VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI.

Scheme of Teaching and Examinations and Syllabus

M.Tech**Production Engineering & System Technology (MPT)**

(Effective from Academic year 2020 - 21)

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
Scheme of Teaching and Examinations – 2020 - 21
M.Tech Production Engineering & System Technology (PEST)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

I SEMESTER

Sl. No	Course	Course Code	Course Title	Teaching Hours per Week			Examination				Credits
				Theory	Practical	Skill Development Activities	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	P	SDA					
1	PCC	20MPT11	Mathematical Methods in Engg.	03	--	02	03	40	60	100	4
2	PCC	20MPT12	Decision-Making Techniques	03	--	02	03	40	60	100	4
3	PCC	20MPT13	CIM and Automation	03	--	02	03	40	60	100	4
4	PCC	20MPT14	Theory of Metal Cutting	03	--	02	03	40	60	100	4
5	PCC	20MPT15	Composite Materials	03	--	02	03	40	60	100	4
6	PCC	20MPTL16	Production Engg. Laboratory	--	04	--	03	40	60	100	2
7	PCC	20RMI17	Research Methodology and IPR	01	--	02	03	40	60	100	2
			TOTAL	**17**	**04**	**12**	**21**	**280**	**420**	**700**	**24**

Note: PCC: Professional core.

Skill development activities:
Students and course instructor/s to involve either individually or in groups to interact together to enhance the learning and applicationskills.
The students should interact with industry (small, medium and large), understand their problems or foresee what can be undertaken for study in the form of research/ testing / projects, and for creative and innovative methods to solve the identified problem.
The students shall
(1) Gain confidence in modelling of systems andalgorithms.
(2) Work on different software/s (tools) to Simulate, analyse and authenticate the output to interpret and conclude. Operate the simulated system under changed parameter conditions to study the system with respect to thermal study, transient and steady state operations,etc.
(3) Handle advanced instruments to enhance technicaltalent.
(4) Involve in case studies and field visits/ fieldwork.
(5) Accustom with the use of standards/codes etc., to narrow the gap between academia andindustry.
All activities should enhance student's abilities to employment and/or self-employment opportunities, management skills, Statistical analysis, fiscal expertise,etc.

Internship: All the students have to undergo mandatory internship of 6 weeks during the vacation of I and II semesters and /or II and III semesters. A University examination shall be conducted during III semester and the prescribed internship credit shall be counted for the same semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/complete the internship shall be declared as fail in internship course and have to complete the same during the subsequent University examination after satisfying the internship requirements.

Note: (i) Four credit courses are designed for 50 hours Teaching – Learning process.
(ii) Three credit courses are designed for 40 hours Teaching – Learningprocess.
(iii) Two credit courses are designed for 25 hours Teaching – Learningprocess.

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II SEMESTER

Sl. No	Course	Course Code	Course Title	Teaching Hours /Week			Examination				Credits
				Theory	Practical/ Seminar	Skill Development Activities	Duration in hours	CIE Marks		Total Marks	
				L	P	SDA					
1	PCC	20MPT21	Non-Conventional Machining Processes	03	--	02	03	40	60	100	4
2	PCC	20MPT22	Quality Assurance and Reliability	03	--	02	03	40	60	100	4
3	PCC	20MPT23	Tool Engineering and Design	03	--	02	03	40	60	100	4
4	PEC	20MPT24X	Professional elective 1	04	--	--	03	40	60	100	4
5	PEC	20MPT25X	Professional elective 2	04	--	--	03	40	60	100	4
6	PCC	20MPTL26	QT and QC Laboratory	--	04	--	03	40	60	100	2
7	PCC	20MPT27	Technical Seminar	--	02	--	--	100	--	100	2
TOTAL				**17**	**06**	**06**	**18**	**340**	**360**	**700**	**24**

Note: PCC: Professional core, PEC: Professional Elective.

Professional Elective 1		**Professional Elective 2**	
Course Code under 20MPT24X	**Course title**	**Course Code under 20MPT25X**	**Course title**
20MPT241	Operations Management	20MPT251	Design of Experiments
20MPT242	Industrial Robotics	20MPT252	Agile Manufacturing
20MPT243	Design for Manufacturing and Assembly	20MPT253	Advanced Materials and Processing
20MPT244	**Product Data Management**	20MPT254	Organizational Behaviour

Note:

1. Technical Seminar: CIE marks shall be awarded by a committee comprising of HoD as Chairman, Guide/co-guide, if any, and a senior faculty of the department. Participation in the seminar by all postgraduate students of the programme shall bemandatory.

The CIE marks awarded for Technical Seminar, shall be based on the evaluation of Seminar Report, Presentation skill and performance in Question and Answer session in the ratio 50:25:25.

2. Internship: All the students shall have to undergo mandatory internship of 6 weeks during the vacation of I and II semesters and /or II and III semesters. A University examination shall be conducted during III semester and the prescribed internship credit shall be counted in the same semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/complete the internship shall be declared as fail in internship course and have to complete the same during the subsequent University examination after satisfyingthe internship requirements.

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III SEMESTER

Sl. No	Course	Course Code	Course Title	Teaching Hours /Week			Examination				Credits
				Theory	Practical/ Mini–Project/ Internship	Skill Development activities	Duration in hours	CIE Marks		Total Marks	
				L	P	SDA					
1	PCC	20MPT31	Advanced Manufacturing Practices	03	--	02	03	40	60	100	4
2	PEC	20MPT32X	Professional elective 3	03	--	--	03	40	60	100	3
3	PEC	20MPT33X	Professional elective 4	03	--	--	03	40	60	100	3
4	Project	20MPT34	Project Work phase -1	--	02	--	--	100	--	100	2
5	PCC	20MPT35	Mini-Project	--	02	--	--	100	--	100	2
6	Internship	20MPTI36	Internship	(Completed during the intervening vacation of I and II semesters and /or II and III semesters.)			03	40	60	100	6
TOTAL				**09**	**04**	**02**	**12**	**360**	**240**	**600**	**20**

Note: PCC: Professional core, PEC: Professional Elective.

Professional elective 3		**Professional elective 4**	
Course Code under	**Course title**	**Course Code under**	**Course title**
20MPT321	Applied Micro-Economics	20MPT331	Non-Destructive Testing
20MPT322	Surface Treatment and Finishing	20MPT332	Simulation and Modeling of Manufacturing Systems
20MPT323	Industrial Design and Ergonomics	20MPT333	Advanced Fluid Power Systems
20MPT324	Human Resources Management	20MPT334	Project Management

Note:

1. Project Work Phase-1: Students in consultation with the guide/co-guide if any, shall pursue literature survey and complete the preliminary requirements of selected Project work. Each student shall prepare relevant introductory project document, and present aseminar.

CIE marks shall be awarded by a committee comprising of HoD as Chairman, Guide/co-guide if any, and a senior faculty of the department. The CIE marks awarded for project work phase -1, shall be based on the evaluation of Project Report, Project Presentation skill and performance in Question and Answer session in the ratio50:25:25.

SEE (University examination) shall be as per the University norms.

2. Internship: Those, who have not pursued /completed the internship shall be declared as fail in internship course and have to complete the same during subsequent University examinations after satisfying the internship requirements. Internship SEE (University examination) shall be as per the Universitynorms.

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IV SEMESTER

Sl. No	Course	Course Code	Course Title	Teaching Hours /Week		Examination				Credits
				Theory	Practical/ Field work	Duration in hours	CIE Marks	SEE Marks Viva voce	Total Marks	
				L	P					
1	Project	20MPT41	Project work phase -2	--	04	03	40	60	100	20
			TOTAL	--	**04**	**03**	**40**	**60**	**100**	**20**

Note:

1. Project Work Phase-2:

CIE marks shall be awarded by a committee comprising of HoD as Chairman, Guide/co-guide, if any, and a Senior faculty of the department. The CIE marks awarded for project work phase -2, shall be based on the evaluation of Project Report subjected to plagiarism check, Project Presentation skill and performance in Question and Answer session in the ratio 50:25:25.

SEE shall be at the end of IV semester. Project work evaluation and Viva-Voce examination (SEE), after satisfying the plagiarism check, shall be as per the University norms.

MATHEMATICAL METHODS IN ENGG. (common to MPT, MPE, MPD, MEM, MPM, MPY, & MSE)			
Course Code	**20MPT11**	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, roundoff 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 20marks.
- There will be two full questions (with a maximum of four sub questions) from eachmodule.
- Each full question will have sub question covering all the topics under amodule.
- The students will have to answer five full questions, selecting one full question from eachmodule.

Textbook/ 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.

DECISION MAKING TECHNIQUES			
Course Code	**20MPT12**	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Introduction: Statistics and managerial decisions, statistical data and Operations Research techniques.

