literature search, developing theoretical and conceptual frameworks and writing a review.
- Explain various research designs, sampling designs, measurement and scaling techniques and also different methods of data collections.
- Explain several parametric tests of hypotheses, Chi-square test, art of interpretation and writing research reports
- Discuss various forms of the intellectual property, its relevance and business impact in the changing global business environment and leading International Instruments concerning IPR.

Question paper pattern:

- The question paper will have ten questions.
- Each full question is for 20 marks.
- There will be 2full questions (with a maximum of four sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module.

Textbooks

(1) Research Methodology: Methods and Techniques, C.R. Kothari, Gaurav Garg,New Age International,4th Edition, 2018.

(2) Research Methodology a step-by-step guide for beginners. (For the topic Reviewing the literature under module 2), RanjitKumar,SAGE Publications,3rd Edition, 2011.

(3) Study Material (For the topic Intellectual Property under module 5), Professional Programme Intellectual Property Rights, Law and Practice, The Institute of Company Secretaries of India, Statutory Body Under an Act of Parliament, September 2013.

Reference Books

(1) Research Methods: the concise knowledge base, Trochim, Atomic Dog Publishing, 2005.

(2) Conducting Research Literature Reviews: From the Internet to Paper, Fink A, Sage Publications, 2009.

*** END OF I SEMESTER ***

THEORY OF METAL FORMING			
Course Code	20MPM21	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Introduction To Forming Process: Introduction to metal forming, Effect of temperature on forming process-hot working, cold working. Effect of Metallurgical structure, Effect of speed of deformation work of Plastic deformation, Friction in forming operation. Concept of true stress and true strain, uniaxial, biaxial, triaxial stresses, Vonmoises criteria, tresca criteria, principle stresses, concepts of plane stress and plane strain and problems.

10 Hrs

Module-2

Forging: Classification, various stages during forging, Forging equipment, brief description, deformation in compression, forging of slabs, discs with respect to sticking, sliding and mixed friction forging defects. Residual stresses in forging and problems.

10 Hrs

Module-3

Rolling of Metals: Classification, forces and geometrical relationships in rolling. Expression for rolling load, roll separating force.

Variables in rolling: Deformation in rolling, Defects in rolled products, Residual stresses in rolled products. Torque and Horsepower and problems.

10 Hrs

Module-4

Extrusion: Classification, Extrusion equipment, variables in extrusion, Deformation in extrusion, Extrusion defects, Work done in extrusion and problems.

Drawing: Principles of Rod and wire drawing, variables in wire drawing, Residual stresses in rod, wire and tube drawing, Defects in Rod and wire drawing and problems.

10 Hrs

Module-5

Sheet Metal forming: Introduction, Forming methods, shearing and Blanking, Bending, stretch forming, Deep drawing, redrawing operations, Defects in formed products and methods of HERF.

10 Hrs

Course outcomes:

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

1. Understand the basics of metal forming.
2. Recognize the importance of metal forging using different geometrical shapes and various defects.
3. Understanding the concept of rolling ,types of rolling mills and processes and its defects
4. To understand the concepts of extrusion and drawing and their applications.
5. To understand the types of sheet metal forming processes and HERF

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.■

Textbooks

1. Mechanical MetalIurgy- Dieter G.E. - McGraw Hill Publications.

2. Principles of Metal Working - R.Rowe - Amold London – 1965.

OPERATIONS MANAGEMENT			
Course Code	20MPM22	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Introduction to Production and Operation management: Operations Management – Need, History, System, functions. Environment of operations, Concept of productivity and its analysis, Computing productivity (Numericals).

Operations Strategy: Strategic management process, Operations/ manufacturing Strategy meaningful differentiation, Flexibility, Comparison: Traditional vs New approaches, cost leadership, Operations Strategies, Key success factors, Strengths, Weakness, Opportunities and Threats (SWOT) analysis, Five forces model, Operations Strategic action and its relationship with other, Functional areas of management, Operation Function's role: a new concept, Globalization.

10 Hrs

Module-2

Facility Location: Nature of location decision, situations that influence location decision, Case of the already established organization, location choice for the first time, Choice of a site within a region, Backward areas and industrial policy, Global location, Reasons for a foreign location, Location of facilities for service businesses, Behavioural aspects in location panning of services, Location models - ,Factor rating method, Weighted factor rating method, Load-distance method, Centre of gravity method, Break-even analysis. Locational economics (Numericals).

Plant Layout: Features, Cost, Optimization in a product/line layout, Optimization in process Layout, Assembly line balancing: Line efficiency, balance delay (Numericals).

10 Hrs

Module-3

Forecasting: Need and importance of Forecasting, Input-Output of forecasting Model, Techniques: Delphi Method, Simple and Moving average, Exponential Smoothing, Correlation and Regression Analysis, Karl Pearson's Correlation, Minimizing forecasting errors - MAD, Tracking Signal.

Personnel management in Operations Management: Personnel policy, Employment and manpower planning, Education Training and management development, Industrial relations, Health, safety and welfare.

10 Hrs

Module-4

Purchasing and Supply Chain Management (SCM): Introduction, Importance of purchasing and SCM, The procurement process, Concept of tenders, Approaches to SCM, Vendor development, Measures of purchasing and SCM, Make or buy decision, Types of buying, E-procurement.

Environmental Considerations in Production and Operations Management : productions and service operations disturb the environment, making the processes 'Green' , similarities in Operations and Environment issues, , Organizational response to environmental sustainability.

10 Hrs

Module-5
Scheduling: Priority decision rules, Johnson's Algorithm for job sequencing (n job through 2 machines, n jobs through 3 machines, n jobs through m machines and 2 jobs through m machines) Use of Gantt charts. (Numericals). **Role of Operations Management:** Role of production and Operations Management in Flexible manufacturing system (FMS), Robotics, Computer integrated manufacturing (CIM), Service orientation and customer focus. **10 Hrs**
Course outcomes: At the end of the course the student will be able to: 1. Analyze the various factors of Production & Operations Management System and will be able to identify Operations Strategy of any firm 2. Analyze the various factors involved in deciding the facility, layout for a firm &analyze the evaluation and implementation of layouts. 3. Familiar with forecasting types and personnel management. 4. Understand the Purchasing and Supply Chain Management and Environmental Considerations in Production and Operations Management 5. Get awareness of different scheduling techniques and role of OM in different system
Question paper pattern: The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60. • The question paper will have ten full questions carrying equal marks. • Each full question is for 20 marks. • There will be two full questions (with a maximum of four sub questions) from each module. • Each full question will have sub question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module.■
Textbooks
1. Production and operations management-S N Chary 4th edition – Tata-Mcgraw hillNew Delhi second print 2009
2. Production and operations management-Alan-muhlemann, Johnoakland, Keithlockyer.6th Edition, 1992 ELBS Pitmen publishing , London
Reference Books
1 Modern Production / Operations Management by E.S. Buffa , 5th Ed, John Wiley &Sons.
2. Production / Operations Management by Joseph G Monks, McGraw Hill Books
3. Operations Management for Competitive Advantage, R.B.Chase, N.J.Aquilino, F.Roberts Jacob; McGraw Hill Companies Inc., Ninth Edition.

NON - DESTRUCTIVE TESTING			
Course Code	20MPM23	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Magnetic Particle Inspection: Methods of generating magnetic field, types of magnetic particles and suspension liquids steps in inspection – application and limitations.

10 Hrs

Module-2

Eddy Current Inspection: principles, operation variables, procedure, inspection coils, and detectable discounts by the method.
Microwave Inspection: Microwave holography, applications and limitations.

