

M. Tech. (ME) : Syllabus Revision in 2018-19.

S. No	Course Code	Session 2017-18	Session 2018-19	Remark Syllabus Change/ new course
1	MTMEPE 101	<p>Computer Aided Process Planning</p> <p>UNIT 1 Introduction to CAPP: Information requirement for process planning system, Role of process planning, advantages of conventional process planning over CAPP, Structure of Automated process planning system, feature recognition, methods.</p> <p>UNIT 2 Generative CAPP system: Importance, principle of Generative CAPP system, automation of logical decisions, Knowledge based systems, Inference Engine, implementation, benefits.</p> <p>UNIT 3 Retrieval CAPP system: Significance, group technology, structure, relative advantages, implementation, and applications.</p> <p>UNIT 4 Selection of manufacturing sequence: Significance, alternative manufacturing processes, reduction of total set-up cost for a particular sequence, quantitative methods for optimal selection, examples.</p> <p>UNIT 5 Determination of manufacturing tolerances: design tolerances, manufacturing tolerances, methods of tolerance allocation, sequential approach, integration of design and manufacturing tolerances, advantages of integrated approach over sequential approach.</p>	<p>Computer Aided Process Planning</p> <p>UNIT 1 Introduction to CAPP: Information requirement for process planning system, Role of process planning, advantages of conventional process planning over CAPP, Structure of Automated process planning system, feature recognition, methods.</p> <p>UNIT 2 Generative CAPP system: Importance, principle of Generative CAPP system, automation of logical decisions, Knowledge based systems, Inference Engine, implementation, benefits.</p> <p>UNIT 3 Retrieval CAPP system: Significance, group technology, structure, relative advantages, implementation, and applications.</p> <p>UNIT 4 Selection of manufacturing sequence: Significance, alternative manufacturing processes, reduction of total set-up cost for a particular sequence, quantitative methods for optimal selection, examples.</p> <p>UNIT 5 Determination of manufacturing tolerances: design tolerances, manufacturing tolerances, methods of tolerance allocation, sequential approach, integration of design and manufacturing tolerances, advantages of integrated approach over sequential approach.</p>	No Change
2	MTMEPE 102	<p>Quality Management Systems</p> <p>UNIT 1 Review of Quality Control: Quality assurance, Total Quality Management (TQM), Core concepts, Quality gurus and their contribution, Quality costs and measurement.</p> <p>UNIT 2 Total Quality Control (TQC): TQC concepts, Responsibility, Learning from the west, TQC concepts categorized, Goals, Process control</p>	<p>Quality Management Systems</p> <p>UNIT 1 Review of Quality Control: Quality assurance, Total Quality Management (TQM), Core concepts, Quality gurus and their contribution, Quality costs and measurement.</p> <p>UNIT 2 Total Quality Control (TQC): TQC concepts, Responsibility, Learning from the west, TQC concepts categorized, Goals, Process control, Easy to see quality control as facilitator, Small lot sizes,</p>	No Change

		<p>control, Easy to see quality control as facilitator, Small lot sizes, Housekeeping, daily machine checking, Full proof devices, Tools of analysis, QC circles, TQC in Japanese-owned US electronics plant, TQC in Japanese-owned automotive plants.</p> <p>UNIT 3 Taguchi Methods: Review of design of experiments, Process optimization and robust product design using orthogonal arrays, Taguchi loss functions quality level, Taguchi online feed back quality control, Manufacturing tolerance design course will include software applications and industry case studies.</p> <p>UNIT 4 Total Quality Management (TQM): philosophy of TQM, Customer focus, Organization, Top management commitment, Teamwork, Goal setting and bench marking, TQM systems-Quality policy deployment, Quality function deployment, Standardization, Designing for quality, manufacturing for quality, implementation-KAIZEN, POKA YOKE, Six sigma etc</p> <p>UNIT 5 Quality System and Standards: ISO 9000 system QS 9000, ISO 14000- need, Advantages, Clauses, Implementation, Quality auditing, Case studies,</p>	<p>Housekeeping, daily machine checking, Full proof devices, Tools of analysis, QC circles, TQC in Japanese-owned US electronics plant, TQC in Japanese-owned automotive plants.</p> <p>UNIT 3 Taguchi Methods: Review of design of experiments, Process optimization and robust product design using orthogonal arrays, Taguchi loss functions quality level, Taguchi online feed back quality control, Manufacturing tolerance design course will include software applications and industry case studies.</p> <p>UNIT 4 Total Quality Management (TQM): philosophy of TQM, Customer focus, Organization, Top management commitment, Teamwork, Goal setting and bench marking, TQM systems-Quality policy deployment, Quality function deployment, Standardization, Designing for quality, manufacturing for quality, implementation-KAIZEN, POKA YOKE, Six sigma etc</p> <p>UNIT 5 Quality System and Standards: ISO 9000 system QS 9000, ISO 14000- need, Advantages, Clauses, Implementation, Quality auditing, Case studies,</p>	
3	MTMEPE 103	<p>Ergonomics And Work System Design</p> <p>UNIT 1 Method Study: Process Analysis, Process and Activity Charts, Operation Analysis, Basic procedure, Micro Motion Study, Principles of Motion Economy. Work Measurement: Purposes and uses, Basic procedure, Techniques</p> <p>UNIT 2 Procedures for work sampling study; Random, systematic, stratified and zone sampling techniques; Practical applications, Evaluation and improvements; Performance sampling. Motion pattern used in MTM; MTM data and its installation.</p> <p>UNIT 3 Ergonomics and Production: Ergonomics</p>	<p>MTMEPE103A: Ergonomics and Work System Design</p> <p>UNIT 1 Method Study: Process Analysis, Process and Activity Charts, Operation Analysis, Basic procedure, Micro Motion Study, Principles of Motion Economy. Work Measurement: Purposes and uses, Basic procedure, Techniques</p> <p>UNIT 2 Procedures for work sampling study; Random, systematic, stratified and zone sampling techniques; Practical applications, Evaluation and improvements; Performance sampling. Motion pattern used in MTM; MTM data and its installation.</p> <p>UNIT 3 Ergonomics and Production: Ergonomics and product design, ergonomics in automated systems;</p>	No Change