Fundamentals of Statistics and Probability: Presentation and Analysis of Statistical Data, Measures of Central tendency and Location, Measure of Dispersion, Skewness and Kurtosis: Numerical Problems, Introduction to Probability and basic rules of probability**.**
. 10Hrs

Module-2

Decision Making under Uncertainty: Alternative criteria for decision under uncertainty, Bayesian approach and Incremental analysis.
Linear Programming Problem: Formulation of LPPs, Solution of LPPs by graphical method. **Solution of LPP by simplex method**: Concept of duality and solution of dual problems, Solution of LPP by dual simplex method and Sensitivity analysis.
. **10Hrs**

Module-3

Transportation and Assignment Problems: Structure of transportation problem and various methods to find IBFS, Optimality test of transportation problems by MODI method, Solution of degeneracy and unbalanced transportation problems, Time minimisation problems, Assignment problems and solution by Hungarian method, Flight scheduling problems and Traveling Salesman-problem.
. **10Hrs**

Module-4

Theory of Games: Two person zero sum game, Minimax & Maximin strategies, Solution of game by dominance rules, arithmetic and algebraic methods, m×2 and 2×n games: Solution by method of sub games and graphical method. 3×3 games: Solution by method of matrices, approximate method using iterative procedure. Solution of game by Linear programming approach.
Waiting Line: Basic structure of queuing systems and characteristics, Expressions for M/M/lqueuingmodel**. 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 levelling.
Simulation of Management Systems: Simulation and Monte Carlo method, Waiting line and inventorysimulationmodels. **10Hrs**

Course outcomes:

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

1. Provide greater insight into decision-making processes, with strong fundamentals.
2. Understand better how people perceive and decide about risk and transform domain situation to LPP and solveit.
3. Formulate as Transportation, Assignment, and Travelling salesman problems and derive Optimumsolutions.
4. Formulate game theory problems and obtain solutions using different methods. Understand the fundamentals ofQueues.
5. Develop an appropriate network diagram for the given problem and analyse the project using critical path, floats, slacks. Crash the project and obtained minimum cost/time schedule. Develop simulation models using Monte Carlotechnique.

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 20marks.
- There will be two full questions (with a maximum of four sub questions) from eachmodule.
- Each full question will have sub question covering all the topics under amodule.
- The students will have to answer five full questions, selecting one full question from eachmodule.

Textbook/ Textbooks

(1) Quantitative Techniques for Managerial Decisions – U K Srivastava, G V Shenoy, and S C Sharma, - New Age International (P) Ltd., Publishers

(2) Operations Research: P K Gupta and D S Heera – S Chand & Company Ltd.

Reference Books

(1) Operations Research - H. A. Taha- Prentice Hall of India

(2) Introduction to Operations Research - Hillier and Liberman- McGraw Hill International

(3) Operations Research – S. D Sharma, Kedar Nath Ram Nath & Company Ltd.

CIM AND AUTOMATION			
Course Code	**20MPT13**	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Production development through CIM: Computers in Industrial manufacturing, Product cycle & Production development cycle, Introduction of CAD/CAM & CIM, sequential and concurrent engineering, soft and hard prototyping.

Computer Process Monitoring: Process control methods, direct digital control, supervisory computer control, steady state optimal control, on line search strategies, adaptive control.

. **10Hrs**

Module-2

Computer Aided Quality Control: The computer in Q.C, automated inspection principles and methods, Contact inspection methods, non-contact inspection methods, machine vision system, optical inspection method, sensors, coordinate, measuring machine, Computer-Aided testing, Integration of CAQLwithCAD/CAM.

. **10Hrs**

Module-3

Computer Integrated Manufacturing: Fundamentals of CAD/CAM, Computerized Manufacturing planning systems, shop floor control & automatic identification techniques. Computer Network for manufacturing, and the future automated factor.

. **10Hrs**

Module-4

Detroit type of Automation: Flow lines, Transfer Mechanisms, work pattern transfer, Different methods, & Problems. Analysis of Automated flow lines: Analysis of transfer lines without storage with storage buffer single stage, Double stage, Multistage with problems, Automated assembly systems, Design for automated assembly, parts feeding devices, analysis of Multi station assembly machine, Analysis of Single stage assembly machine.

. **10Hrs**

Module-5

Automated material Handling Storage: Material functions, types of material handling equipment, analysis of material handling systems, design of system, conveyor system, automated guided vehicle systems, automated storage/retrieval systems, caroused storage systems work in process storage, interfacing handling&storage with manufacturing.

. **10Hrs**

Course outcomes:

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

1. Understand the effect of manufacturing automationstrategies.
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 20marks.
- There will be two full questions (with a maximum of four sub questions) from eachmodule.
- Each full question will have sub question covering all the topics under amodule.
- The students will have to answer five full questions, selecting one full question from eachmodule.

Textbooks

(1) CAD/CAM -Zimmers& Grover – PHI

(2) CAD/CAM/CIM - P.Radhakrishna - New Age International - 2nd

Reference Books

(1) CAD/CAM -Zeid – Mc-Graw Hill

(2) CAD/CAM - P.N.Rao - TMH

(3) Robotics for Engineering - Koren.Y - Mc-Graw Hill

THEORY OF METAL CUTTING			
	20MPT14/20 MPE12	CIE Marks	40
Course Code	3:0:2	SEE Marks	60
Teaching Hours/Week (L:P:SDA)	04	Exam Hours	03
Credits			

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:
Textbooks
(1) Metal Cutting Principles - M.C. Shaw - Oxford Publication – 1985.
(2) Fundamentals of metal cutting & Machine Tools-by B.L.Juneja& G.S–Sekhar -Wiley Eastern.

COMPOSITE MATERIALS			
Course Code	**20MPT15**	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Introduction to composite materials: Definition, Classification, Types of matrices & reinforcements, characteristics & selection, Fiber composites, laminated composites, particulate composites, prepegs, sandwich, construction. **10Hrs**

Module-2

Micro mechanical analysis of a lamina: Introduction, Evaluation of the four elastic moduli – Rule of mixture, Macro mechanics of a lamina: Hooke's law for different types of materials, number of elastic constants, Laminate code, Failure criterion. . **10Hrs**

Module-3

Manufacturing: Lay up and curing – open and closed mould processing – Hand layup techniques Bag moulding and filament winding. Pultrusion, Pulforming, Thermoforming, Injection moulding, Cutting, Machining and joining, tooling, Quality assurance Introduction, material qualification, types of defects, NDTmethods. **. 10Hrs**

Module-4

Fabrication of Composites: Cutting, machining, drilling, mechanical fasteners & adhesive bonding joining computer aided design manufacturing tooling fabrication equipment Design of Fibre Reinforced Composite structures: Introduction, Composite structural design, Design criteria, Laminate design, Mathematical analysis of the laminate, Design ofcomposite stiffeners. **10 Hrs**

Module-5

Application developments – Aircrafts, missiles, space hardware, automobile, electrical and electronics, marine, recreational and sports equipment-future potential of composites. Metal matrix composites: Reinforcement materials, types, Characteristics & Selection, base metals-selection, applications. Powder metallurgy technique, liquid metallurgytechnique. **10 Hrs**

Course outcomes:

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

1. Identify, describe and evaluate the properties of fibre reinforcements, polymer matrix materials and commercial composites.
2. Identify, describe rule of mixture and failure criteria for composites.
3. Develop competency in one or more common composite manufacturing techniques, and be able to select the appropriate technique for manufacture of compositematerials.
4. Understand and analyse fabrication of composites and design of structure ofcomposites.
5. Understand and recommend composites for different applications and MMCs

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 20marks.
- There will be two full questions (with a maximum of four sub questions) from eachmodule.
- Each full question will have sub question covering all the topics under amodule.
- The students will have to answer five full questions, selecting one full question from eachmodule.

Textbook

(1)Composite Materials Handbook - Mein Schwartz - McGraw Hill Book Company - 1984.

(2)Mechanics of Composite Materials - AutarK.Kaw - CRC Press New York - 1stedi, 1997

Reference Books

(1)Composite Materials hand book - MeingSchwaitz - McGraw Hill Book Company

(2) Forming Metal hand book, ASM handbook, V15, 1988, P327-338.

(3)Composite Science and Engineering - K.K.Chawla - Springer

PRODUCTION ENGG. LABORATORY			
Course Code	**20MPTL16**	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	0:4:0	SEE Marks	60
Credits	02	Exam Hours	03

Sl. NO	**Experiments**
1	To become familiar with the use of a kinematics graphics simulator in order to perform robot motion and programming.
	To use trajectory planning concepts on the model of a single-link robotic manipulator.
	To familiarize students with the use of a vision system.
2	Simulation of Cutting/Milling operations on a computer using CAM packages.
3	Determination of Chip reduction co-efficient (reciprocal of chip thickness ratio) during single point turning.
4	Forces measurements during orthogonal turning.
5	Torque and Thrust measurement during drilling.
6	Measurement of Chip tool Interface temperature during turning using thermocouple technique.
7	Study of capstan lathe and its tooling and prepare a tool layout and job as per given drawing.
8	To prepare metallic samples for metallographic examination and to study the principle and construction of the Metallurgical Microscope.

Course outcomes:

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

1. Understand usage of G and M codes and write CNC program for a givencomponent.
2. Use CAM package for simulating tool path, power requirement and cycle time, etc.
3. Measure cutting forces during machining using different Dynamometers.
4. Understand the different specimen preparationtechniques.

Question paper pattern:

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

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

REFERENCE BOOKS:

1. CAD/CAM –Zimmers& Grover –PHI.
2. CAD/CAM/CIM - P.Radhakrishna - New AgeInternational
3. Automation, Production systems & CAM - M.P. Grover -Prentice Hall
4. CAD/CAM -Zeid – Mc-GrawHill
5. CAD/CAM - P.N.Rao -TMH
6. Robotics for Engineering - Koren.Y - Mc-GrawHill
7. Robert vision & Sensory Controls - Rooks B. - North Holland(ed) vol-3

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,AnIllustration. **5Hrs**

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, ImportantExperimentalDesigns. **5Hrs**

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, CaseStudyMethod. **5Hrs**

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 ChiSquareTests. **5Hrs**

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 underTRIPS 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 RightHolder, Layout-Designs of Integrated Circuits, Protection of Undisclosed Information, Enforcement of Intellectual Property Rights, UNSECO. **5Hrs**

Course outcomes:

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

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

Question paper pattern:

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

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, September2013.
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 ***

NON-CONVENTIONAL MACHINING PROCESSES			
Course Code	**20MPT21**	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Introduction: Need for non-traditional machining processes, Classification, Comparison between conventional and non-conventional machining, Process selection.