10 Hrs

Module-3

Ultrasonic Inspection: Basic equipment characteristics of ultrasonic waves, variables inspection, inspection methods pulse echo A,B,C scans transmission, resonance techniques, transducer elements couplets, search units, contact types and immersion types inspection standards-standard reference blocks.

10 Hrs

Module-4

Radiography Inspection: Principles, radiation source X-rays and gamma rays, X-ray tube, radiographic films, neutron radiography, Thermal inspection principles, equipment inspection methods applications.

10 Hrs

Module-5

Optical Holography: Basics of Holography, recording and reconstruction.
Acoustical Holography: systems and techniques applications. Indian standards for NDT.
10 Hrs

Course outcomes:

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

1. Distinguish the destructive and non-destructive testing and find effectiveness.
2. Find the surface defect using liquid penetrant and magnetic particle test and eddy current test.
3. Learn the mechanism of flaw detection using ultrasonic wave system.
4. Understand the operations of microwave and radiography inspection system.
5. Understand the basics of holography and interferometry and its application in defect detection.

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module. ■

Reference Books

1. Non Destructive Testing McGonnagle JJ – Garden and reach New York.

2. Non Destructive Evolution and Quality Control volume 17 of metals hand book 9 edition Asia internal 1989.

3. The Testing instruction of Engineering materials Davis H.E Troxel G.E wiskovilC.T McGraw hill.

QUANTITATIVE TECHNIQUES IN DECISION MAKING			
Course Code	20MPM241	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Introduction: Statistics and managerial decisions, statistical data and Operations Research techniques. Fundamentals of Statistics, probability and probability distributions: Measures of central tendency andlocation, Measure of dispersion, skewness and kurtosis, Probability and rules of probability, Random variablesand probability distributions - Binomial, Poisson, Hyper geometric and Normal.

10 Hrs

Module-2

Linear Programming Problem: Formulation of L.P.P., Solution of L.P.P. by graphical method, Solution of L.P.P. by simplex method, Concept of duality and solution of dual problems, Solution of L.P.P. by dual simplex method.

10 Hrs

Module-3

Transportation Problems: Structure of transportation problem finding Initial Basic feasible solution by North-West Corner method, Least-Cost Method and Vogel's Approximation method(VAM)., Optimality test of transportation problems by MODI method, Solution of degeneracy and unbalanced transportation problems.

10 Hrs

Module-4

Theory of Games: Two person zero sum game, Minimax&maximin strategies, Solution of game by dominance rules, arithmetic and algebraic methods, Solution of game by graphical method and method of matrices, Solution of game by Linear programming approach and approximate method to solve game problems.

10 Hrs

Module-5

Network Analysis: PERT and CPM, Network construction and determination of critical path, Calculation of ES, EF, LS, LF, TF, FF and IF, Crashing of a project, Scheduling of a project and resource leveling.

10 Hrs

Course outcomes:

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

1. Understand the basic Statistical measures of Central Tendency and Dispersion.
2. Recognize the importance and value of Operations Research and mathematical modeling in solving practical problems in industry
3. Formulate a managerial decision problem into a mathematical model
4. Understand Operations Research models and apply them to real-life problems
5. Able to design new simple models, like: CPM, PERT to improve decision making and develop critical thinking and objective analysis of decision problems

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.■

Textbooks

1. Quantitative Techniques for managerial decisionsm - Srivastava U.K. – New Age International Private Limited - ISBN Number: 8122401899.

2. Operations Research - H. Taha- Prentice Hall India – 8 Edition.

Reference Books

1. Operations Research: An Introduction - Gupta and Heera - S.Chand and Company – 2002

2. Introduction to Operations Research - Hillier and Liberman- McGraw Hill International. -ISBN 10: 0072321695

QUALITY AND RELIABILITY ENGINEERING			
Course Code	**20MPM242**	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Basic Concepts: Definitions of quality and Reliability, Parameters and Characteristics, Quality control, statistical Quality Control, Reliability concepts. Concepts in Probability and Statistics : Events, Sample Space, Probability rules, Conditional probability, Dependent and Independent Events, Application of Probability concepts in Quality Control, Problems.

10 Hrs

Module-2

Statistical Aspects and Probability Distributions : Statistical Tools in Quality Control, The concept of Variation,Graphical Tools for data representation and analysis, Discrete and Continuous Distributions, Normal, Poisson,Binomial, Weibull Distribution, Problems.

Control Charts: Variable charts X chart, R chart, s chart, Attribute charts, P chart, NP chart, C chart.

10 Hrs

Module-3

Failure Data Analysis : Introduction, Failure Data, Quantitative measures, MTTF, MTBF, Bathtub Curve, MeanLife, Life Testing, Problems, Introduction to Failure Mode and Effect Analysis. Acceptance Sampling: Fundamentals of acceptance sampling, types of acceptance sampling, O.C Curve, AQL,LTPD, AOQL.

10 Hrs

Module-4

System Reliability: Series, parallel and mixed configuration, Block diagram concept, r- out of-n structure solving problems using mathematical models. Maintainability and Availability: Introduction, Formulas, Techniques available to improve maintainability and availability trade-off among reliability, maintainability and availability, Simple problems.

10 Hrs

Module-5

Reliability Improvement and Allocation: Difficulty in achieving reliability, Methods for improving reliability during design, Different techniques available to improve reliability, redundancy and improvement factors evaluation.

10 Hrs

Course outcomes:

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

1. Understand the quality and basic probability concept.
2. Construct the control chart for variables.
3. Construct the control chart for attributes and analyse failure data.
4. Construct OC curve for determining the probability of lot acceptance.
5. Understand the basic concept of reliability and calculate maintainability and availability of resources.

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module. ■

Textbooks

1.The Assurances Sciences - Halpern, Seigmund - Prentice Hall International, New Jersey, U.S.A - 1978.

(2) 2.Quality Planning and Analysis - Juran, J.M andGryna, F.M. - Tata McGraw Hill publishing CoimpanyLtd.,New Delhi, India – 1982.

TOOL ENGINEERING			
Course Code	20MPM243	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Cutting Tool Materials

Introduction and desirable properties ,Carbon and Medium-Alloy Steels ,High-Speed Steels ,Cast-Cobalt Alloys ,Carbides ,Coated Tools, Alumina-Based Ceramics ,Cubic Boron Nitride, Silicon-Nitride Based Ceramics ,Diamond ,Reinforced Tool Materials ,Cutting-Tool Reconditioning.

Design of Cutting Tools-Basic Requirements ,Mechanics and Geometry of Chip Formation , General Considerations for Metal Cutting ,Design of single point Cutting Tools , Design of Milling Cutters ,Design of Drills and Drilling , Design of Reamers, Design of Taps, Design of Inserts , Determining Shank Size for Single-point Carbide Tools.

10 Hrs

Module-2

Gauges and Gauge Design-Limits fits and tolerances, Geometrical tolerances-specification and measurement., Types of gauges ,Gauge design, gauge tolerances.

Work Holding Devices- Basic requirements of work holding devices, Location: Principles, methods and devices, Clamping : Principles, methods and devices.

10 Hrs

Module-3

Drill Jigs -Definition and types of Drill Jigs ,Chip Formation in Drilling ,General Considerations in the Design of Drill Jigs, Drill Bushings ,Drill Jigs. Design of Fixtures-Fixtures and Economics , Types of Fixtures , Milling Fixtures , Boring Fixtures , Broaching Fixtures , Lathe Fixtures.

10 Hrs

Module-4

Design of Press Tools-Introduction to press tools and related terminology, effect of clearances, theory of deformation, stages of cutting operation, center of pressure, strap strip layout , die and punch design, design of simple, compound and progressive dies, methods of mounting punches and dies, design of drawing dies, bend allowances, bending and forming dies.