		<p>and product design, ergonomics in automated systems; Expert systems for ergonomic design; Anthropometrics data and its applications in ergonomic design; Limitations of anthropometric data, Use of computerized database; Case study.</p> <p>UNIT 4 Man Machine Systems: Human factors affecting work, energy requirements for men; Effects of noise, light, heat and humidity, Monotony and fatigue on operator performance Case studies, man machine system characteristics; system components and its reliability, Man machine communication, design and arrangements of controls and displays,</p> <p>UNIT 5 Control and Displays: Shapes and sizes of various controls and displays- Multiple displays and control situations; design of major controls in automobiles, machine tools. Visual Effects of Line and Colour: The mechanics of seeing; Psychology of seeing.</p>	<p>Expert systems for ergonomic design; Anthropometrics data and its applications in ergonomic design; Limitations of anthropometric data, Use of computerized database; Case study.</p> <p>UNIT 4 Man Machine Systems: Human factors affecting work, energy requirements for men; Effects of noise, light, heat and humidity, Monotony and fatigue on operator performance Case studies, man machine system characteristics; system components and its reliability, Man machine communication, design and arrangements of controls and displays,</p> <p>UNIT 5 Control and Displays: Shapes and sizes of various controls and displays- Multiple displays and control situations; design of major controls in automobiles, machine tools. Visual Effects of Line and Colour: The mechanics of seeing; Psychology of seeing.</p>	
4	-	-	<p>MTMEPE103B: Energy Management</p> <p>UNIT 1 Introduction: Energy sources; Instrumentation and measurements. Principles of Energy Management and Energy Audit: General principles, planning and program; Introduction to energy audit; General methodology; Site surveys; Energy systems survey, energy audit; Instrumentation.</p> <p>UNIT 2 Heating and Cooling Management: General principles of energy managements in HVAC systems; Human comforts and health requirements; HVAC systems; Boiler and heat sources; Chillers, fans, pumps, cooling towers, Energy management opportunities; Modeling of heating and cooling loads in buildings.</p> <p>UNIT 3 Electrical Load and Lighting Management: General principles; Illumination and human comfort; Lighting systems; Electrical load analysis; Peak load controls. Steam generation and distribution, Hot water and pumping, Compressed air; Energy storage for process industries.</p> <p>UNIT 4 Integrated Building systems: General principles; Environment conformation; Passive design considerations; Building envelope design consideration, Integration of building system, Energy storage-cold storage techniques, Economic analysis.</p> <p>UNIT 5</p>	Code Change