Mechanical Process: Ultrasonic machining (USM): Introduction, Elements of the process, Mechanism of material removal, Essentials of Equipment, Tool materials, Cutting tool system design: Magnetostriction assembly, Tool cone (Concentrator), & Exponential concentrator of circular cross section & rectangular cross section, Hollow cylindrical concentrator, Effect of process parameters, Limitations, Applications.

Abrasive Jet Machining: Principles, Equipment details, Process variables, Material removal rate, Applications, Advantages & Disadvantages. **10 Hrs**

Module-2

Thermal Metal Removal Process:Electric Discharge Machining (EDM): Principle of operation, Mechanism of meta removal, Basic EDM circuitry, Spark erosion generators, Electrode feed control, Analysis of relaxation type of circuit, Material removal rate using relaxation circuit, critical resistance, Electric parameters in R-C Circuit, Die electric fluids, Flushing, Electrodes for spark erosion, Selection of electrode material, Surface finish, Machining accuracy, Applications. **10 Hrs**

Module-3

Electro Chemical and Chemical Processes: Electro Chemical Machining (ECM): Principle of ECM, Elements of ECM process, Chemistry of the ECM, Process parameters, Determination of the metal removal rate; Accuracy, Surface finish, Dynamics of ECM process, Hydrodynamics of ECM process, Tool Design, Advantages and disadvantages, Applications. Electro Chemical Grinding, Electro Chemical honing and Electro chemical deburring.

Chemical Machining: Fundamental principle, Elements of theprocess – Maskants, Etchants, Advantages and disadvantages,Applications. **. 10Hrs**

Module-4

Plasma Arc Machining (PAM): Introduction, Plasma, Nonthermal Generation of Plasma, Equipment, Mechanism of metal removal, PAM parameters, Process characteristics, Type of torches, Applications.

Electron Beam Machining (EBM): Introduction, Equipment for production of Electron beam, Theory of electron beam machining-thermal & non thermal types, Process characteristics, applications. Laser

Laser Beam Machining (LBM): Introduction, Principle of generation of lasers, Equipment and Machining procedure, Types of Lasers, Process
characteristics, Advantages and limitations, Applications. **10 Hrs**

Module-5

Ion Beam Machining (IBM): Introduction, Principle of IBM, Mechanism of metal removal and associated equipment, Process characteristics, Advantages and limitations, Applications.

High Velocity Forming Processes (HERF): Introduction, Development of specific process, Selection, Comparison of conventional and high velocity forming methods, Types of high velocity forming methods: Explosion forming process, Electro hydraulics forming, Magneticpulseforming. **10Hrs**

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 andAJM.
2. Understand EDM concept and operatingcharacteristic.
3. Distinguish ECM with other operations and various application and understand the usage of various chemical and maskants inCHM.
4. Understand the generation of plasma, electron beam, laser and their machiningcharacteristics.
5. Understand the formation of ion beam and this application and various high velocity formingprocess.

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 20marks.
- There will be two full questions (with a maximum of four sub questions) from eachmodule.
- Each full question will have sub question covering all the topics under amodule.
- The students will have to answer five full questions, selecting one full question from eachmodule.

Textbook

(1)New technology: Institution of Engineers - Bhattacharya – India

(2)Modern Machining Process - P.C Pandy& H.S. Shan – Tata

Reference Books

(1)Production Technology - HMT - Tata McGraw Hill

(2)Modern Manufacturing Method - Adithan- New Age International (p) Limited

(3)Modern Machining Processes - P.K. Mishra - Narosa Publishing House

QUALITY ASSURANCE AND RELIABILITY			
Course Code	**20MPT22**	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Basic Concepts: Definitions of quality, Quality of design, Quality of conformance, and Quality of performance, Dimensions of quality, Quality characteristics, Quality control, Statistical quality control and cost of quality.

Fundamentals of Probability and Statistics: Events, Sample space, Probability rules, Dependent and Independent events, Statistical tools in quality control, Concept of variation, Graphical tools for data representation and analysis, Discrete and continuous probability distributions and their applications in quality control, numerical problems. **10Hrs**

Module-2

Control charts for Variables: Variation, Causes of variation, Objectives of control charts, Choice of variable, Subgroup size and subgrouping, frequency of sampling, control limits. Process capability analysis, Relationship of a process in control to specification limits, Variable charts - X bar chart, R chart, σ chart, revision of control limits and RPI, Introduction to cusum chart and moving range charts, numericalproblems. **10Hrs**

Module-3

Control charts for Attributes: Control charts for fraction nonconforming (p chart, np chart) and nonconformities (c chart and u chart) with variable and constant sample size, Choice between variables and attributes control charts, revision of control limits, numericalproblems.

Failure Data Analysis : Introduction, Failure Data, Quantitative measures, MTTF, MTBF, Bathtub Curve, Mean Life, Life Testing, numerical problems, Introduction to Failure Mode and EffectAnalysis.
. **10Hrs**

Module-4

Acceptance Sampling: Fundamentals of acceptance sampling, Sampling methods, OC Curves and their characteristics, AQL, IQL, LTPD, AOQ/AOQL. Types of acceptance sampling-Single, Double, Multiple, and Sequential sampling plans, Average Total Inspection, comparison amongst sampling plans, numerical problems.
10 Hrs

Module-5

System Reliability: Definition, Series, parallel and mixed configuration, Block diagram concept, r-out-of-n structure solving problems using mathematical models. Difficulty in achieving reliability, Methods for improving reliability during design, Different techniques available to improve reliability, Reliability-Cost trade off, Prediction and Analysis, numerical problems.

Maintainability and Availability: Introduction, Techniques available to improve maintainability and availability, trade-off among reliability, maintainability and availability,Simpleproblems. **10Hrs**

Course outcomes:

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

1. Understand the quality and basic probabilityconcept.
2. Construct the control chart for variables.
3. Construct the control chart for attributes and analyse failuredata.
4. Construct OC curve for determining the probability oflot acceptance.
5. Understand the basic concept of reliability andcalculate maintainability and availability ofresources.

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 20marks.
- There will be two full questions (with a maximum of four sub questions) from eachmodule.
- Each full question will have sub question covering all the topics under amodule.
- The students will have to answer five full questions, selecting one full question from eachmodule.

Textbooks

(1) Statistical Quality Control – Montgomery D.C. John Wiley & Sons, Inc

(2) Statistical Quality Control – Grant and Leavenworth

Reference Books

(1) Quality Planning and Analysis - Juran, J.M and Gryna, F.M. - Tata McGraw Hill publishing Coimpany Ltd., New Delhi, India – 1982.

(2) Concepts in Reliability Engineering – Srinath K.S. - Affiliated East-West Press Private Limited, New Delhi, India -1985.

(3) Statistical Quality Control – R C Gupta, Khanna Publishers,

TOOL ENGINEERING AND DESIGN			
Course Code	**20MPT23**	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Introduction: Concept, meaning and definitions of tool, tool design and tool engineering. Tools-types, classification, features & applications.

Design of Single Point Tool: Tool Signature, Selection of Tool Angles, Design of shank section for single point tool to account for strength and rigidity. Design of Multi Point Tools – Drill,Reamers.

. 10 Hrs

Module-2

DESIGN of peripheral Milling cutters, Design of Broach.

Location and Clamping: General principles of location, 3-2-1 Principle of Location, Principle of Radial location, General study of locating devices. General principles of clamping, Study of various Clampingdevices. **10Hrs**

Module-3

Design of Fixtures: Difference between a Jig and a Fixture, Design of Milling fixture, Study of other fixtures like Lathe fixture, Inspection fixture. Study of different types of Drill jigs. **Design of Gauges:** Types of gauges. Factors to be considered in the design of gauges, Design of Plug gauge, Design ofSnapgauge. **10Hrs**

Module-4

Design of Press Tools: A General study of Press operations. Elements of a Die, Strip layout, calculation of center of pressure. Design of Blanking Die, Design of Piercing Die, Design of ProgressiveDie.

. **10Hrs**

Module-5

Design of Forming Dies: Study of Drawing and Bending process, Design of Drawing Die, Design of Bending Die.

Tool Layout and Cam Design of Single Spindle Automats: Classification of Automats and their applications. Tool layout and Cam design for automatic screwcuttingmachine. **10Hrs**

Course outcomes:

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

1. Understand the tool design concept and design the singlepoint cuttingtool.
2. Design the mill cutters, broach and clampingdevices.
3. Understand the application of jigs and fixtures, gauges anddesign them.
4. Understand the concept of press tools and itsdies.
5. Design forming dies and understand the classificationand application ofautomats.

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 20marks.
- There will be two full questions (with a maximum of four sub questions) from eachmodule.
- Each full question will have sub question covering all the topics under amodule.
- The students will have to answer five full questions, selecting one full question from eachmodule.

Textbooks

(1)Text book of Production Engineering-P. C. Sharma Chorotar Publishing house.

(2)**Tool Design** Donaldson and GoldingTata McGraw Hill, New Delhi

Reference Books

(1) Fundamentals of Tool Design- ASTME

(2) Jigs and FixturesP.H.JoshiMcGraw Hill Education3rd edition, 2010

(3)Fundamentals of Tool DesignFrankW.WilsonPHI publications

OPERATIONS MANAGEMENT			
Course Code	**20MPT241**	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Understanding Operations: Introduction to operations management, manufacturing trends in India, Service as a part of operations management, operations as a key functional area, operations management: a systems perspective, operations management functions, challenges in operations management.
Operational strategy: relevance of operations strategy, strategy formulation process, measure for operational excellence, options for strategic decisions in operations, break even analysis, cost versus flexibility trade off in operations strategy, related problems. **10 Hrs.**

Module-2

Process and capacity analysis: process flow charting, planning premises and process implications, analyzing processes, business process Re-Engineering, defining capacity, measure of capacity, time horizon in capacity planning, capacity planning framework, alternatives for capacity augmentation, decision tree for capacity planning, related problems.