10 Hrs

Module-5

Dies and moulds - Bending:Types,Parts and functions of bending die,Definition, calculations and factors affecting bend radii, bend allowance and spring back,Method to compute bending pressure,Types, sketch, working and applications of bending dies,Drawing dies-types and method to determine blank size for drawing operation,Types, sketch, working and applications of drawing dies (embossing, curling, bulging, coining, swaging and hole flanging).

10 Hrs

Course outcomes:

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

1.Select cutting tool materials and tool geometries for different metal.
2.Select locating and clamping devices for given component.
3.Select and design jig and fixture for given simple component.
4.Classify and explain various press tools and press tools operations.
5.Select a die for a given simple component.

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbooks

1.JOSHI P .H, "Jigs & Fixtures", New Delhi -Tata McGraw Hill Pub. Co. Ltd., 11th print 1999.

2.D. Eugene Ostergaard,"Basic die design", McGraw-Hill, 1963

Reference Books

1. ASTME, "Fundamentals of Tool Design", Prentice Hall of India, 1983.

2. Donaldson, "Tool Design", Tata-McGraw Hill, 3rd Edition, 2000.

3. An Introduction to Jig & Tool Design -KEMPSTER M.H.A.- Bristol- ELBS 3rd Ed.1974

FINITE ELEMENT ANALYSIS			
Course Code	20MPM244	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Introduction: Equations of equilibrium, stress-strain relations for 2-D and 3-D, Potential energy and equilibrium, Boundaryconditions, Von Misses Stresses.

FEM for 1-D Problems: General procedure for FEA, Raleigh Ritz method, Galerkin Approach, shape functions, stiffness matrix, loadvectors, temperature effects, Applications of boundary conditions using elimination and penalty approaches.

10 Hrs

Module-2

FEM for 1 D and 2-D Problems: Application problems – 1-D bar element. Trusses and beams, Shape functions (2D element), stiffness matrix, strain matrix, load vectors for CST Elements and application problems.

10 Hrs

Module-3

FEM for Axisymmetric Problems: Axisymmetric formulation, triangular elements, PE approach, Body force term, application problems.

10 Hrs

Module-4

FEM for Scalar Field Problems: 1-D Steady state heat transfer, torsion, potential flow and fluid flow in ducts and application Problems. **10 Hrs**

Module-5

Dynamic Analysis: Equations of motion for dynamic problems consistent and lumped mass matrices formulation of element mass matrices free vibration and forced vibration problems formulation.

10 Hrs

Course outcomes:

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

1. Solve differential equations using weighted residual methods
2. Develop the finite element equations to model engineering problems governed by second order differential equations
3. Apply the basic finite element formulation techniques to solve engineering problems by using one dimensional elements
4. Apply the basic finite element formulation techniques to solve engineering problems by using two dimensional elements
5. Apply the basic finite element formulation techniques to find natural frequency of single degree of vibration system

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Reference Books

(1)Introduction to Finite Elements in Engineering – Tirupathi R.-Chandrupatla Ashok DBelegundu -Prentice Hall India Pvt. Ltd., New Delhi – 3rd Edition, 2003

(2) Concepts and Applications of finite Element Analysis - Cook R.D - Malkus D.S &PleshaM.E – JohnWiley& Sons - 1989.

(3)Applied Finite Element Analysis -Segerlind L.J - John Wiley & Sons Edition- 1984

(4) The Finite Element Method in Engineering, - Rao SS Pergomon Press – Oxford - 2ndEdition, 1984

(5) Finite Element Procedures in Engineering Analysis - Bathe K .J - Prentice Hall NewJersey- 1982.

(6) Energy and Finite Element Methods in Structural mechanics - Shames III &DymC L -Wiley eastern ltd– 1995.

(1)Introduction to Finite Elements in Engineering – Tirupathi R.-Chandrupatla Ashok DBelegundu -Prentice Hall India Pvt. Ltd., New Delhi – 3rd Edition, 2003

SUPPLY CHAIN MANAGEMENT			
Course Code	20MPM251	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Introduction to supply chain management: Supply chain basics (Definition of SC, Objectives of SC, SC stages, SC flows, SC Examples), decision phases in a supply chain (SC Strategy or Design, SC Planning and SC Operation), supply chain efficiency and responsiveness.

Process view of a supply chain (Cycle view, Push/Pull View), Supply Chain Macro Processes in a firm, drivers of supply chain performance (Facilities, Inventory, Transportation, Information and Sourcing), Supply Chain performance: Competitive and supply chain strategies, achieving strategic fit.

10 Hrs

Module-2

Planning and Managing Inventories in a Supply Chain: Review of inventory concepts, Role of cycle inventory in a SC, Economies of scale to exploit fixed costs, Economics of scale to exploit quantity discounts, short-term discounting (Trade promotions). Role of safety inventory in a SC, safety inventory determination, Impact of supply uncertainty, aggregation and replenishment policies on safety inventory.**10 Hrs**

Module-3

Designing distribution networks in a SC : Role of distribution in the SC, factors influencing distribution network design, Design options for distribution network, E-Business and the distribution network.
Transportation in a SC: Role of Transportation in a SC, Modes of transportation and their performance characteristics, Design options for a transportation network, tailored transportation, Trade-offs in transportation design, Risk management in transportation.

10 Hrs

Module-4

Sourcing decisions in a SC: Role of sourcing in a SC, In-house and Outsource, supplier scoring & assessment, Supplier selection – Auctions and Negotiations, Contracts, Role of IT in sourcing.

Pricing and Revenue Management in a SC: Role of Pricing and Revenue Management in a supply chain, Pricing and Revenue management for Multiple customer segments, perishable assets, seasonal demand, bulk and spot contracts, Role of IT in pricing and revenue management.

10 Hrs

Module-5

Information Technology in a SC: The role of IT in a Supply Chain, The Supply Chain IT framework, CRM, ISCM, SRM, Transaction Management Foundation (TMF), Future of IT in SC. The role of E-business in a supply chain, E-business framework, E-business in practice. Case discussion.

Co-ordination in a SC: Lack of SC Co-ordination and the Bullwhip effect, effect on performance of lack of co-ordination, Obstacles to Co-ordination in a SC. Managerial levers to achieve co-ordination.

10 Hrs

Course outcomes:

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

1. Know the basic concepts of SCM and list out the important drivers of SC.
2. Understand the importance of SC drivers and their influence on SC performance.
3. Able to apply the concepts of SCM on simple real time SC's.

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

1. Supply Chain Management – Strategy, Planning & Operation. Sunil Chopra & PeterMeindl; PearsonEducation Asia, ISBN: 9788120331587

Reference Books

(1)Supply Chain Redesign – Transforming Supply Chains into Integrated Value Systems Robert B Handfield, Ernest L Nichols - Jr., 2002, Pearson Education Inc, ISBN: 81-297-0113-8

2. Modelling the Supply Chain -Jeremy F Shapiro, Duxbury -Thomson Learning -2002,ISBN 0-534-37363

3.Designing & Managing the Supply Chain -David Simchi Levi, Philip Kaminsky&Edith Simchi Levi -McGraw Hill.

HUMAN RESOURCE MANAGEMENT			
Course Code	20MPM252	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Introduction to Human Resources: Importance of Human Resources – Human Resource Planning, Job Analysis and Methods. Recruitment .

Recruiting Sources: Recruiting Efforts with possible constraint – ability to attract incumbents.
10 Hrs

Module-2

The Selection Process: Cost of Selection – Discrete Selection Process – The Comprehensive Approach – Key Elements in successful Predictors – Selection Devices – Employment Tests and Interviews.
Employee Training: Determination of Training Needs and Priorities – Formal Employee Training Methods – Methods for Training Managers.**10 Hrs**

Module-3

Career Development: Value of Effective Career Development – External versus Internal Dimensions to a career – Career Stages.