			Economic Aspects of Energy Management: General considerations; Economic analysis methods; Life-cycle costing, Break even analysis, benefit cost analysis, payback period analysis, present worth analysis, equivalent annual cost analysis.	
5	MTMEPE 104.B	<p>Machine Tool Design</p> <p>UNIT 1 Machine Tool Drive: working and auxiliary motion in machine, Machine tool drives, Hydraulic transmission, Mechanical transmission, General requirements of machine tool design, Layout of machine tools.</p> <p>UNIT 2 Regulation of Speed and Feed Rates: Aim of speed feed regulation, stepped regulation of speed, design of speed box, Design of feed box, Special cases of gear box design, Set stopped regulation of speed and feed rates.</p> <p>UNIT 3 Design of Machine Tool Structure: Fundamentals of machine tool structures and their requirements, Design criteria of machine tool structure, Static and dynamic stiffness, Design of beds and columns, Design of housing models, Techniques in design of machine tool structure.</p> <p>UNIT 4 Design of Guide-ways and power Screws: Function and type of guide-ways, design of slide-ways, Protecting devices for slide-ways, Design of power screws. Design of Spindles and Spindle Supports: Materials for spindles, Design of spindles, Antifriction bearings, Sliding bearings.</p> <p>UNIT 5 Dynamics of Machines Tools: General procedure of assessing dynamic stability of EES, Cutting processing, Closed loop system, Dynamic characteristics of cutting process, Stability analysis.</p>	<p>MTMEPE103C: Machine tool design</p> <p>UNIT 1 Machine Tool Drive: working and auxiliary motion in machine, Machine tool drives, Hydraulic transmission, Mechanical transmission, General requirements of machine tool design, Layout of machine tools.</p> <p>UNIT 2 Regulation of Speed and Feed Rates: Aim of speed feed regulation, stepped regulation of speed, design of speed box, Design of feed box, Special cases of gear box design, Set stopped regulation of speed and feed rates.</p> <p>UNIT 3 Design of Machine Tool Structure: Fundamentals of machine tool structures and their requirements, Design criteria of machine tool structure, Static and dynamic stiffness, Design of beds and columns, Design of housing models, Techniques in design of machine tool structure.</p> <p>UNIT 4 Design of Guide-ways and power Screws: Function and type of guide-ways, design of slide-ways, Protecting devices for slide-ways, Design of power screws. Design of Spindles and Spindle Supports: Materials for spindles, Design of spindles, Antifriction bearings, Sliding bearings.</p> <p>UNIT 5 Dynamics of Machines Tools: General procedure of assessing dynamic stability of EES, Cutting processing, Closed loop system, Dynamic characteristics of cutting process, Stability analysis.</p>	Code Change
6	MTMEPE 104.C	<p>Lean Manufacturing</p> <p>UNIT 1 Just In Time Production System: JIT Logic - Pull system, Japanese approach to production elimination of waste, JIT implementation requirements, JIT application for job shops</p>	<p>MTMEPE104A: Lean Manufacturing</p> <p>UNIT 1 Just In Time Production System: JIT Logic -Pull system, Japanese approach to production elimination of waste, JIT implementation requirements, JIT application for job shops</p> <p>UNIT 2</p>	Code Change

		<p>UNIT 2 Kanban System: Kanban rules supplier Kanban and sequence schedule used by supplier, Monthly information & daily information, Later replenish system by Kanban sequenced withdrawal P system by sequence schedule table -problems & counter measures in applying Kanban system to subcontractors - Supplier Kanban circulation in the paternal manufacturer - structure of supplier Kanban sorting office.</p> <p>UNIT 3 The Rise & Fall Of Mass Production: Mass production, work force, organization, tools, product –logical limits of mass production, Sloan as a necessary compliment to Ford</p> <p>UNIT 4 The Rise Of Lean Production: Birthplace, concrete example, company as community, Final assembly plant, product development and engineering. Changing customer demand, dealing with the customer, future of lean production.</p> <p>UNIT 5 Shortening Of Production Lead Times: Reduction of setup times, practical procedures for reducing setup time. Standardization of operations, Machine layout, multi function workers and job rotation, Improvement activities to reduce work force and increase worker morale, foundation for improvements.</p>	<p>Kanban System: Kanban rules supplier Kanban and sequence schedule used by supplier, Monthly information & daily information, Later replenish system by Kanban sequenced withdrawal P system by sequence schedule table -problems & counter measures in applying Kanban system to subcontractors - Supplier Kanban circulation in the paternal manufacturer - structure of supplier Kanban sorting office.</p> <p>UNIT 3 The Rise & Fall Of Mass Production: Mass production, work force, organization, tools, product –logical limits of mass production, Sloan as a necessary compliment to Ford</p> <p>UNIT 4 The Rise Of Lean Production: Birthplace, concrete example, company as community, Final assembly plant, product development and engineering. Changing customer demand, dealing with the customer, future of lean production.</p> <p>UNIT 5 Shortening Of Production Lead Times: Reduction of setup times, practical procedures for reducing setup time. Standardization of operations, Machine layout, multi function workers and job rotation, Improvement activities to reduce work force and increase worker morale, foundation for improvements.</p>	
7			<p>MTMEPE104B: Product Engineering</p> <p>UNIT 1 Product Design Process: Design Process Steps, Morphology of Design. Problem Solving and Decision Making: Problem-Solving Process, Creative Problem Solving, Invention, Brainstorming, Morphological Analysis, Behavioral Aspects of Decision Making, Decision Theory, Decision Matrix, Decision Trees.</p> <p>UNIT 2 Materials Selection: Problem of Materials Selection, Performance Characteristics of Materials, Materials Selection Process, Sources of Information on Materials, Economics of Materials, Evaluation Methods for Materials Selection, Cost versus Performance Relations, Weighted Property Index, Cost Comparison, Value Analysis, Materials Systems, Materials Substitution</p> <p>UNIT 3</p>	Code Change