Design of manufacturing process: Determinant of process characteristics in operations, types of process and operations systems, process product matrix, layout planning, types of layouts, performance measure for layout design, design of process layouts, design of product layouts, approaches to layout design, technology issues in process design, complexity in operations management, relatedproblems.
. **10Hrs**

Module-3

Inventory planning and control: inventory planning for independent demand items, types of inventory, cost of inventory, inventory control for deterministic demand items, handling uncertainty in demand, inventory control systems, selective control of inventory, inventory planning for single period demand,relatedproblems. **10Hrs**

Module-4

Demand forecasting: forecasting time horizon, design of forecasting system, developing forecasting logic, sources of data, and models for forecasting, extrapolative methods using time series, causal methods of forecasting, accuracy of forecasts, using forecasting system, related problems.

Aggregate production planning: planning hierarchies in operations, aggregate production planning, need, frame work for aggregate planning, alternatives for managing supply, basic strategies for aggregate production planning, aggregate production planning methods, OR tools for production planning, Master production scheduling, related problems. **10Hrs**

Module-5

Resource planning: Dependent demand attributes, planning a framework, MRP Logic, MRP system, CRP, DRP, MRP II, ERP, Resources planning in services, related problems.

Scheduling of operations: need for scheduling, loading of machines, scheduling context, scheduling flow shops, scheduling of job shops,

input output control, operational control issues in mass production systems, operations planning and control based on the theory of constrains,relatedproblems. **10Hrs**
Course outcomes: At the end of the course the student will be able to: 1. Understand the basic concept of OM, manufacturing trends in INDIA. 2. Design of product layout, process layout and analyse process and capacity. 3. Applying appropriate inventory planningtechnique. 4. Forecast the demand and prepare MPS. 5. Constructing MRP, MRPII and schedule the jobs andmachines.
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 20marks. • There will be two full questions (with a maximum of four sub questions) from eachmodule. • Each full question will have sub question covering all the topics under amodule. • The students will have to answer five full questions, selecting one full question from eachmodule.
Textbooks
(1) Operations Management: Theory and Practice- B. Madhavan, Pearson Education India
(2) Production and Operations Management: R. Pannerselam- Prentice Hall of India Pvt., Ltd.
Reference Books
(1) Operations Management for Competitive Advantages: Chase and Aquilano, TMH Publications
(2) Operations Management: William Stevenson TMH Publications
(3) Operations Management: Robert Russell and Bernard Taylor, Pearson Publisher

INDUSTRIAL ROBOTICS			
Course Code	**20MPT242**	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

FUNDAMENTAL CONCEPTS OF ROBOTICS: History, present status and future trends, Robotics. Robot, Definition. Robotics Systems and Robot Anatomy, Specification of Robotics. Resolution, Repeatability and Accuracy of a Manipulator.

ROBOT DRIVES: Power transmission systems and control Robot drive mechanisms, hydraulic-electric-pneumatic drives. Mechanical transmission method – Rotary-to-Rotary motion conversion. Rotary-to-linear motion conversion end effectors – types-grip and problem Remote-Centered compliance Devices- Control of Actuators in Robotic Mechanisms. **10Hrs**

Module-2

SENSORS AND INTELLIGENT ROBOTS: Sensory devices – Non-optical-Position sensors – Optical position sensors – velocity sensors – proximity sensors: Contact and non-contact type- Touch and slip sensors – Force and Torque Sensors – AI and Robotics.

COMPUTER VISION FOR ROBOTICS SYSTEMS: Robot vision systems – Imaging components – Image representation – Hardware aspects-Picture coding – Object Recognition and Categorization-Visual inspection – software considerations – applications – commercial – Roboticsvisionsystems. **10Hrs**

Module-3

COMPUTER CONSIDERATIONS FOR ROBOTIC SYSTEMS: Computer architecture for robots, hardware, Computational elements in robotic applications – Robot programming – sample programs path planning – Robot'scomputersystem. **10Hrs**

Module-4

TRANSFORMATIONS AND KINEMATICS: HomogeneousCo-ordinates – Co-ordinate Reference Frames – Homogeneous Transformations for the manipulator – the forward and inverse probleme of manipulator kinematics – Motion generation – Manipulator dynamics – Jacobian in terms of D.H.Matrices controller architecture. **10Hrs**

Module-5

ROBOT CELL DESIGN AND CONTROL: Specifications of Commerical Robots – Robot Design and Process specifications – motor selection in the design of a robotic joint – Robot Cell layouts – Economic and Social aspects ofrobotics.

APPLICATIONS OF ROBOTS: Capabilities of Robots – Robotics Applications – Obstacle avoidance – Robotics in India – The future of Robotics. **10Hrs**

Course outcomes:
At the end of the course the student will be able to:
1. Understand the concept of robotics and itsdrives.
2. Understand the sensors applications and images recognition mechanism.
3. Program robot and analyse the computational element of robot computer system.
4. Transform robot manipulator using knowledge kinematics and mathematicalmethods.
5. Design and control robot cells and understand the application of robots.

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 20marks.
- There will be two full questions (with a maximum of four sub questions) from eachmodule.
- Each full question will have sub question covering all the topics under amodule.
- The students will have to answer five full questions, selecting one full question from eachmodule.

Textbooks

(1) Robotics Engineering An integrated approach - Richard D Klafter, Thomas A Chmielewski, Michael Negin – Prentice Hall of India Pvt. Ltd.

(2) Robotics: Control Sensing, Vision, intelligence - Fu KS Gomaler R C, Lee C S G - McGraw Hill

Reference Books

(1) Handbook of Industrial Robotics - Shuman Y. Nof - John Wiley & Sons, New York - 1985.

(2) Robotics Technology and Flexible Automation - Deb SR - McGraw Hill BookCo. - 1994.

DESIGN FOR MANUFACTURING AND ASSEMBLY			
Course Code	**20MPT243**	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

INTRODUCTION: General design principles for manufacturability, Process Capability, Feature tolerance, Geometrical tolerance, Surface finish, Review of relationship between attainable Tolerance grades, and different machining processes, Economics of process selection, Principles of Design for Manufacture, Quality Manufacturability, Introduction to ToleranceChartingTechnique. **10Hrs**

Module-2

DESIGN OF CASTINGS: Redesign of castings based on parting line considerations, Minimising core requirements, other design consideration, economic production quantities**.**

DESIGN OF WELDMENTS: Advantages of weldments, Design for economical and efficient welding, Redesigning cast members using weldments, use of welding symbols, Economic production quantities, Design recommendations, cost reduction. . **10Hrs**

Module-3

DESIGN FOR ASSEMBLY: Applications of selective assembly, Design recommendations for different fastening arrangements, Automatic assembly, control of axial play in assemblies, Design for easy assembly, Design for easy disassembly.

TRUE POSITION THEORY AND DATUM SYSTEMS: Theoretically exact dimension, virtual size concept, assembly considerations as applied to True Position Tolerancing, examples, Grouped datum systems, different types examples. . **10Hrs**

Module-4

DESIGN FOR MACHINING: Parts cut to length, screw machined products, Machined round holes, Moulded parts, Parts produced buy planning. shaping & slotting, Broached parts, Ground parts, roller burnished parts, Gears, Economical deburring, re dimensioning of parts based on manufacturing datum.

DESIGN FOR FORGING: Introduction, open die forging. Closed die forging. **10Hrs**

Module-5

DESIGN FOR POWDER METALLURGY: Introduction, Design guidelines, Background, Design for Powder Metallurgy parts.

A review of design considerations in formed metal components, non metallic parts, Designing for heat treatment, Design for quality and massproduction. **10Hrs**

Course outcomes:

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

1. Understand the principles of manufacturability and design for manufacture.
2. Design casting and weldment for economic productionquantity.
3. Understand the concept of assembly, its design and true position of datumsystem.
4. Design parts cut to length and screw machine parts of various processes, open and closed die forging.
5. Design guidelines and background for powder metallurgy partsand reviewing of formed parts.

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 20marks.
- There will be two full questions (with a maximum of four sub questions) from eachmodule.
- Each full question will have sub question covering all the topics under amodule.
- The students will have to answer five full questions, selecting one full question from eachmodule.

Textbooks

(1)"Product Design for Manufacture and Assembly" Geoffrey Boothroyd, Peter Dewhurst and Winston A. Knight, Standardsmedia. ISBN-13: 978-1420089271,

(2)**"Product Design and Development".**Karl T. Ulrich and Steven D. EppingerMcGraw-Hill EducationISBN-13: 978-0073404776

Reference Books

(1) **"Product Design and Manufacturing",** Chitale A. K and Gupta R. C, Prentice Hall India Learning Private Limited,ISBN-13: 978-8120342828, 5th Edition. 2011

PRODUCT DATA MANAGEMENT			
Course Code	**20MPT244**	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Product Data Management : Product life cycle, Complexity in Product Development, General Description of PDM
Basic functionality of PDM: Information architecture, PDM System architecture, Applications used in PDM systems. Trends in PDM.
. **10Hrs**

Module-2

Document Management Systems: Document management and PDM, Document life cycle, Content Management, Document management and related technologies, Document management resources on the Internet. **10Hrs**

Module-3

Workflow Management in PDM: Structure Management, Engineering Change Management, Release Management, Version Management, Configuration Management.
. **10Hrs**

Module-4

Creating Product Structures: Part centric approach, CAD centric approach, Product Structure configuration, Managing Product Structures, PDM Tools: Matrix One, Team Center, Windchill. Enovia, PDM resources on the Internet.
. **10Hrs**

Module-5

PDM Implementation Case Studies: Sun Microsystems, Inc., Mentor Graphics Corporation, Ericsson Radio Systems AB, Ericsson Mobile Communications AB, ABB Automation Technology Products, SaabTech Electronics AB.
. **10Hrs**

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

1. Explain the concepts, tools and techniques for managing product data.
2. Analyze various processes in the product data management frameworks.
3. Evaluate risks in large and complex workflow management environments.
4. Develop product data management plans for various types of organizations.
5. Understand The Sun Microsystems, Inc., Mentor Graphics Corporation andABB.