Motivating the Employees: Different Theories and Approaches to work Motivation – Job Design.Work scheduling and Motivation – Performance Appraisals – Rewarding the Productive Employee.
10 Hrs

Module-4

Compensating the Work Force: Compensation Administration – Factors influencing the Compensation Administration – Job Evaluation and Pay Structure – Incentive Compensation Plans – Benefits and Services.
10 Hrs

Module-5

Maintaining the Work Force: Labor Relations – some Legislation governing Labor Relations – Safety and Health of Workers – Combating Stress and Burnout Problems – Employee Discipline – disciplinary Actions – collective bargaining process.
10 Hrs

Course outcomes:
At the end of the course the student will be able to:
1. Understand the basic concepts of HRM, Functions and role of HRM.
2. Know methodology of job selection process implemented in various sectors.
3. Analyse the effectiveness in training, evaluating and benchmarking HR training.
4. Understand the career development concept and methods of personal appraisal.
5. Understand International activities of HRM, Staffing, communication, appraisal training and interview system.

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Reference Books

1. Principles of personnel management – Flippo – McGraw Hill.

2. Personnel principles and policies for modern manpower – Yoder Prentice Hall India.

3. Personnel/Human Resource Management – Terry Leap & Michael CrinocollierMacmillan publishers.

ADVANCED JOINING PROCESSES			
Course Code	20MPM253	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Welding Distortion: Introduction, Distortion and residual stresses, concept of distortion, types of distortion, Control of welding distortion, minimizing distortion in repair work, Effect of metal properties on welding distortion, Calculation of shrinkage.

Welding processes: Electro Slag Welding, Electron Beam Welding, Plasma arc Welding, Laser Beam Welding, Explosion Welding, Diffusion Welding, Ultrasonic Welding, Friction welding and Thermit welding.

10 Hrs

Module-2

Welding of Dissimilar Metals: Introduction, Concept and metallurgical problems in dissimilar metals welding, techniques for welding dissimilar metals, welding various dissimilar metals combination.

Welding of Plastics: Introduction, Principle of welding plastics, common weldable plastics, weld joint design, surface preparation, Plastics welding processes such as Heated tool welding, Hot gas welding, High frequency welding, Ultrasonic welding and Friction welding with their principle of operation, Equipment required, Advantages, Disadvantages and Application.**10 Hrs**

Module-3

Welding Symbols: Need for, representing the welds, Basic weld symbols, Location of Weld, Supplementary symbols, Dimensions of welds, Examples.

Welding Design: Introduction, Principles of sound welding design, Welding joint design Welding positions, Allowable strengths of welds, under steady loads. Allowable fatigue strength of weld. Design of weld subjected to combined stresses. Weld throat thickness, solved and Unsolved Examples.

10 Hrs

Module-4

Inspection of Welds: Destructive techniques like Tensile, Bend, and Nick break, Impact & Hardness. Non-Destructive techniques like 'X' rays, Ultrasonic, Magnetic particle, Dye Penetrate, Gamma ray inspection.

Quality Control in Welding: Introduction, Quality assurance v/s Quality control, Weld quality, Discontinuities in welds, their causes and remedies and Quality conflicts.

10 Hrs

Module-5

Computer-Aided Welding Design: Introduction, welding analysis, Engineering design v/s welding design, perspectives in welding design, solution to the welding design problems.

Computer-Aided Welding Analysis: Computer-aided welding analysis, computer-aided welding design, use of interactive computer graphics, cautions and conclusions.

10 Hrs

Course outcomes:

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

1. Introduce the various advanced welding techniques which make them interested to choose a career in the field of welding.
2. Understand the advanced welding practices in Industries and their comparative merits and demerits.
3. Select the right kind of welding techniques for joining raw materials of various thicknesses.
4. Select appropriate welding technique suitable for joining various types of metals.
5. Understand theComputer-Aided Welding Design andComputer-Aided Welding Analysis.

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

1. Welding Technology - O.P. Khanna
2. Welding Engineering - Rossi - McGraw Hill.
3. Advanced Welding processes – Nikodaco&Shansky - MIR Publications.
4. Welding Engineering Handbook - A.W.S.
5. Welding for Engineers - Udin, Funk &Wulf

PRODUCT LIFE CYCLE MANAGEMENT			
Course Code	20MPM254	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Product life cycle management: Need for PLM, Components of PLM, Product Data and Product workflow, Drivers for Change.
10 Hrs

Module-2

The PLM Strategy, Developing a PLM Strategy, A Five-step Process, Strategy Identification and Selection, Strategy Elements, Implications of Strategy Elements, Policies, Strategy Analysis, Communicating the Strategy.**10 Hrs**

Module-3

Change Management for PLM, Configuration management, Cost of design changes, schemes for concurrent engineering,Design for manufacturing and assembly, robust design, failure mode and effect-analysis.**10 Hrs**

Module-4

Modeling, Current concepts, part design, sketching, use of datum's construction features, free ovulation, pattering, copying, and modifying features, reference standards for datum specification, Standards for Engineering data exchange.**10 Hrs**

Module-5

Tolerance mass property calculations, rapid prototyping and tooling, finite modeling and analysis, general procedure, analysis techniques,Finite element modeling. Applicability of FEM, Static analysis, thermal analysis, dynamic analysis.**10 Hrs**

Course outcomes:
At the end of the course the student will be able to:
1. Gain knowledge about phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation.
2. Illustrate various approaches and techniques for designing and developing products.
3. Apply product engineering guidelines / thumb rules in designing products for molding, machining, sheet metal working etc.
4. Acquire knowledge in applying virtual product development tools for components, machining and manufacturing plant
5. Understand the Tolerance mass property calculations.

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Reference Books

(1)Product Lifecycle Management Paradigm for century Product Realization - John Stark, Springer-Verlag, 21st, London, 3rd printing - 2006. 441 pp., ISBN: 1-85233-810-5.

(2) CAD/CAM Theory and Practice - Zeid, McGraw Hill.- 1991.

(3)Computer Integrated Design and Manufacturing, - Mark Henderson & Philip Wolfe, BedworthMcGraw hill inc.- 1991.

(4)Part modeling Users Guide, Engineer - I998.

LABORATORY - II			
Course Code	20MPML26	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	0:4:0	SEE Marks	60
Credits	02	Exam Hours	03

Sl. NO	**Experiments**
1	Determination of Chip reduction co-efficient (reciprocal of chip thickness ratio) during single point turning
2	Forces measurements during orthogonal turning
3	Estimation of Power required during orthogonal turning
4	Torque and Thrust measurement during drilling
5	Roughness determination for machined surfaces and its influence of tool geometry and feed rate.
6	Study of capstan lathe and its tooling and prepare a tool layout & job as per given drawing
7	Study the principle & construction of the Metallurgical Microscope and prepare metallic samples for metallographic examination
8	Study of Microstructure and Hardening of steel in different medium and cooling rates
9	Effect of Carbon percentage on the hardness of Steel.
10	Determination of wear and coefficient of friction for the given specimen using pin on disc tester

Question paper pattern:
The SEE questions will be set for **100** marks:

1. Two experiments for **80** marks.
2. Viva voce for **20** marks.

TECHNICAL SEMINAR			
Course Code	20MPM27	CIE Marks	100
Number of contact Hours/week	0:0:2	SEE Marks	--
Credits	02	Exam Hours	--

Course objectives:

The objective of the seminar is to inculcate self-learning, face audience confidently, enhance communication skill, involve in group discussion and present and exchange ideas.