			<p>Interaction of Materials, Processing, and Design: Role of Processing in Design, Classification of Manufacturing Processes, Economics of Manufacturing, Design for Castings, Forgings, Sheet-Metal Forming, Machining, Powder Metallurgy, Welding. Residual Stresses in Design, Design for Heat Treatment, Design for Assembly.</p> <p>UNIT 4 Transport Documentation and Transport Functionality – Bill of Lading, Freight Bill, Shipping Manifest. Responsibilities of Traffic Department. Product Movement, Product Storage, Participants in Transportation Decision – Shippers, Carriers, Government, Public.</p> <p>UNIT 5 Materials Handling, Packaging and Warehouse Functionality: Fork Lift Trucks, Pallet Trucks, Tow Tractor, Conveyors, Carousels. Automated & Semi Automated Handling Procedure. Consumer Packaging, Industrial Packaging, Importance of Packaging, Function of Packaging. Warehouse Operating Principles, Classification – (1) Private, (2) Public, (3) Contract Warehouse, Planning the distribution warehouse.</p>	
8	-	-	<p>MTMEPE104C: Mechatronics</p> <p>UNIT 1 Introduction: Definition of Mechatronics products, design considerations and trade offs. Overview of Mechtronic products. Intelligent machine Vs Automatic machine economic and social justification.</p> <p>UNIT 2 Actuators and drive systems: Mechanical, Electrical, hydraulic drive systems, Characteristics of mechanical, Electrical, Hydraulic and pneumatic actuators and their limitations.</p> <p>UNIT 3 Architecture of intelligent machines: Introduction to Microprocessor and Microcontrollers. Programmable logic controls and identification of systems. System design classification, motion control aspects in design.</p> <p>UNIT 4 Machine vision: Feature and pattern recognition methods, concepts of perception and cognition in decision-making.</p> <p>UNIT 5 Sensor interfacing and Machine vision: Analog and digital sensors for motion measurement, digital transducers, human-Machine and machine-</p>	Code Change

			Machine inter facing devices and strategy.	
9	-	-	<p>MTMEPE105: Research Methodology and IPR</p> <p>Unit-1: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.</p> <p>Unit-2: Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper. Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee</p> <p>Unit-3: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.</p> <p>Unit-4: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.</p> <p>Unit-5: New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.</p>	New Course
10	MTMEPE 105	<p>ERGONOMICS AND WORK SYSTEM DESIGN LAB</p> <p>LIST OF EXPERIMENTS:</p> <ol style="list-style-type: none"> To study the activities of the machine and the operator by micro motion technique To prepare the layout of shop floor and working areas or work stations by method study To study how principles of motion economy work to minimizing the physical and perceptual loads imposed on people engaged in any type of work. To study how work performance and machine utilization by direct observation takes place by work 	<p>MTMEPE107: ERGONOMICS AND WORK SYSTEM DESIGN LAB</p> <p>LIST OF EXPERIMENTS:</p> <ol style="list-style-type: none"> To study the activities of the machine and the operator by micro motion technique To prepare the layout of shop floor and working areas or work stations by method study To study how principles of motion economy work to minimizing the physical and perceptual loads imposed on people engaged in any type of work. To study how work performance and machine utilization by direct observation takes place by work sampling To study the various work sampling practical applications 	Code Change

		<p>sampling</p> <ol style="list-style-type: none"> 5. To study the various work sampling practical applications 6. To study how to optimize the integration of man and machine so as to improve the work rate and accuracy 7. To study various ergonomics aspects in automated systems 8. To study how the various human factors affecting work 9. To study how the noise, light, heat and humidity affect the human performance 10. To study shapes and sizes of various controls and displays in any work station for better performance 11. To study ergonomically design of major controls in automobiles 	<ol style="list-style-type: none"> 6. To study how to optimize the integration of man and machine so as to improve the work rate and accuracy 7. To study various ergonomics aspects in automated systems 8. To study how the various human factors affecting work 9. To study how the noise, light, heat and humidity affect the human performance 10. To study shapes and sizes of various controls and displays in any work station for better performance 11. To study ergonomically design of major controls in automobiles 	
11	-	-	MTMEPE106 :Audit Course-Personality Development Through Life Enlightenment Skills	New Course
12	-	-	MTMEPE108: Manufacturing Lab LIST OF EXPERIMENTS: <ol style="list-style-type: none"> 1. To Study the Various Machining practice and parametric analyses on USM. 2. To Study the Various Machining practice and parametric analyses on EDM. 4. To Study the Various Machining practice and parametric analyses on ECM. 5. To Study the Various Machining practice and parametric analyses on AJM. 6. To Study the Various Measurement of forces, surface roughness and temperature in case of milling and grinding operations. 	New Course
13	MTMEPE 201	<p>Enterprise Resource Planning</p> <p>UNIT 1 Introduction to ERP: Introduction, Evolution of ERP, Reasons for growth of ERP, Advantages /disadvantages of ERP, Evaluation of ERP, Various Modules in ERP</p> <p>UNIT 2 Modules in ERP: Finance and Controlling, Sales and Distribution, Materials Management, Production Planning and Control, Quality Management, Planet Maintenance, Human Resource</p> <p>UNIT 3 Business Processes: Order To Cash, Procure To Pay, Plan To Produce, Make To Stock, Make To Order and Assemble To Order,</p>	<p>MTMEPE201: Enterprise Resource Planning</p> <p>UNIT 1 Introduction to ERP: Introduction, Evolution of ERP, Reasons for growth of ERP, Advantages /disadvantages of ERP, Evaluation of ERP, Various Modules in ERP</p> <p>UNIT 2 Modules in ERP: Finance and Controlling, Sales and Distribution, Materials Management, Production Planning and Control, Quality Management, Planet Maintenance, Human Resource</p> <p>UNIT 3 Business Processes: Order To Cash, Procure To Pay, Plan To Produce, Make To Stock, Make To Order and Assemble To Order, Difference in Discrete and Process industries</p>	No Change