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 20marks.
- There will be two full questions (with a maximum of four sub questions) from eachmodule.
- Each full question will have sub question covering all the topics under amodule.
- The students will have to answer five full questions, selecting one full question from eachmodule.

Textbooks

(1)Computer Integrated Design and Manufacturing - David Bed worth. Mark Henderson &. Philips Wolfe - McGraw Hill Inc

(2)Visual Modeling with Rational Rose and UML - Terry Quatrain -

Reference Books

(1)Wind-chill - RS.O Reference manuals - 2000.

DESIGN OF EXPERIMENTS			
Course Code	**20MPT251**	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Strategy of Experimentation, Typical applications of Experimental design, Basic Principles, Guidelines for Designing Experiments.

Concepts of random variable, probability, density function cumulative distribution function. Sample and population, Measure of Central tendency; Mean median and mode, Measures of Variability, Concept of confidence level. Statistical Distributions: Normal, Log Normal & Weibull distributions. Hypothesis testing, Probability plots, choice of sample size. Illustration through Numerical examples. **12Hrs**

Module-2

Classical Experiments: Factorial Experiments: Terminology: factors, levels, interactions, treatment combination, randomization, Two-level experimental designs for two factors and three factors. Three-level experimental designs for two factors and three factors, Factor effects, Factor interactions, Fractional factorial design, Saturated Designs, Central composite designs. Illustration through Numerical examples.
. **08Hrs**

Module-3

Measures of variability, Ranking method, Column effect method & Plotting method, Analysis of variance (ANOVA) in Factorial Experiments: YATE's algorithm for ANOVA, Regression analysis, Mathematical models from experimental data. Illustration through Numerical examples.

Quality, Western and Taguchi's quality philosophy, elements of cost, Noise factors causes of variation. Quadratic loss function & variations of quadratic loss function. Robust Design: Steps in Robust Design: Parameter design and Tolerance Design. Reliability Improvement through experiments, Illustration through Numerical examples**.** **12Hrs**

Module-4

Types of Orthogonal Arrays, selection of standard orthogonal arrays, Linear graphs and Interaction assignment, Dummy level Technique, Compound factor method, Modification of linear graphs. Illustration through Numerical examples.
. **08Hrs**

Module-5

Evaluation of sensitivity to noise. Signal to Noise ratios for static problems: Smaller-the-better type, Nominal-the –better-type, Larger-the-better type. Signal to Noise ratios for Dynamic problems. Illustration through Numerical examples.

Parameter and tolerance design concepts, Taguchi's inner and outer arrays, parameter design strategy, tolerance design strategy. Illustration throughNumericalexamples. **10Hrs**

Course outcomes:

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

1. Plan data collection, to turn data into information and tomake decisions that lead appropriateaction.
2. Apply the methods taught to real lifesituations.
3. Plan, analyze, and interpret the results ofexperiments.
4. To understand the Orthogonal arrays.
5. Analyze the Parameter and tolerance designconcepts.

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 20marks.
- There will be two full questions (with a maximum of four sub questions) from eachmodule.
- Each full question will have sub question covering all the topics under amodule.
- The students will have to answer five full questions, selecting one full question from eachmodule.

Textbooks

(1) Design and Analysis of Experiments, Douglas C Montgomerry, Wiley, 8th Edition

(2) Design and Analysis of Experiments, R. Panneerselvam, PHI

Reference Books

(1) Quality Engineering Using Robust Design, Madhav S,Phadke, PHI

(1) Design of Experiments with Minitab, Paul Mathews, New Age International.

(2) Design of Experiments with Minitab, Virgil L Anderson and Robert A Mclean, Taylor and Francis

AGILE MANUFACTURING			
Course Code	**20MPT252**	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Introduction - What is agile Manufacturing? - Competitive environment of the future the business case for agile manufacturing conceptual frame work foragilemanufacturing. **10Hrs**

Module-2

Four Core Concepts: Strategy driven approach - integrating organization, people technology interdisciplinary designmethodology. . **10Hrs**

Module-3

Agile Manufacturing and Change Management: The change implications. Post failures in advanced manufacturing, changes on the way, traditional management accounting, paradigm, investment appraisal, product costing - performance, measurement and control systems, Traditional organization, control technological and design paradigms traditional problems in workplace- organizational issues – roleoftechnology. **10Hrs**

Module-4

Agile Manufacturing Enterprise Design: Agile manufacturing - enterprise design.. system concepts as the basic manufacturing theory - joint technical & organizational design and a model for the design of agile manufacturing enterprise, enterprise design process insights into design processes, what is interdisciplinary design, Main issues - simple designexample. **10Hrs**

Module-5

Skill & Knowledge Enhancing Technologies for Agile Manufacturing: Skill and Knowledge enhancing Technologies - scheduling - technology design strategic-Design Concepts. Design and Skill of Knowledge enhancing Technologies for machine tool systems - Historical overview, Lessons, problems and Futuredevelopment. . **10Hrs**

Course outcomes:

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

1. Understand the agile manufacturing and conceptual framework.
2. Analyse the four core concept of agilemanufacturing.
3. Study the implication of advanced manufacturingsystem.
4. Understand and design the agile manufacturingenterprises.
5. Design skill and knowledge enhancing technology foragile manufacturing.

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 20marks.
- There will be two full questions (with a maximum of four sub questions) from eachmodule.
- Each full question will have sub question covering all the topics under amodule.
- The students will have to answer five full questions, selecting one full question from eachmodule.

Textbooks

(1) Agile manufacturing - Forging new Frontiers - Paul T. Kidd - Addison Wesley Publication

(2)Agile Manufacturing – Proceedings of International Conference - Dr. M.P Chowdiah (Editor) – TataMcGraw Hill Publications

Reference Books

(1)On Agile manufacturing - Tata McGraw Hill Publications

(2)Agile manufacturing - Forging Neat Furniture's - Paul T Kidd – Addition Wesley Pub

ADVANCED MATERIALS AND PROCESSING			
Course Code	**20MPT253**	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Classification and characteristics: Metals, Ceramics, Polymers and composites.
General properties and structure: Atoms, molecules bonds in solids, Crystalline - Defects in Metallic structure, Dislocations and plastic deformation - Strengthening mechanism - grain size, dislocation - Cold work, precipitation hardening, dispersion hardening - phase reactions, fatigue andCreepbehavior. **10Hrs**

Module-2

Ferrous Alloys: Iron carbon equilibrium diagrams - Steels and cast irons - properties, structure, composition and applications transformation hardening in steels - TIT diagrams - Heat treatment processes - Effect of alloying elements - High alloy steels, Stainless steel types, tool Steels, Manganese steels, heat resistant steels, HSLA, Maraging steels. **10 Hrs**

Module-3

Non Ferrous alloys: Alloys of copper, Aluminium, nickel, magnesium, titanium, lead, tin, Zinc - composition, heat treatment, structure, propertiesandapplication. **10Hrs**

Module-4

Polymers and polymerizations: Structure and properties of thermoplastics and thermo sets – Engineering Applications - property modifications - Mechanical and thermal behaviour – processing methods.
Ceramics : Nature and structure of Ceramics - Refractory Abrasives glasses - glass ceramics - Advanced ceramics processing methods.
. **10Hrs**

Module-5

Composites : Definition - classification and characteristics of composite materials - Volume fraction - laminated composites particulate composites, fibrous composites - Types of reinforcements, their shape and size - production and properties of fiber reinforced plastics, Metal Matrix composites and ceramic matrix composites -Applications.
Processing of Polymers: composites, ceramics - thermal spraying - Ion beam machining diamond coating techniques tribological Applications.
. **10Hrs**

Course outcomes:
At the end of the course the student will be able to:
1. Classify materials and physicalcharacteristics.
2. Understand iron carbon equilibrium diagram, TTT diagram, heat treatment process of variousssteels.
3. Understand alloys of various nonferrousmetals.
4. Understand polymers, ceramics and their mechanical – thermal properties.
5. Identify the composites and their structure and Understand applications ofceramics.

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 20marks.
- There will be two full questions (with a maximum of four sub questions) from eachmodule.
- Each full question will have sub question covering all the topics under amodule.
- The students will have to answer five full questions, selecting one full question from eachmodule.

Textbook

(1) Engineering Metallurgy, Raymond and HiggensELBS/EA

(2) Introduction to Material Science and Engineering, James.F.ShacklefordMc Millan, NY7th edition

(3) **Powder Metallurgy-Metals Hand Book,** ASM, USAVol.7, 1974

(4) **Composite Materials - Science and Engineering,** Chawla K.K Springer - Verlag, Newyork2nd edition, 1998.