Each student, under the guidance of a Faculty, is required to

- Choose, preferably through peer reviewed journals, a recent topic of his/her interest relevant to the Course of Specialization.
- Carryout literature survey, organize the Course topics in a systematic order.
- Prepare the report with own sentences.
- Type the matter to acquaint with the use of Micro-soft equation and drawing tools or any such facilities.
- Present the seminar topic orally and/or through power point slides.
- Answer the queries and involve in debate/discussion.
- Submit two copies of the typed report with a list of references.

The participants shall take part in discussion to foster friendly and stimulating environment in which the students are motivated to reach high standards and become self-confident.

The CIE marks for the seminar shall be awarded (based on the relevance of the topic, presentation skill, participation in the question and answer session and quality of report) by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculties from the department with the senior most acting as the Chairperson.

Marks distribution for CIE of the course 20MPM27 seminar:

Seminar Report: 30 marks

Presentation skill:50 marks

Question and Answer:20 marks

*** END OF II SEMESTER***

TOTAL QUALITY MANAGEMENT			
Course Code	20MPM31	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Principles And Practice: Definition of TQM , basic approach, Obstacles to TQM, TQM Framework, benefits of TQM.
Business Evolution: Customer Satisfaction, four fitness of Customer Satisfaction, Evolution of Customer Satisfaction Methodology, Leadership vs Empowerment, Four Practical Revolutions in Management thinking , Four Levels of Practice.

10 Hrs

Module-2

Customer Focus: Change in the Work Concept: Market-in, Philosophy-in and Philosophyout, Evolution of Customer Focus and Its Challenges, Three Stages of Customer Focus, Customer Concerns, Integration of Concerns, Individualizing Customers.

10 Hrs

Module-3

Continuous Improvement: Management by process, WV Model of Continuous Improvement, Three types of improvements, Continuous Improvement of Processes for All Types of Work, Continuous Improvement verses breakthrough, Continuous Improvement and the Scientific Method.

10 Hrs

Module-4

Managing Existing Processes: Process Discovery and Management: Thinking In Terms of Process, Process Discovery, steps of Process Discovery, benefits of Process Discovery. The 7 QC Tools.

Proactive Improvement: Proactive Improvement concept, Kawakita's Five Principles, Language Data and Use of Semantics, Comparison of Affective and Report language, Five principles of Customer Visitation, The purpose of Proactive Improvement to Develop New Products.

10 Hrs

Module-5

Total Participation: Employee Involvement – Motivation, employee surveys, empowerment, teams, suggestion system, recognition and reward, gain sharing, performance appraisal, unions and employee involvement, three sets of skills of leader ship. QC Circles.

InititationStragiesAnd Mobilization : CEO involvement and the importance of CEO, A General Model for Mobilization, Hoshin Management, Hoshin Management and Its Parts, Proactive , Reactive, and Control phases in Management.

10 Hrs

Course outcomes:

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

1. Learn the principles and practices of TQM.
2. Know the evolution and challenges made in industries by TQM.
3. Understand the models to solve the problems and improving the circumstances.
4. Learn the quality tools implemented in industries and its performances
5. Know the involvement of employees and the changes by management.

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module. ■

Textbook/ Textbooks

(1) Four Practical Revolutions in Management: systems for creating unique organizational capability" -Shoji Shiba and David Walden,– Productivity Press &Center for Quality Management, (USA) , 2001, Special Indian Edition,ISBN- 9781563273889/9781563272172/ 9781563272318

(2) "Total Quality Management"- *Besterfield*, Pearson Education, 2011. ISBN,817758412X, 9788177584127

Reference Books

(1)"Management for Total Quality" -N Logothetis- Prentice Hall of India, New Delhi,2003, ISBN-81-203-1137-X

(2)"Total Quality Management"-H D Ramachandra and K R Phanesh-2006 edition.

RAPID PROTOTYPING			
Course Code	20MPM321	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Module-1

Introduction: Need for the compression in product development, history of RP systems, Survey of applications, Growth of RP industry, and classification of RP systems.

Stereo Lithography Systems: Principle, Process parameter, Process details, Data preparation, data files and machine details, Application.

08 Hrs

Module-2

Selective Laser Sintering and Fusion Deposition Modeling: Type of machine, Principle of operation, process parameters, Data preparation for SLS, Applications, Principle of Fusion deposition modeling, Process parameter, Path generation, Applications.

Solid Ground Curing: Principle of operation, Machine details, Applications.

08 Hrs

Module-3

Laminated Object Manufacturing: Principle of operation, LOM materials. Process details, application.

Concepts Modelers: Principle, Thermal jet printer, Sander's model market, 3-D printer. GenisysXs printer HP system 5, object Quadra systems.

08 Hrs

Module-4

Rapid Tooling: Indirect Rapid tooling -Silicone rubber tooling – Aluminum filled epoxy tooling Spray metal tooling, Cast kirksite, 3Q keltool, etc. Direct Rapid Tooling Direct. AIM, Quick cast process, Copper polyamide, Rapid Tool, DMILS, Prometal, Sand casting tooling, Laminate tooling soft Tooling vs. hard tooling.

08 Hrs

Module-5

RP Process Optimization: factors influencing accuracy. Data preparation errors, Part building errors, Error in finishing, influence of build orientation.

08 Hrs

Course outcomes:

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

1. Describe product development, conceptual design and classify rapid prototyping systems; explain stereo lithography process and applications.
2. Explain direct metal laser sintering, LOM and fusion deposition modeling processes.
3. Demonstrate solid ground curing principle and process.
4. Discuss LENS, BPM processes; point out the application of RP system in medical field define virtual prototyping and identify simulation components.
5. Understand the RP Process Optimizations.

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module. ■

Textbooks

(1) 1. Stereo lithography and other RP & M Technologies - Paul F. Jacobs - SME, NY 1996.

(2) 2. Rapid Manufacturing - Flham D.T &Dinjoy S.S - Verlog London

Reference Books

(1. Wohler's Report 2000 - Terry Wohlers - Wohler's Association - 2000.

ADVANCED FLUID POWER SYSTEMS			
Course Code	20MPM322	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Module-1

Fluid Power Systems And Fundamentals: Introduction to fluid power system Review of Pascal's law and its applications in Fluid Power Systems, Structure of Hydraulic control system, Advantages and disadvantages of fluid power & its applications.

The Source of Hydraulic Power: Hydraulic Pumps, pumping theory, pump classification, Gear pumps, Vane pumps, piston pumps, variable displacement pumps, pump performance and pump selection.

08 Hrs

Module-2

Hydraulic Actuators: Linear Hydraulic Actuators (cylinder),Cylinder mountings, Cylinder Force,Velocity and Power, Cylinder loading through mechanical linkages, Hydraulic Cylinder cushions, hydraulic Rotary Actuators, Gear motors, vane motors, piston motors, Hydraulic theoretical torque , power and flow rate.

Control components in Hydraulic Systems:
i) Directional Control Valves – Classification, 2/2, 3/2,4/2 & 4/3 ways DCV's, Different Centre configurations in 4/3 way valves, actuation of DCV's, Indirect actuation, Valve Lap – Lap during Stationary and during switching.
ii) Pressure Control Valves: Classification, opening & Closing Pressure difference, Cracking Pressure, Pressure Relief Valve – Simple & Compound type,
iii) Flow Control valves – Fixed throttle, Variable throttle, Pressure Compensation principles
iv) Check valve, Pilot operated check valve.