		<p>Difference in Discrete and Process industries</p> <p>UNIT 4 Manufacturing Process Knowledge: Auto Industry, Hi Tech, FMCG, Pharma and Chemical.</p> <p>UNIT 5 ERP Projects: Project types, Implementation methodology, Various steps in the project Implementation, Project Preparation, Business Blueprinting, As Is – To Be Study, Gap Analysis, Realization, Final Preparation, Go Live and Support, User Training, Issues during implementation</p>	<p>UNIT 4 Manufacturing Process Knowledge: Auto Industry, Hi Tech, FMCG, Pharma and Chemical.</p> <p>UNIT 5 ERP Projects: Project types, Implementation methodology, Various steps in the project Implementation, Project Preparation, Business Blueprinting, As Is – To Be Study, Gap Analysis, Realization, Final Preparation, Go Live and Support, User Training, Issues during implementation</p>	
14	MTMEPE 202	<p>Cnc Technology & Programming</p> <p>UNIT 1 Introduction to CNC Machine tools: Evolution of Computerized control in manufacturing, Components, Working principle of CNC, DNC and Machining centers.</p> <p>UNIT 2 Feedback devices: Introduction, Digital incremental displacement measuring systems, Incremental rotary encoders, Moire fringes, Digital absolute measuring system.</p> <p>UNIT 3 APT programming: APT language structure, APT geometry, Definition of point, time, vector, circle, plane, patterns and matrices. APT motion commands: setup commands, point-to point motion commands, continuous path motion commands, post processor commands, control commands, Macro subroutines, Part programming preparation for typical examples.</p> <p>UNIT 4 Economics and Maintenance of CNC machine tools: Introduction, factors influencing selection of CNC machines, Cost of operation of CNC machines, Maintenance features of CNC machines, Preventive maintenance, Documentation, Spare parts, Training in Maintenance.</p> <p>UNIT 5 Control Systems and interface: Open and closed loop systems, Micro processor</p>	<p>MTMEPE202: CNC Technology & Programming</p> <p>UNIT 1 Introduction to CNC Machine tools: Evolution of Computerized control in manufacturing, Components, Working principle of CNC, DNC and Machining centers.</p> <p>UNIT 2 Feedback devices: Introduction, Digital incremental displacement measuring systems, Incremental rotary encoders, Moire fringes, Digital absolute measuring system.</p> <p>UNIT 3 APT programming: APT language structure, APT geometry, Definition of point, time, vector, circle, plane, patterns and matrices. APT motion commands: setup commands, point-to point motion commands, continuous path motion commands, post processor commands, control commands, Macro subroutines, Part programming preparation for typical examples.</p> <p>UNIT 4 Economics and Maintenance of CNC machine tools: Introduction, factors influencing selection of CNC machines, Cost of operation of CNC machines, Maintenance features of CNC machines, Preventive maintenance, Documentation, Spare parts, Training in Maintenance.</p> <p>UNIT 5 Control Systems and interface: Open and closed loop systems, Micro processor based CNC systems, block diagram of typical CNC system, description of hard ware and soft interpolation systems, Standard and optional features of CNC control systems.</p>	No Change

		based CNC systems, block diagram of typical CNC system, description of hard ware and soft interpolation systems, Standard and optional features of CNC control systems.		
15	MTMEPE 203	<p>RELIABILITY, MAINTENANCE MANAGEMENT & SAFETY</p> <p>UNIT 1 Reliability Engineering: System reliability - series, parallel and mixed configuration, Block diagram, Solving problems using mathematical models. Reliability improvement and allocation-Difficulty in achieving reliability, Method of improving reliability during design, different techniques available to improve reliability.</p> <p>UNIT 2 Maintainability, Availability & Failure Analysis: Maintainability & Availability – Introduction, formulae, Techniques available to improve maintainability & availability, Defect generation – Types of failures, defects reporting and recording, Defect analysis, Failure analysis, Equipment down time analysis, Breakdown analysis, TA, FMEA, FMECA.</p> <p>UNIT 3 Maintenance Planning and Replacement: Maintenance planning – Overhaul and repair; Meaning and difference, Optimal overhaul/Repair/Replace maintenance policy for equipment subject to breakdown, Fixed time maintenance, Total productive maintenance.</p> <p>UNIT 4 Condition Monitoring: Techniques-visual monitoring, temperature monitoring, vibration monitoring, lubricant monitoring, Crack monitoring, Thickness monitoring, Noise and sound monitoring, Condition monitoring of hydraulic system, Machine diagnostics - Objectives, Monitoring strategies.</p> <p>UNIT 5 Safety Aspects: Importance of safety, Factors affecting safety, Safety aspects of site and plant, Hazards of commercial chemical reaction and operation, Instruments for safe operation, Safety education and training, Personnel safety, Disaster planning and measuring safety effectiveness, Future trends in industrial safety.</p>	<p>MTMEPE203A: Reliability, Maintenance Management & Safety</p> <p>UNIT 1 Reliability Engineering: System reliability - series, parallel and mixed configuration, Block diagram, Solving problems using mathematical models. Reliability improvement and allocation-Difficulty in achieving reliability, Method of improving reliability during design, different techniques available to improve reliability.</p> <p>UNIT 2 Maintainability, Availability & Failure Analysis: Maintainability & Availability – Introduction, formulae, Techniques available to improve maintainability & availability, Defect generation – Types of failures, defects reporting and recording, Defect analysis, Failure analysis, Equipment down time analysis, Breakdown analysis, TA, FMEA, FMECA.</p> <p>UNIT 3 Maintenance Planning and Replacement: Maintenance planning – Overhaul and repair; Meaning and difference, Optimal overhaul/Repair/Replace maintenance policy for equipment subject to breakdown, Fixed time maintenance, Total productive maintenance.</p> <p>UNIT 4 Condition Monitoring: Techniques-visual monitoring, temperature monitoring, vibration monitoring, lubricant monitoring, Crack monitoring, Thickness monitoring, Noise and sound monitoring, Condition monitoring of hydraulic system, Machine diagnostics - Objectives, Monitoring strategies.</p> <p>UNIT 5 Safety Aspects: Importance of safety, Factors affecting safety, Safety aspects of site and plant, Hazards of commercial chemical reaction and operation, Instruments for safe operation, Safety education and training, Personnel safety, Disaster planning and measuring safety effectiveness, Future trends in industrial safety.</p>	No Change