(5) **Cast Metal Matrix CompositesASM Metals Hand Book**

ORGANISATIONAL BEHAVIOUR			
Course Code	**20MPT254**	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Orgnanizational Behavior – Definition, Need for studying Organizational Behavior, Disciplines involved in the study of Organizational Behavior, -Contributing disciplines and area like psychology, social psychology, economics, anthropology etc. Application of Organizational Behavior inBusiness.. **10Hrs**

Module-2

Individual behaviour– personality, perception, learning, attitudes inter-personal behaviour – Group and inter-group behaviour. . **10Hrs**

Module-3

Group Dynamics – Formal and Informal Group, Group Norms, Group Cohesiveness, Group Behaviour and Group Decision –making. . **10Hrs**

Module-4

Motivation and morale, leadership-nature, styles and approaches, development of leadership including laboratory training. Power and Authority – Definition of Power – TypesofPower. **10Hrs**

Module-5

Management of change- Conflict Management- OrganisationHealth, Development and Effectiveness. Management of culture, Cross CulturalManagement. **10Hrs**

Course outcomes:

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

1. Define organisationalbehaviour, analyse discipline and area of application inbusiness.
2. Understand personality, interpersonal and intergroupbehaviour.
3. Understand group types, norms and decisionmaking.
4. Understand nature and development of leadership and types of power.
5. Learn the management of conflict, development, effectivenessand cross cultural 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 20marks.
- There will be two full questions (with a maximum of four sub questions) from eachmodule.
- Each full question will have sub question covering all the topics under amodule.
- The students will have to answer five full questions, selecting one full question from eachmodule.

Textbooks

(1) **Organizational Behavior** – Stephen. P. Robbins – Prentice Hall, India. - 9th edition 2001.
(2) **Organizational Behavior** – Fred Luthans – McGraw Hill – 1997
Reference Books
(1) **Human Behavior at work**– Keith Davis – Prentice Hall India – 2007.
(2) **Organizational Psychology** – Robin, Kolb, etc – 1996

QT AND QC LABORATORY			
Course Code	**20MPTL26**	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	0:4:0	SEE Marks	60
Credits	02	Exam Hours	03

Sl. NO	**Experiments**
1	Introduction to OR Packages.
2	Building Linear Programming Models (Formulation of LPP) and performing sensitivityanalysis.
3	Building Transportation Models
4	Exercise on Assignment and Traveling salesman problems.
5	Building network models Construction of PERT/CPM networks CPM –Determination of critical path, Time duration and floats PERT –Determination of project duration and variance.
6	Exploring Data Introduction and Describing Data - Relationships Among Variables.
7	Correlation and Regression Modelling and Analysis.
8	Plotting control charts for variable and attribute data using software package.

Suggested Software Packages:
*****LINDO / Quantitative System Analysis (QSA)/ TORA software / M.S. Projects/ARENA.(OR softwares)
*****SYSTAT/SPSS/R/MINITAB/MATLAB etc. (Statistical softwares)

Course outcomes:
At the end of the course the student will be able to:
1. Identify and develop appropriate OR model for the real world problem.
2. Identify and analyse critical path in projectnetworks.
3. Understand and implement basic data analysis like Correlation and Regression.
4. Identify and plot appropriate control chart for the givendata.

Question paper pattern:
The SEE questions will be set for 100 marks:
1. Two experiments for **80**marks.
2. Viva voce for **20**marks.

Reference Books

(1)Quantitative Techniques for Managerial Decisions – U K Srivastava, G V Shenoy, and S C Sharma, - New Age International (P) Ltd., Publishers

(2)Operations Research: P K Gupta and D S Heera – S Chand & Company Ltd.

(3)Operations Research - H. A. Taha- Prentice Hall of India

(4)Operations Research – S. D Sharma, Kedar Nath Ram Nath & Company Ltd.

(5)Statistical Quality Control – Montgomery D.C. John Wiley & Sons, Inc

(6)Statistical Quality Control – Grant and Leavenworth

(7)Statistical Quality Control – R C Gupta, Khanna Publishers,

TECHNICAL SEMINAR			
Course Code	20MPT27	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 ofSpecialization.
- Carryout literature survey, organize the Course topics in a systematicorder.
- Prepare the report with ownsentences.
- Type the matter to acquaint with the use of Micro-soft equation and drawing tools or any suchfacilities.
- Present the seminar topic orally and/or through power point slides.
- Answer the queries and involve indebate/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 becomeself-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 20MPT27 seminar:

Seminar Report: 30 marks

Presentation skill:50 marks

Question and Answer:20 marks

*** END OF II SEMESTER***

ADVANCED MANUFACTURING PRACTICES			
Course Code	**20MPT31**	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Need of CPC for a company, what CPC can do, CPC-getting the right tool.
JIT – Introduction – The spread of JIT Movement, some definitions of JIT, core Japanese practices of JIT, Creating continuous Flow Manufacture, Enabling JIT to occur, Basic elements of JIT, Benefits of JIT.
Just in Time Production – Primary purpose, profit through cost reduction, Elimination of over production, Quality control, Quality Assurance, Respect for Humanity, Flexible work Force, JIT Production Adapting to changing production Quantities, process layout for shortened lead Times, Standardization of operation, Automation.
Sequence and scheduling used by suppliers: Monthly and daily Information. Sequenced withdrawal system by sequenced schedule table, problems and counter measures in applying the Kanban system tosubcontractors. **10 Hrs**

Module-2

Toyota Production System-The philosophy of TPS, Basic Frame work of TPS, Kanbans. Determining the Number of Kanbans in Toyota ProductionSystem.
a) Kanban Number under Constant Quantity WithdrawalSystem.
b) Constant Cycle, Non-constant Quantity Withdrawal System.
Supplier Kanban and the Sequence Schedule for Use bySuppliers.
a) Later Replenishment System byKanban.
b) Sequenced WithdrawalSystem.
c) Circulation of the Supplier Kanban withinToyota.
Production Smoothing inTPS
Production Planning
Production Smoothing Adaptability to Demand Fluctuations
Sequencing Method for the Mixed Model Assembly Line to Realize Smooth ProductionofGoal. **10 Hrs**

Module-3

Just-in-Time Production with Total Quality Control just in time concept, cutting lot sizes, cutting set-up times, cutting purchase order costs, the JIT cause-Effect chain, Scrap/Quality Improvements, Motivational effects, Responsibility effects, small Group improvement Activities, withdrawal of Buffer Inventory, the total Quality Control Concept. **10 Hrs**

Module-4

Total Quality Control-Introduction-Total Quality Control concepts, responsibility, learning from the west, TQC concepts categorized, Goals, Habit of improvement, perfection, Basics, process control, Easy to see Quality control as facilitator, small lot sizes, Housekeeping, Less than full capacity scheduling, Daily machine checking, Techniques and Aids, Exposure of problems, Fool proof Devices, Tools of Analysis, QC Circles, TQC in Japanese-owned US Electronics plant, TQC in Japanese-ownedAutomotiveplants. **10Hrs**

Module-5

Plant Configurations: Introduction-ultimate lant configuration, job shop Fabrication, Frame Welding, Forming Frame parts from Tubing, Dedicated production lines, overlapped production, the daily schedule, Forward Linkage by means of Kanban, physical merger of processes, Adjacency, mixed Models, Automated production Lines, Pseudo Robots, Robots, CAD and Manufacturing, Conveyors and stacker Cranes, AutomaticQualityMonitoring. **10 Hrs**

Course outcomes:

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

1. Explaining the details of types of advanced manufacturing and machining processes, theirϖ evolution andneed.
2. Identifying the correct advanced manufacturing processes by formulating and determiningϖ the correct AMPs for development of various complex shapedgeometries.
3. Hands on experiments on the Advanced Machines such as EDM, WEDMetc.
4. Design and development of experimental apparatus of any one advanced or derived andϖ hybridmanufacturing.
5. Understand the different plantconfigurations.

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 20marks.
- There will be two full questions (with a maximum of four sub questions) from eachmodule.
- Each full question will have sub question covering all the topics under amodule.
- The students will have to answer five full questions, selecting one full question from eachmodule.

Textbook/ Textbooks

(1)Japanese Manufacturing Techniques - Richard Schonberger - Pearson Higher Education

(2)Just In Time Manufacturing – Kargoanker (manual).

Reference Books

(1)An Integrated Approach To Just In Time - Yasuhiro Monden - Toyota Production system.

(2)Lean Thinking - James Womack - Simon & Schuster Adult - ISBN: 0743249275, 2003.

(3)The machine that changed the World - James P. Womack, Daniel T Jones, and Daniel Roos - The story of Lean production – by– Harper Perennial edition published -1991.

APPLIED MICRO-ECONOMICS			
Course Code	**20MPT321**	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Module-1

Introduction: Circular Flow of Economic Activity, Nature of the firm Concept of Economic Profit. Demand Theory and Analysis: Individual and Market Demand, price Elasticity, income elasticity and cross Elasticity. 08**Hrs**

Module-2

Production Theory and Analysis: Production Function, Production with one variable Input and two inputs, Economies of Scale and Scope, Estimation ofProductionFunction. **08Hrs**

Module-3

Cost Theory and Analysis: The Economic Cost Concept, Opportunity Costs, Explicit & Implicit, Marginal, Incremental and Sunk Cost Function, Short and Long run cost Functions, Profit Contribution AnalysisNumericalProblems. **08Hrs**

Module-4

Market Structure: Perfect Competition and Monopoly, Monopolistic Competition, Oligopoly: Numerical Problems. Barriers toEntry. . 1**0Hrs**

Module-5

Pricing Decisions: Price Discrimination,ProductBundling. 06**Hrs**

Course outcomes:

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

1. Understand concept like flow of economic activity, profit and demand and priceelasticity.
2. Estimate production functions with one and two inputvariables.
3. Find optimistic cost considering all relevantfactors.
4. Compare monopoly and oligopoly competition in market and barriers toenter.
5. Understand pricing on multiple product and employment ofinput.

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 20marks.
- There will be two full questions (with a maximum of four sub questions) from eachmodule.
- Each full question will have sub question covering all the topics under amodule.
- The students will have to answer five full questions, selecting one full question from eachmodule.