08 Hrs

Module-3
Hydraulic Circuit Design &Analysis: Control of single and double – acting hydraulic cylinder, regenerative circuit, pump unloading circuit, Double pump hydraulic system, Counter Balance valve application, Hydraulic cylinder sequencing circuits. Locked cylinder using pilot check valve, Cylinder synchronizing circuits, Speed control of hydraulic cylinder, Speed control of hydraulic motors, Accumulators and accumulator circuits. **08 Hrs**
Module-4
Introduction to Pneumatic Control: Production of compressed air-Compressors, Preparation of compressed air –Driers, Filters, Regulators, Lubricators. Structure of Pneumatic control system. Pneumatic Actuators: Linear cylinders-types, end position cushioning, Rod-less cylinders, working advantages. Cylinder performance. Rotary actuator types, construction and application. **Pneumatic Valve:** Directional control valves, impulse valve, Quick exhaust valve, shuttle valve, Twin pressure valve, Time delay valve. **08 Hrs**
Module-5
Pneumatic Circuit & Logic Circuits:- Control of single and double acting cylinder, impulse operation, speed control, sequencing, Pneumatic Vacuum system AND,OR, NOT, NAND, NOR, YES Function, Logic circuits design using shuttle valve & twin pressure valve, Binary Arithmetic, logic &Boolean Algebra, use of kannaughveitch map for pneumatic circuit design. **08 Hrs**
Course outcomes: At the end of the course the student will be able to: 1. Explain the working principle and performance parameters of various hydraulic and pneumatic components and systems. 2. Design hydraulic and pneumatic circuits for mechanical engineering applications. 3. Analyze performance evaluation of fluid power systems and propose improvements. 4. Understand the Control of single and double acting cylinder, impulse operation, speed control, sequencing, Pneumatic Vacuum system AND,OR, NOT, NAND, NOR, YES Functions. 5. Analyse the Electrical Control in Fluid Power systems.
Question paper pattern: The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60. • The question paper will have ten full questions carrying equal marks. • Each full question is for 20 marks. • There will be two full questions (with a maximum of four sub questions) from each module. • Each full question will have sub question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module. ■
Textbooks

(1) 1. Fluid power with applications, Anthony Esposito, Seventh edition, Pearson education,Inc, 2008
(2) 2. Pneumatic systems, S.R.Majumadar, Tata McGraw Hill Publishing Co., 2001.
Reference Books
(1) 1. Oil Hydraulic systems – principles and maintenance, S.R. Majumdar, Tata McGrawHill publishing company Ltd., 2003.
(2) 2. Pneumatics and Hydraulics, Andrew Parr. Jaico publishing Co., 2006.
(3) 3. Components & Application - Bosch Rexroth didactic - Hydraulics Trainer - Vol 1.Publication

SURFACE TREATMENT AND FINISHING			
Course Code	20MPM323	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Module-1

Fundamentals of Electro plating: Galvanizing, Hot dip metal coating, thin coating, thin coating, chromium plating, Nickel plating.

08 Hrs

Module-2

Vacuum coating, FVD & CVD metal spraying - Methods, surface preparation, mechanical. Properties of sprayed metals, plasma coating.

08 Hrs

Module-3

Plastic coating of metal - PVC coating Spherodising process details, phosphate coating - mechanism of formation.

08 Hrs

Module-4

Heat treatment methods: Annealing, Normalizing, Tempering, Case hardening methods, flame hardening sub zero treatment.

08 Hrs

Module-5

Heat treatment methods for gears, spindles, cutting tools.

Advanced coating technologies: Hard facing, electro deposition technique, coating characterization.

08 Hrs

Course outcomes:

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

1. To understand the principles of operations, tests to evaluate mechanical and tribological properties.
2. To understand the principles of failure analysis and examination of failed components.
3. To understand the strain rate testing, test machine requirements and specimens measurements.
4. To understand and describe the different types of coating and working principles.
5. To learn and understand different heat treatment processes and their effect on finishing.

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module. ■

Reference Books

(1) 1. Surface preparations & finishes for Metals - James A Murphy - McGraw Hill.

(2) 2. Principles of metal surface treatment and protection - Pergamon Press Gabe, DavidRussell - Description, Oxford ; New York - 2d ed., 1978
(3) 3. Handbook of metal treatment and testing - John wiley& sons.

VALUE ENGINEERING			
Course Code	20MPM324	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Module-1

INTRODUCTION TO VALUE ANALYSIS: Definition of Value, Value Analysis, Value Engineering, Value management, Value Analysis versus Value Engineering, Value Analysis versus Traditional cost reduction techniques, Symptoms to apply value analysis, Coaching of Champion concept.

TYPE OF VALUES: Reasons for unnecessary cost of 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.

08 Hrs

Module-2

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.

PROBLEM SETTING & SOLVING SYSTEM: A problem solvable stated is half solved, Steps in problem setting system, Identification, Separation and Grouping of functions. Case studies.

08 Hrs

Module-3

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.

PROBLEM SETTING & SOLVING SYSTEM: A problem solvable stated is half solved, Steps in problem setting system, Identification, Separation and Grouping of functions. Case studies.

08 Hrs

Module-4

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.

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).

08 Hrs

Module-5

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.
08 Hrs

Course outcomes:

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

1. To understand the concepts of value engineering, identify the advantages, applications.
2. To understand various phases of value engineering. Analyze the function, its approach and evaluation.
3. To learn queuing theory.
4. To evaluate the value engineering operation in maintenance and repair activities.
5. To create the value engineering team and discuss the value engineering case studies.

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module. ■

Textbooks

(1)Techniques of Value Analysis and Engineering– Lawrence D. Miles, McGraw – Hill Book Company, 2ndEdn.

(2)Value engineering for Cost Reduction and Product Improvement – M.S. Vittal, Systems Consultancy Services Edn 1993

(3)Value Management, Value Engineering and Cost Reduction – Edward D Heller Addison Wesley Publishing Company 1971

Reference Books

(1)Value Analysis for Better Management – Warren J Ridge American Management Association Edn 1969

(2)Getting More at Less Cost (The Value Engineering Way) – G.Jagannathan Tata Mcgraw Hill Pub. Comp. Edn 1995

(3)Value Engineering – Arther E Mudge McGraw Hill Book Comp. Edn 1981

SIMULATION AND MODELING OF MANUFACTURING SYSTEMS			
Course Code	20MPM331	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Module-1

Principle of Computer Modelling and Simulation: Monte Carlo simulation. Nature of computer- modelling and simulation. Limitations of simulation, areas of applications.

System and Environment: Components of a system -discrete and continuous systems, Models of a system -a variety of modelling approaches.

08 Hrs

Module-2

Discrete Event Simulation: Concepts in discrete event simulation, manual simulation using event scheduling, single channel queue, too server queue, simulation of inventory problem.

Statistical Models in Simulation: Discrete distributions, continuous distributions.

08 Hrs

Module-3

Random Number Generation: Techniques for generating random numbers- Mid square method -the mod product method -Constant multiplier technique -Additive congruential method –Linear congruential method -Tests for random numbers -The Kolmogorov-Smimov test -the Chi-square test. IvicaCmkovic, Ulfaskluna and AnnitaborsenDohlgvist Publisher Artechhouse.

08 Hrs

Module-4

Random Variable Generation: Inversion transforms technique-exponential distribution. Uniform distribution, weibul distribution, continuous distribution, generating approximate normal variates-Erlang distribution.

Empirical Discrete Distribution: Discrete uniform -distribution poisson distribution geometric distribution - acceptance -rejection technique for Poisson distribution gamma distribution.

08 Hrs

Module-5

Design and Evaluation of Simulation Experiments: variance reduction techniques antithetic variables, variables verification and validation of simulation models. Simulation Software: Selection of simulation software, simulation packages.

08 Hrs

Course outcomes:
At the end of the course the student will be able to:
1. Describe the role of important elements of discrete event simulation and modeling paradigm.
2. Conceptualize real world situations related to systems development decisions, originating from source requirements and goals.
3. Develop skills to apply simulation software to construct and execute goal-driven system models.
4. Interpret the model and apply the results to resolve critical issues in a real world environment.
5.Understand the Input modeling, verification and validation of simulation models.