16			<p>MTMEPE203B: Cryogenic Systems</p> <p>UNIT 1 Introduction & Low Temperature properties of Engineering Materials: Historical background, Present area involving cryogenics, Mechanical properties; Thermal properties; Electrical and Magnetic properties; properties of Cryogenic fluids.</p> <p>UNIT 2 Gas Liquefaction System: Joule Thompson effect; Adiabatic expansion; Simple Linde-Hampson, Precooled Linde- Hampson system; Liquid dual pressure system; Cascaded system; Claude system, Kapitza system, Collins helium liquefaction system.</p> <p>UNIT 3 Critical Component of Liquefaction System: Effect of heat exchanger; Effectiveness of system performance, Effect of compressor and expander efficiency on system performance; effect of heat transfer to the system.</p> <p>UNIT 4 Cryogenic Refrigeration System: Phillips refrigerator, Importance refrigerator, effectiveness for Phillips refrigerator, Gifford-McMahan refrigerator. Measurement System of Low Temperature: Temperature measurement, Flow rate measurement, Liquid level measurement.</p> <p>UNIT 5 Cryogenic Storage & Transfer System: Cryogenic fluid storage vessels, Insulation, Cryogenic transfer system. Vacuum Technology: Importance of Vacuum technology in cryogenics, Calculation of pump down time for a vacuum system, Components of vacuum systems, Mechanical vacuum pumps, Vacuum gauges & valves.</p>	Code Change
17			<p>MTMEPE203C: Inventory management Syllabus</p> <p>UNIT 1 Definition, Importance, Function, Classification of Inventory, Inventory related Cost, Objectives of Inventory Control, Planning for Inventory Control, Types of Inventory Situations .</p> <p>UNIT 2 Selective Inventory Control Model- ABC Analysis, VED, XYZ, FSN, SOS, GOLF, EOQ Model, P & Q System, Concept of JIT.</p> <p>UNIT 3 Inventory Control Process – Perpetual Review,</p>	Code Change

			<p>Periodic Review, Modified Control, Distribution Requirement Planning (DRP), Process of DRP, Benefits & limitation of DRP.</p> <p>UNIT 4: Classification of W.I.P Inventories, Factors influencing, W.I.P inventory, Problems, Controlling Method.</p> <p>UNIT 5 Factors influencing Finished Goods inventory, Requirement of inventory control Systems, Multi echelon Inventory Model, Use of Information Technology in Inventory Management.</p>	
18	MTMEPE 204.A	<p>PRODUCT ENGINEERING</p> <p>UNIT 1 Product Design Process: Design Process Steps, Morphology of Design. Problem Solving and Decision Making: Problem-Solving Process, Creative Problem Solving, Invention, Brainstorming, Morphological Analysis, Behavioral Aspects of Decision Making, Decision Theory, Decision Matrix, Decision Trees.</p> <p>UNIT 2 Materials Selection: Problem of Materials Selection, Performance Characteristics of Materials, Materials Selection Process, Sources of Information on Materials, Economics of Materials, Evaluation Methods for Materials Selection, Cost versus Performance Relations, Weighted Property Index, Cost Comparison, Value Analysis, Materials Systems, Materials Substitution</p> <p>UNIT 3 Interaction of Materials, Processing, and Design: Role of Processing in Design, Classification of Manufacturing Processes, Economics of Manufacturing, Design for Castings, Forgings, Sheet-Metal Forming, Machining, Powder Metallurgy, Welding. Residual Stresses in Design, Design for Heat Treatment, Design for Assembly.</p> <p>UNIT 4 Transport Documentation and Transport Functionality – Bill of Lading, Freight Bill, Shipping Manifest. Responsibilities of Traffic Department. Product Movement, Product Storage, Participants in Transportation Decision – Shippers, Carriers, Government, Public.</p> <p>UNIT 5</p>	<p>MTMEPE204A: Cellular manufacturing systems</p> <p>UNIT 1 Cellular manufacturing: Introduction, Group machining Concept, Principle, Terminology, characteristics, Perspectives, Objectives, Techniques, Applications, Factors to be considered for implementation, factors influencing the success of cellular manufacturing.</p> <p>UNIT 2 Cell formation techniques: Design and Manufacturing Attributes, Cell Design and Representation of the Problem. Cell Formation Techniques – Traditional methods, Similarity coefficient methods, Array based methods. Cell Design Considerations, Data Structure and Influence on the Solution.</p> <p>UNIT 3 Processing the Exceptional Components: Introduction, Processing Exceptional Components, Models for Eliminating Exceptional Components.</p> <p>UNIT 4 Evaluation of Cellular Manufacturing Solutions: Introduction, Static Evaluation of Cells, Measure of flexibility (MF), Selection of Solution, VEDO Analysis, Comparison of Different Methods.</p> <p>UNIT 5 Line Balancing in Cellular manufacturing: Line balancing for cells, Design Factor in Line Balancing, Bowl Phenomena in Cellular Manufacturing environment, effect on production rates.</p>	Code Change