Textbook/ Textbooks
(1)H C Peterson and W C Lewis, Managerial Economics, PHI, New Delhi.
(2)Samuelson W F, and S G Marks, Managerial Economics, Dryden Press, FortWorth
Reference Books
(1)Managerial Economics, William F Samuelson and Stephen G Marks, John Wiley &Sons.
(2)Managerial Economics and Strategy, Jeffrey M Perloff , Pearson
(3)Managerial Economics, H L Ahuja, S Chand Publicationsp

SURFACE TREATMENT AND FINISHING			
Course Code	**20MPT322**	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. Vacuum coating, FVD & CVD metal spraying - Methods, surface preparation, mechanical.

08Hrs

Module-2

Properties of sprayed metals, plasma coating. Plastic coating of metal - PVC coating Spherodising process details, phosphate coating - mechanism of formation.

08Hrs

Module-3

Testing of surface coating- methods.Heat treatment methods, Annealing, Normalizing, Tempering, Case hardening methods, flame hardening sub zero treatment.

08Hrs

Module-4

Heat treatment methods for gears, spindles, cutting tools.

08Hrs

Module-5

Advanced coating technologies: Hard facing, electro deposition technique, Nano-coatings, coating characterization

08Hrs

Course outcomes:

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

1. Understand the basic concept of coating, plating and metal spray methods inelectroplates.
2. Understand the mechanism of coating formation and theirproperties.
3. Test coated and spray metal surfaces using suitable heat treatment methods.
4. Heat treat gears, spindle and cuttingtools.
5. Understand electro deposition and Nano coatingtechnique.

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 eachmodule.
- Each full question will have sub question covering all the topics under amodule.
- The students will have to answer five full questions, selecting one full question from eachmodule.

Textbooks

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

(2)Principles of metal surface treatment and protection - Pergamon Press Gabe, David Russell - Description, Oxford ; New York
Reference Books
(1)Handbook of metal treatment and testing - John wiley& sons.
(2)Heat Treatment of Metals – Zakrov - MlR Publications.
(3)Metals Hand Book – ASM.

INDUSTRIAL DESIGN AND ERGONOMICS			
Course Code	**20MPT323**	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Module-1

Introduction: An approach to industrial design - elements of design structure for industrial design in engineering application in modem manufacturing systems. Ergonomics and Industrial Design: Introduction - general approach to the man-machine relationship-workstation design-workingposition.

08 Hrs

Module-2

Control and Displays: shapes and sizes of various controls and displays-multiple displays and control situations - design of major controls in automobiles, machine tools etc., - design of furniture – design of instruments.**10 Hrs**

Module-3

Ergonomics and Production: Ergonomics and product design ergonomics in automated systems- expert systems for ergonomic design, Anthropomorphic data and its applications in ergonomic design limitations of anthropomorphic data - use of computerized database.

. 08 Hrs

Module-4

Visual Effects of Line and Form: The mechanics of seeing psychology of seeing, general influences of lined and form. Colour: colour and light - colour and objects - colour and the eye colour consistency - colour terms - reactions to colour and colour continuation - colour onengineeringequipments. **08Hrs**

Module-5

Aesthetic Concepts: Concept of unity - concept of order with variety - concept of purpose style and environment - Aesthetic expressions. Style-components of style - house style, observations style in capital goods.

Industrial Design in Practice: General design - specifying design equipments - rating the importance of industrial design – industrial design in thedesignprocess. **08 Hrs**

Course outcomes:

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

1. Understanding the concepts of Industrial design and man-machine relationship.
2. Design of optimistic display and control devices for various applications.
3. Applying the anthropomorphic data in ergonomicdesign.
4. Understanding the visual effects of lines, form and color on engineeringequipments.
5. Choosing appropriate aesthetic aspects for design of industrial machinery anddevices.

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 20marks.
- There will be two full questions (with a maximum of four sub questions) from eachmodule.
- Each full question will have sub question covering all the topics under amodule.
- The students will have to answer five full questions, selecting one full question from eachmodule.

Textbooks

(1)Industrial design for Engineers - Mayall W.H. - LondonCliffee Books Ltd.

(2)Applied Ergonomics Hand Book - Brien Shakel (Edited) - Butterworth Scientific,

HUMAN RESOURCES MANAGEMENT			
Course Code	**20MPT324**	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Module-1

HRM in perspective, competitive challenges, uses of HR information, Demographics and employee concerns, social issues, diversity in. HRM,

Relationship of Job Requirements and HRM functions, Job Analysis, Job Description, Job Design, Designing work for groups, flexible work schedules, Industrial engineering and ergonomic consideration, HR Planning, Effective HRP, Forecasting and balancing supply and demand of HR, recruiting from inside and outside, Recruiting protected class, Recruitingolderpeople. **08Hrs**

Module-2

Selection, Matching people and job, sources of information about job candidate, The US Employee Polygraph Protection Act, graphology, Medical examination, Drug test, Interview methods Guidelines for interviewers, appropriate and inappropriate interview questions, selectiondecision. **08Hrs**

Module-3

Developing effectiveness in HR, Investment in Training, System approach, Conducting the .needs assessment, designing training programs, trainee readiness and motivation, principles of learning, characteristics of trainees, training methods for non-managerial employees, OJT, Technology for training, training methods for MDP, Evaluating, benchmarkingHRtraining. **08Hrs**

Module-4

Career development and Appraisal, identifying career opportunity and requirements, gauging employee potential, career development initiative, Mentor check list, career development for women and minorities, dual career couples, personal career development, Behavioural methods of appraisal, balanced score card, personal score card appraisal interviews;performancediagnosis. **08Hrs**

Module-5

International HRM, Managing across borders, International staffing, Skills of a global manager, content of training program. Non-verbal communications, developing local resources, compensation of host country employees, managers and expatriate managers. Case studies on appraisal system, developing a training session, evaluating a given training program. Preparation of structured and unstructured interviews. **08 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 ofHRM.
2. Know methodology of job selection process implemented in various sectors.
3. Analyse the effectiveness in training, evaluating and benchmarking HRtraining.
4. Understand the career development concept and methods of personal appraisal.
5. Understand International activities of HRM, Staffing, communication, appraisal training and interviewsystem.

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 20marks.
- There will be two full questions (with a maximum of four sub questions) from eachmodule.
- Each full question will have sub question covering all the topics under amodule.
- The students will have to answer five full questions, selecting one full question from eachmodule.

Textbooks

(1)Managing Human Resources - Wayne F Cascio - Tata McGraw Hill, New Delhi

(2)Managing Human Resources - George Bohlander and Scot Snell - Thompson South western.

Reference Books

(1)Human Resource Management - BiswajeetPattanayak - Prentice Hall of India Pvt. Ltd.

(2)Human Resource Management - K. Ashwathappa,

(3)Personnel Management - C.B.Memoria - Himalaya Publishing.

NON DESTRUCTIVE TESTING			
Course Code	**20MPT331**	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Module-1

Introduction: Definition, concept of NDT, comparison between destructive and non destructive testing, purposes of NDT, classification of NDT methods, advantages, disadvantages, application of NDT in industries, visual inspection, pressure and leak testing.

Liquid Penetrant Inspection: Basic processing steps of LPI, penetrant testing materials, penetrant dwell time, developers, material smear and its removal, advantages, disadvantages &applications.
. **08Hrs**

Module-2

Magnetic particle inspection: Basic principle of MPI, Processing steps of MPI, Methods of generating magnetic fields, types of magnetic particles and suspension liquids, advantages, disadvantages and applications.

Eddy current inspection: Basic principle of eddy current inspection, operating variables, procedure, inspection coils, and detectable discontinuities by the method of eddy current inspection, advantages, disadvantagesandapplications. **08Hrs**

Module-3

Ultrasonic inspection: Principle of ultrasonic inspection, basic equipment, characteristics of ultrasonic waves, variables in inspection, inspection methods - scanning systems, pulse echo A-scan, B-scan, and C-scans, contact and immersion methods, transducer elements, couplants, search units, reference blocks, applications..
. **08 Hrs**

Module-4

Microwave inspection: Principle of microwave inspection, basic equipment & inspection procedure, advantages, disadvantages and applications.

Radiography inspection: Principle of radiographic inspection, radiation sources, X-rays and Gamma-rays, X-ray tubes, Radiographic films, screens and filters, image intensifiers, penetrameters, image quality, radiographic sensitivity, neutron radiography, safety aspects related totesting,applications. **08Hrs**

Module-5

Holographic Inspection: Basic principle of optical holography, The basic hologram, recording and reconstruction, interferrometric holography, methods of storing for interferrometric holography, basic principle of acoustic holography, systems and techniques, advantages, disadvantages, and applications of holography.
. **08 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 currenttest.
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 andits application in defectdetection.

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 20marks.
- There will be two full questions (with a maximum of four sub questions) from eachmodule.
- Each full question will have sub question covering all the topics under amodule.
- The students will have to answer five full questions, selecting one full question from eachmodule.

Textbooks

(1)Non Destructive Testing - Mc Gonnagle J J – Garden and Reach, New York.

(2)Non Destructive Inspection and Quality Control – Metals Hand Book Vol.11 American Society of Metals

Reference Books

(1)The Testing and Inspection of Engineering materials - Davis H.E, Troxel G.E, Wiskovil C.T - McGraw Hill.

(2) Non Destructive Evaluation 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 wiskovil C.T - McGraw hill.