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module. ■

Textbooks

Discrete Event System Simulation - Jerry Banks & .John S Carson II - Prentice HallInc.-1984.

(2) Systems Simulation - Gordan. G. - Prentice Hall India Ltd - 1991

Reference Books

(1) 1. System Simulation with Digital Computer - NusingDeo - Prentice Hall of India -1979.

(2) 2. Computer Simulation and Modeling- Francis Neelamkovil - John Wilely& Sons 1987.

(3) 3. Simulation Modeling with Pascal - RathM.Davis& Robert M O Keefe – PrenticeHall Inc. - 1989.

ADVANCED FOUNDRY TECHNOLOGY			
Course Code	20MPM332	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Module-1

Solidification Of Casting: Concept of solidification of metals. Homogenous and heterogeneous nucleation.Growthmechanism.Solidification of pure metals and alloys.Mechanism of columnar and dendritic growth.Coring or Segregation.Concept of progressive and directional solidifications.

Principles Of Casting And Risering: Design of the gating System. Different types of gates. Gating ratio and its functions.Definition and functions of the riser.Types of risers and their application.Design of the riser - its shape.Size and location.

08 Hrs

Module-2

Design Of Casting: Factors to be considered in casting design. Design consideration in pattern making, moulding techniques and core making and assembly. Cooling stresses and hot spots in casting and modification in casting geometry to overcome them.

Casting Quality Control: Casting defects and factors responsible for them.Different inspection and testing methods to evaluate the casting.Quality control activities in a foundry.Salvaging methods of defective casting.

08 Hrs

Module-3

Furnace Technology: Melting furnace design, Heat sources, developments, melting conditions, losses, special melt treatments, melt temperature. Pouring equipments and techniques, special pouring techniques, Ladle heating and insulation. Study of various furnaces used in foundry, construction and operation of crucible and hearth furnaces. Resistance, Arc and Induction furnaces-their construction. Operation and application.

08 Hrs

Module-4

Steel Casting Practice: Common steel casting, their composition, structure and properties. Melting and refining of steel. Gating and risering of steel castings cleaning of steel castings.

Aluminium Foundry Practice: Composition, properties and application of common aluminum alloy casting. Melting and casting of AI-alloys. Gating and risering of AIalloy casting.

08 Hrs

Module-5

Foundry Mechanization And Modernization: Introduction to modernization. Mechanization of foundry and its advantages. Mechanization of sand plant, moulding and core making mechanization in melting, pouring and shakeout units. Material handling equipments and conveyor systems. Captive and mechanized foundries.

08 Hrs

Course outcomes:

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

1. Understand the Solidification process, Gates and Risers types and design
2. Design simple casting design and learn casting defects
3. Understand constructional features and working of different foundry furnaces
4. Understand Ferrous and Aluminum metals and alloys
5. Understand Foundry Mechanization and Modernization

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module. ■

Reference Books

1. Principle of metal casting - Heine, et. al - Tata-McGraw-HiII Publication - 2003.

2. A test book of FoundryTechnology - Lal, M. Khanna, P.O - DhanpatRai& Sons Publication

3. Foundry Technology – PeeterBeelely, – Butterworth

PROJECT MANAGEMENT			
Course Code	20MPM333	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Module-1

Introduction: Identification of Investment Opportunities, Market and Demand Analysis – Technical Analysis -Investment Outlay.

08 Hrs

Module-2

Means of Financing-Profitability and Breakeven Analysis -Cash Flows of Projects -Tax factor in investment Analysis -Interest Compounding and Discounting.

08 Hrs

Module-3

Appraisal Criteria and Selection of Investment- cost of capital analysis of Risk -Financial Projection, social Cost Benefit Analysis.

08 Hrs

Module-4

Manpower Management in Projects-Functional Approach to Manpower Management, - the Element of decision Process Project Team Concepts - Field Autonomy- Policies Governing Projects.

08 Hrs

Module-5

Networks Techniques in Project Management-PERT/CPM Analysis - Administrative aspects of Capital Investment.

08 Hrs

Course outcomes:

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

1. Apply selection criteria and select an appropriate project from different options.
2. Write work break down structure for a project and develop a schedule based on it.
3. Identify opportunities and threats to the project and decide an approach to deal with them strategically.
4. Use Earned value technique and determine & predict status of the project.
5. Capture lessons learned during project phases and document them for future reference

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module. ■

Reference Books

1. Projects - appraisal, preparation, budgeting and implementation – Prasannachandra - Tata MCgraw hill
2. Handbook of Project Management - Dennis lock.
3. Project Management - Dennis lock - Gower Publishing Ltd - 8th Revised edition.

COMPUTER APPLICATIONS IN DESIGN			
Course Code	20MPM334	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Module-1

Introduction to CAD/CAM/CAE Systems: Overview, Definitions of CAD. CAM and CAE, Integrating the Design and Manufacturing Processes through a Common Database-A Scenario, Using CAD/CAM/CAE Systems for Product Development.

Components of CAD/CAM/CAE Systems: Hardware Components ,Vector-Refresh (Stroke- Refresh) Graphics Devices, Raster Graphics Devices, Hardware configuration, Software Components.

08 Hrs

Module-2

Basic Concepts of Graphics Programming: Graphics Libraries, Coordinate Systems, Window and Viewport, Output Primitives - Line, Polygon, Marker Text, Graphics Input, Display List, Transformation Matrix, Translation, Rotation, Mapping, Other Transformation Matrices, Hidden-Line and Hidden-Surface Removal, Back-Face Removal Algorithm, Depth-Sorting, or Painter.s, Algorithm, Hidden-Line Removal Algorithm, z-Buffer Method, Rendering, Shading, Ray Tracing, Graphical User Interface, X Window System.

08 Hrs

Module-3

Representation and Manipulation of Curves: Types of Curve Equations, Conic Sections, Circle or Circular Arc, Ellipse or Elliptic Arc, Hyperbola, Parabola, Hermite Curves, Bezier Curve, Differentiation of a Bezier Curve Equation, Evaluation of a Bezier Curve, B-Spline Curve, Evaluation of a B-Spline Curve, Composition of B-Spline Curves, Differentiation of a B-Spline Curve, Non-uniform Rational B-Spline (NURBS) Curve.

Representation and Manipulation of Surfaces: Types of Surface Equations, Bilinear Surface, Coon's Patch, Bicubic Patch, Bezier Surface, Evaluation of a Bezier Surface.

08 Hrs

Module-4

CAD and CAM Integration : Overview of the Discrete Part Production Cycle, Process Planning, Manual Approach, Variant Approach, Generative Approach, Computer-Aided Process Planning Systems, CAM-I CAPP, MIPLAN and Multi CAPP, Met CAPP, ICEM- PART, Group Technology, Classification and Coding, Existing Coding Systems, Product Data Management (PDM) Systems.

08 Hrs

Module-5

Standards for Communicating Between Systems: Exchange Methods of Product Definition Data, Initial Graphics Exchange Specification, Drawing Interchange Format, Standard for the Exchange of Product Data. Tutorials, Computational exercises involving Geometric Modeling of components and their assemblies.

08 Hrs

Course outcomes:
At the end of the course the student will be able to:
1. Analyse the Overview, Definitions of CAD. CAM and CAE, Integrating the Design and Manufacturing.
2. Understand the concept of Basic Concepts of Graphics Programming.
3. Understand the Representation and Manipulation of Surfaces and Representation and Manipulation of Curves.

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module. ■

Textbooks

(1)Principles of CAD/CAM/CAE systems – Kunwoo - Lee Addison Wesley -1999

(2)CAD/CAM/CIM - Radhakrishnan P. et al. - New Age International - 2008

Reference Books

(1)CAD/CAM – Theory & Practice - Ibrahim Zeid - McGraw Hill - 1998

(2)Computer Integrated Design and Manufacturing - Bedworth, Mark Henderson &Philip Wolfe - McGraw hill inc. - 1991.