		Materials Handling, Packaging and Warehouse Functionality: Fork Lift Trucks, Pallet Trucks, Tow Tractor, Conveyors, Carousels. Automated & Semi Automated Handling Procedure. Consumer Packaging, Industrial Packaging, Importance of Packaging, Function of Packaging. Warehouse Operating Principles, Classification – (1) Private, (2) Public, (3) Contract Warehouse, Planning the distribution warehouse.		
19	MTMEPE 204.B	<p>MECHATRONICS</p> <p>UNIT 1 Introduction: Definition of Mechatronics products, design considerations and trade offs. Overview of Mechtronic products. Intelligent machine Vs Automatic machine economic and social justification.</p> <p>UNIT 2 Actuators and drive systems: Mechanical, Electrical, hydraulic drive systems, Characteristics of mechanical, Electrical, Hydraulic and pneumatic actuators and their limitations.</p> <p>UNIT 3 Architecture of intelligent machines: Introduction to Microprocessor and Microcontrollers. Programmable logic controls and identification of systems. System design classification, motion control aspects in design.</p> <p>UNIT 4 Machine vision: Feature and pattern recognition methods, concepts of perception and cognition in decision-making.</p> <p>UNIT 5 Sensor interfacing and Machine vision: Analog and digital sensors for motion measurement, digital transducers, human-Machine and machine- Machine inter facing devices and strategy.</p>	<p>MTMEPE204B: Concurrent Engineering</p> <p>UNIT 1 Introduction: Extensive definition of Concurrent Engineering (CE), CE design methodologies, Review of CE techniques like DFM (Design for manufacture), DFA (Design for assembly), QFD (Quality function deployment), RP (Rapid prototyping), TD (Total design), for integrating these technologies, Organizing for CE, CE tool box, Collaborative product development.</p> <p>UNIT 2 Use of Information Technology: IT support, Solid modeling, Product data management, Collaborative product commerce, Artificial Intelligence, expert systems, Software hardware component design.</p> <p>UNIT 3 Design Stage: Lifecycle design of products, Opportunities for manufacturing enterprises, Modality of concurrent engineering design, Automated analysis Idealization control, CE in optimal structural design, Real time constraints.</p> <p>UNIT 4 Need for PLM: Importance of PLM, Implementing PLM, Responsibility for PLM, Benefits to different managers, Components of PLM, Emergence of PLM, Lifecycle problems to resolve, Opportunities to seize.</p> <p>UNIT 5 Components of PLM: Components of PLM, Product lifecycle activities, Product organizational structure, Human resources in product lifecycle, Methods, techniques, Practices, Methodologies, Processes, System components in lifecycle, slicing and dicing the systems, Interfaces, Information, Standards.</p>	Code Change
20	MTMEPE 204.C	<p>CRYOGENIC SYSTEMS</p> <p>UNIT 1 Introduction & Low Temperature properties of Engineering Materials:</p>	<p>MTMEPE204C: Robotics</p> <p>UNIT I Fundamentals of Robots: Introduction, definition of robot, classification of robots, History of robotics,</p>	Code Change