SIMULATION AND MODELING OF MANUFACTURING SYSTEMS			
Course Code	**20MPT332**	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. **08Hrs**

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. **08Hrs**

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 AnnitaborsenDohlgvistPublisherArtechhouse. **08Hrs**

Module-4

Random Variable Generation: Inversion transforms technique-exponential distribution. uniform distribution, weibul distribution, continuous distribution, generating approximate normal variates-Erlangdistribution. **08Hrs**

Module-5

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

Design and Evalution of Simulation Experiments: variance reduction techniques -antithetic variables, variables-verification and validation of simulation models. Simulation Software: Selection of simulation software, simulation packages.
. **08Hrs**

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 modelingparadigm.
2. Conceptualize real world situations related to systems development decisions, originating from source requirements andgoals.
3. Develop skills to apply simulation software to construct and execute goal-driven systemmodels.
4. Interpret the model and apply the results to resolve critical issues in a real worldenvironment.
5. Understand the Empirical Discrete Distribution, Design and Evalution of SimulationExperiments**.**

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 20marks.
- There will be two full questions (with a maximum of four sub questions) from eachmodule.
- Each full question will have sub question covering all the topics under amodule.
- The students will have to answer five full questions, selecting one full question from eachmodule.

Textbook/ Textbooks

(1)Discrete Event System Simulation - Jerry Banks & .John S Carson II - Prentice Hall Inc

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

Reference Books

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

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

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

ADVANCED FLUID POWER SYSTEMS			
Course Code	**20MPT333**	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Module-1

Introduction: Pascal Law, Advantages of Fluid Power, Applications of Fluid Power, Components of a FluidPower.

Hydraulic Power Unit: Introduction, Pumping Theory, Pump Classification, Gear Pumps, (Vane Pumps- simple, balanced & pressure compensated vane pump, Vane design) Piston Pumps- Radial, Axial (Bent axis & Swash plate), Pump Performance, Pump Noise, Ripple inpumps.

Hydraulic Actuators: Linear actuator- cylinders, Mechanics of Hydraulic cylinder loading, limited rotation hydraulic actuator, cylinder cushioning, Gear, Vane & Piston motor, Motor performance, Hydrostatictransmission. **08Hrs**

Module-2

Power Controlling Elements – Valves :
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 duringswitching.
ii) Pressure Control Valves: Classification, opening & Closing Pressure difference, Cracking Pressure, Pressure Relief Valve – Simple & Compound type, Pressure reducing valve, sequence, unloading &Counter balance valve, Pressure switches.
iii) Flow Control valves – Fixed throttle, Variable throttle, Pressure Compensation principles, pressure compensated Flow control valve – Reducing & Relieftype.
iv) Check valve, Pilot operated checkvalve.
. **08 Hrs**

Module-3

Hydraulic Circuit Design & Analysis: Control of Single & double acting cylinder, Regeneration circuit, cylinder sequencing & Synchronizing circuit. Speed control of cylinder & Motors, Analysis of Hydraulic system with frictional losses, Accumulators &accumulator circuits.

Pneumatic System: Introduction, – Generation of compressed air, air receiver, servicing FRL unit, Air filter, pressure regulation, lubricator, Pneumatic cylinder & air motor – different types of cylinder, cushion assembly. Cylinder performance.

Pneumatic Valve: Directional control valves, impulse valve, Quick exhaust valve, shuttle valve, Twin pressure valve, Time delayvalve.
. **08Hrs**

Module-4

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, useof

kannaughveitch map for pneumatic circuit design. . **08Hrs**
Module-5
Electrical Control in Fluid Power: Contactors, & Switches, Relays, Limit switch, Electro hydraulic & Electro Pneumatic Circuits, Simple Cylinder reciprocation, interlocking using relays, Proximity switches, application of proximity switches, Time dependent will dependent and traveldependentcircuits. **08Hrs**
Course outcomes: At the end of the course the student will be able to: 1. Understand the basic concepts of fluid power and applications like pump andactuators. 2. Obtain the knowledge of appropriate selection of control for specific application. 3. Design hydraulic and pneumatic circuitalsystem. 4. Design the pneumatic and logic circuits based on mathematical technique. 5. Understand the application of electric elements in controllingthe fluid power.
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 20marks. • There will be two full questions (with a maximum of four sub questions) from eachmodule. • Each full question will have sub question covering all the topics under amodule. • The students will have to answer five full questions, selecting one full question from eachmodule.
Textbooks
(1)Fluid Power with Application - Anthony Esposito - Peason Education - 5th edition.
(2)Oil hydraulics -Principles & maintenance - S.R. Majumdar - Tata M C Graw Hill
Reference Books
(1)Components& Application - Bosch Rexroth didactic - Hydraulics Trainer - vol 1. Publication
(2)Pneumatic System, Principles and Maintenance - S.R. Majumdar - Tata M C Graw HillPublication.
(3)Pneumatics: Theory and Applications - Bosch Rexroth didactic – Publication
(4) Electro Pneumatics - Bosch Rexroth didactic -Vol. 2, Publication.

PROJECT MANAGEMENT			
Course Code	**20MPT334**	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. **08Hrs**

Module-2

Means of Financing- Profitability and Breakeven Analysis -Cash Flows of Projects -Tax factor in investment Analysis -Interest CompoundingandDiscounting. **08Hrs**

Module-3

Appraisal Criteria and Selection of Investment-cost of capital analysisofRisk-FinancialProjection,socialCostBenefitAnalysis. **08Hrs**

Module-4

Manpower Management in Projects- Functional Approach to Manpower Management, - the Element of decision Process Project Team Concepts - Field Autonomy- Policies GoverningProjects. **08Hrs**

Module-5

Networks Techniques in Project Management-PERT/CPM Analysis - Administrative aspects ofCapitalInvestment. **08Hrs**

Course outcomes:

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

1. Understand the relation between investment opportunities, market, and demandanalyses.
2. Analyse the project cash flow, interest and taxfactor.
3. Understand the cost capital analysis of risk, financial project, social cost and benefit analysis.
4. Understand the man power management and project teamconcept.
5. Optimise the project management by PERT andCPM.

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 20marks.
- There will be two full questions (with a maximum of four sub questions) from eachmodule.
- Each full question will have sub question covering all the topics under amodule.
- The students will have to answer five full questions, selecting one full question from eachmodule.

Textbooks

(1)Projects: appraisal, preparation, budgeting & implementation – Prasannachandra– TMH

(2)Handbook of Project Management - Dennis lock.
Reference Books
(1) Project Management - Dennis lock – GowerPublishing Ltd - 8th Revised edition.

PROJECT WORK PHASE – 1			
Course Code	20MPT34	CIE Marks	100
Number of contact Hours/Week	2	SEE Marks	--
Credits	02	Exam Hours	--

Course objectives:

- Support independentlearning.
- Guide to select and utilize adequate information fromvaried resources maintaining ethics.
- Guide to organize the work in the appropriate mannerand present information (acknowledging the sources)clearly.
- Develop interactive, communication, organisation,time management, and presentation skills.
- Impart flexibility andadaptability.
- Inspire independent and teamworking.
- Expand intellectual capacity, credibility, judgement,intuition.
- Adhere to punctuality, setting and meetingdeadlines.
- Instil responsibilities to oneself andothers.
- 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 pointslides.
- Answer the queries and involve indebate/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 becomeself-confident.

Course outcomes:

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

- Demonstrate a sound technical knowledge of theirselected projecttopic.
- Undertake problem identification, formulation, andsolution.
- Design engineering solutions to complex problems utilisinga systemsapproach.
- Communicate with engineers and the community at large in written an oralforms.
- Demonstrate the knowledge, skills and attitudes of a professionalengineer.

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	20MPT35	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 innovativeattitude.
- To guide to select and utilize adequate information from varied resources upholdingethics.
- 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 presentationskills.
- To impart flexibility andadaptability.
- To inspire independent and teamworking.
- To expand intellectual capacity, credibility, judgement, intuition.
- To adhere to punctuality, setting and meetingdeadlines.
- To instil responsibilities to oneself andothers.
- 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 defendit.
- Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the projecttask.
- Habituated to critical thinking and use problem solvingskills.
- Communicate effectively and to present ideas clearly and coherently in both the written and oralforms.
- Work in a team to achieve commongoal.
- Learn on their own, reflect on their learning andtake 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	20MPTI36	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 riskmanagement, paperwork, equipment ordering, maintenance, responding to emergencies etc. The objective are further,

To put theory intopractice.

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 ofinternship.

Seminar: Each student, is required to

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

Course outcomes:

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

- Gain practical experience within industry in which the internship isdone.
- Acquire knowledge of the industry in which the internship is done.
- Apply knowledge and skills learned to classroomwork.
- Develop a greater understanding about career options while more clearly defining personal careergoals.
- Experience the activities and functions ofprofessionals.
- Develop and refine oral and written communicationskills.
- Identify areas for future knowledge and skilldevelopment.
- 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, participationinthequestionandanswersessionbythestudent)bythe committee constituted for the purpose by the Head of the Department. Thecommitteeshallconsistofthreefacultyfromthedepartmentwith
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 theUniversity.

PROJECT WORK PHASE -2			
Course Code	20MPT41	CIE Marks	40
Number of contact Hours/Week	4	SEE Marks	60
Credits	20	Exam Hours	03

Course objectives:

- To support independentlearning.
- 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 presentationskills.
- To impart flexibility andadaptability.
- To inspire independent and teamworking.
- To expand intellectual capacity, credibility, judgement, intuition.
- To adhere to punctuality, setting and meetingdeadlines.
- To instil responsibilities to oneself andothers.
- 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 avoidingplagiarism.

Course outcomes:

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

- Present the project and be able to defendit.
- Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the projecttask.
- Habituated to critical thinking and use problem solvingskills
- Communicate effectively and to present ideas clearly and coherently in both the written and oralforms.
- Work in a team to achieve commongoal.
- Learn on their own, reflect on their learning and take appropriate actions to improveit.

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 10marks.

Semester EndExamination

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 questionand answer session) by the examiners appointed by theUniversity.