(3)Part modeling Users Guide - Pro-Engineer - 1998

PROJECT WORK PHASE – 1			
Course Code	20MPM34	CIE Marks	100
Number of contact Hours/Week	2	SEE Marks	--
Credits	02	Exam Hours	--

Course objectives:

- Support independent learning.
- Guide to select and utilize adequate information from varied resources maintaining ethics.
- Guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly.
- Develop interactive, communication, organisation, time management, and presentation skills.
- Impart flexibility and adaptability.
- Inspire independent and team working.
- Expand intellectual capacity, credibility, judgement, intuition.
- Adhere to punctuality, setting and meeting deadlines.
- Instil responsibilities to oneself and others.
- Train students to present the topic of project work in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas.

Project Phase-1 Students in consultation with the guide/s shall carry out literature survey/ visit industries to finalize the topic of the Project. Subsequently, the students shall collect the material required for the selected project, prepare synopsis and narrate the methodology to carry out the project work.

Seminar: Each student, under the guidance of a Faculty, is required to

- Present the seminar on the selected project orally and/or through power point slides.
- Answer the queries and involve in debate/discussion.
- Submit two copies of the typed report with a list of references.

The participants shall take part in discussion to foster friendly and stimulating environment in which the students are motivated to reach high standards and become self-confident.

Course outcomes:

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

- Demonstrate a sound technical knowledge of their selected project topic.
- Undertake problem identification, formulation, and solution.
- Design engineering solutions to complex problems utilising a systems approach.
- Communicate with engineers and the community at large in written an oral forms.
- Demonstrate the knowledge, skills and attitudes of a professional engineer.

Continuous Internal Evaluation

CIE marks for the project report (50 marks), seminar (30 marks) and question and answer (20 marks) shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session by the student) by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculty from the department with the senior most acting as the Chairperson.

MINI PROJECT			
Course Code	20MPM35	CIE Marks	40
Number of contact Hours/Week	2	SEE Marks	60
Credits	02	Exam Hours/Batch	03

Course objectives:

- To support independent learning and innovative attitude.
- To guide to select and utilize adequate information from varied resources upholding ethics.
- To guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly.
- To develop interactive, communication, organisation, time management, and presentation skills.
- To impart flexibility and adaptability.
- To inspire independent and team working.
- To expand intellectual capacity, credibility, judgement, intuition.
- To adhere to punctuality, setting and meeting deadlines.
- To instil responsibilities to oneself and others.
- To train students to present the topic of project work in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas.

Mini-Project: Each student of the project batch shall involve in carrying out the project work jointly in constant consultation with internal guide, co-guide, and external guide and prepare the project report as per the norms avoiding plagiarism.

Course outcomes:

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

- Present the mini-project and be able to defend it.
- Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.
- Habituated to critical thinking and use problem solving skills.
- Communicate effectively and to present ideas clearly and coherently in both the written and oral forms.
- Work in a team to achieve common goal.
- Learn on their own, reflect on their learning and take appropriate actions to improve it.

CIE procedure for Mini - Project:

The CIE marks awarded for Mini - Project, shall be based on the evaluation of Mini - Project Report, Project Presentation skill and Question and Answer session in the ratio 50:25:25.The marks awarded for Mini - Project report shall be the same for all the batch mates.

Semester End Examination

SEE marks for the mini-project shall be awarded based on the evaluation of Mini-Project Report, Presentation skill and Question and Answer session in the ratio 50:25:25 by the examiners appointed by the University.

INTERNSHIP / PROFESSIONAL PRACTICE			
Course Code	20MPMI36	CIE Marks	40
Number of contact Hours/Week	2	SEE Marks	60
Credits	06	Exam Hours	03

Course objectives:

Internship/Professional practice provide students the opportunity of hands-on experience that include personal training, time and stress management, interactive skills, presentations, budgeting, marketing, liability and risk management, paperwork, equipment ordering, maintenance, responding to emergencies etc. The objective are further,

To put theory into practice.

To expand thinking and broaden the knowledge and skills acquired through course work in the field.

To relate to, interact with, and learn from current professionals in the field.

To gain a greater understanding of the duties and responsibilities of a professional.

To understand and adhere to professional standards in the field.

To gain insight to professional communication including meetings, memos, reading, writing, public speaking, research, client interaction, input of ideas, and confidentiality.

To identify personal strengths and weaknesses.

To develop the initiative and motivation to be a self-starter and work independently.■

Internship/Professional practice: Students under the guidance of internal guide/s and external guide shall take part in all the activities regularly to acquire as much knowledge as possible without causing any inconvenience at the place of internship.

Seminar: Each student, is required to

- Present the seminar on the internship orally and/or through power point slides.
- Answer the queries and involve in debate/discussion.
- Submit the report duly certified by the external guide.
- The participants shall take part in discussion to foster friendly and stimulating environment in which the students are motivated to reach high standards and become self-confident. ■

Course outcomes:

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

- Gain practical experience within industry in which the internship is done.
- Acquire knowledge of the industry in which the internship is done.
- Apply knowledge and skills learned to classroom work.
- Develop a greater understanding about career options while more clearly defining personal career goals.
- Experience the activities and functions of professionals.
- Develop and refine oral and written communication skills.
- Identify areas for future knowledge and skill development.
- Expand intellectual capacity, credibility, judgment, intuition.
- Acquire the knowledge of administration, marketing, finance and economics. ■

Continuous Internal Evaluation CIE marks for the Internship/Professional practice report (20 marks), seminar (10 marks) and question and answer session (10 marks) shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session by the student) by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculty from the department with
Semester End Examination SEE marks for the internship report (30 marks), seminar (20 marks) and question and answer session (10 marks) shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session) by the examiners appointed by the University. ■

PROJECT WORK PHASE -2			
Course Code	20MPM41	CIE Marks	40
Number of contact Hours/Week	4	SEE Marks	60
Credits	20	Exam Hours	03

Course objectives:

- To support independent learning.
- To guide to select and utilize adequate information from varied resources maintaining ethics.
- To guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly.
- To develop interactive, communication, organisation, time management, and presentation skills.
- To impart flexibility and adaptability.
- To inspire independent and team working.
- To expand intellectual capacity, credibility, judgement, intuition.
- To adhere to punctuality, setting and meeting deadlines.
- To instil responsibilities to oneself and others.
- To train students to present the topic of project work in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas. ■

Project Work Phase - II: Each student of the project batch shall involve in carrying out the project work jointly in constant consultation with internal guide, co-guide, and external guide and prepare the project report as per the norms avoiding plagiarism. ■

Course outcomes:

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

- Present the project and be able to defend it.
- Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.
- Habituated to critical thinking and use problem solving skills
- Communicate effectively and to present ideas clearly and coherently in both the written and oral forms.
- Work in a team to achieve common goal.
- Learn on their own, reflect on their learning and take appropriate actions to improve it. ■

Continuous Internal Evaluation:

Project Report: 20 marks. The basis for awarding the marks shall be the involvement of the student in the project and in the preparation of project report. To be awarded by the internal guide in consultation with external guide if any.

Project Presentation: 10 marks.

The Project Presentation marks of the Project Work Phase -II shall be awarded by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculty from the department with the senior most acting as the Chairperson.

Question and Answer: 10 marks.

The student shall be evaluated based on the ability in the Question and Answer session for 10 marks.

Semester End Examination

SEE marks for the project report (30 marks), seminar (20 marks) and question and answer session (10 marks) shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session) by the examiners appointed by the University. ■