		<p>Historical background, Present area involving cryogenics, Mechanical properties; Thermal properties; Electrical and Magnetic properties; properties of Cryogenic fluids.</p> <p>UNIT 2 Gas Liquefaction System: Joule Thompson effect; Adiabatic expansion; Simple Linde-Hampson, Precooled Linde- Hampson system; Liquid dual pressure system; Cascaded system; Claude system, Kapitza system, Collins helium liquefaction system.</p> <p>UNIT 3 Critical Component of Liquefaction System: Effect of heat exchanger; Effectiveness of system performance, Effect of compressor and expander efficiency on system performance; effect of heat transfer to the system.</p> <p>UNIT 4 Cryogenic Refrigeration System: Phillips refrigerator, Importance refrigerator, effectiveness for Phillips refrigerator, Gifford-McMahan refrigerator. Measurement System of Low Temperature: Temperature measurement, Flow rate measurement, Liquid level measurement.</p> <p>UNIT 5 Cryogenic Storage & Transfer System: Cryogenic fluid storage vessels, Insulation, Cryogenic transfer system. Vacuum Technology: Importance of Vacuum technology in cryogenics, Calculation of pump down time for a vacuum system, Components of vacuum systems, Mechanical vacuum pumps, Vacuum gauges & valves.</p>	<p>robot components, degree of freedom, robot joints, robot coordinates, reference frames, programming modes, robot characteristics, robot work space, robot languages, advantages, disadvantages and applications of robots.</p> <p>UNIT 2 Dynamic analysis and forces: Introduction, Lagrangian mechanics, Effective moments of inertia, dynamic equations for multi-degree of freedom robots-kinetic energy, potential energy, the Lagrangian, robot's equations of motion, static force analysis of robots.</p> <p>UNIT 3 Trajectory planning: Introduction, path Vs trajectory, basics of trajectory planning, joint space trajectory planning-third order polynomial trajectory planning, fifth order polynomial trajectory planning, Cartesian-space trajectories.</p> <p>UNIT 4 Robot Actuators: Introduction, characteristic of Actuating systems-weight, power to weight ratio, operating pressure, stiffness Vs compliance, comparison of actuating systems, hydraulic devices, pneumatic devices, servomotors, stepped motors.</p> <p>UNIT 5 Robot sensors: Introduction, sensor characteristics, LVDT, Velocity sensors-Encoders, Tachometers, Accelerating sensors, strain gauges, Torque sensors, light and infrared sensors, touch and tactile sensors, optical proximity sensors, Ultrasonic proximity sensors.</p>	
21	MTMEPE 205	<p>CNC TECHNOLOGY LAB List of experiments: 1. Study of different feedback devices used in cnc systems. 2. Study of nc, cnc & dnc hardware systems 3. Study of apt programming language structure. 4. Write an apt program for lathe machine operation. 5. Write an apt program for milling operation. 6. Study of vertical machining center. 7. Study of horizontal machining center. 8. Study of maintenance methods required for cnc machines</p>	<p>CNC Technology Lab (MTMEPE205) List of experiments: 1. Study of different feedback devices used in cnc systems. 2. Study of nc, cnc & dnc hardware systems 3. Study of apt programming language structure. 4. Write an apt program for lathe machine operation. 5. Write an apt program for milling operation. 6. Study of vertical machining center. 7. Study of horizontal machining center.</p>	No Change
22	-	-	<p>MTMEPE206:Robotics Lab List of experiments:</p>	New Course

			<ol style="list-style-type: none"> 1. To study the various parts of robots and fields of robotics. 2. To study the various kinematics and inverse kinematics of robots. 3. To study the Euler, Lagrangian formulation of Robot dynamics. 4. To study the trajectory planning for robot. 5. To study the control of robots for some specific applications. 6. To study the different type of motors used in robot . 7. To study the Velocity sensors-Encoders for robot 	
23	-	-	Mini Project and Seminar (MTMEPE 208)	New Course
24	MTMEPE 301	<p>AUTOMATED MATERIAL HANDLING SYSTEMS</p> <p>UNIT 1 Introduction to Material Handling - Overview of material handling equipment, considerations in material handling system design, the ten principles of material handling</p> <p>UNIT 2 Material Transport Systems - Industrial trucks, automated guided vehicle systems (AGVS), vehicle guidance technology, vehicle management and safety, monorails and other rail guided vehicles, conveyor systems, types of conveyors, conveyor operations and features, cranes and hoists, analysis of material transfer systems.</p> <p>UNIT 3 Storage Systems - Storage system performance, storage location strategies, conventional storage methods and equipment, automated storage systems, automated storage/retrieval systems (AS/RS), types of AS/RS and applications, carousel storage systems, engineering analysis of storage systems</p> <p>UNIT 4 Material Handling and Storage System in FMS/CIM - Functions of the handing system, FMS layout configurations material handling equipment</p> <p>UNIT 5 Robot Technology - Robot anatomy, need, purpose and motives for robot use in industry, elements of a robotic system, need for using robots, robot physical configurations, robot motions, motion planning, trajectory planning, technical</p>	<p>MTMEPE301A: Automated material handling systems</p> <p>UNIT 1 Introduction to Material Handling - Overview of material handling equipment, considerations in material handling system design, the ten principles of material handling</p> <p>UNIT 2 Material Transport Systems - Industrial trucks, automated guided vehicle systems (AGVS), vehicle guidance technology, vehicle management and safety, monorails and other rail guided vehicles, conveyor systems, types of conveyors, conveyor operations and features, cranes and hoists, analysis of material transfer systems.</p> <p>UNIT 3 Storage Systems - Storage system performance, storage location strategies, conventional storage methods and equipment, automated storage systems, automated storage/retrieval systems (AS/RS), types of AS/RS and applications, carousel storage systems, engineering analysis of storage systems</p> <p>UNIT 4 Material Handling and Storage System in FMS/CIM - Functions of the handing system, FMS layout configurations material handling equipment</p> <p>UNIT 5 Robot Technology - Robot anatomy, need, purpose and motives for robot use in industry, elements of a robotic system, need for using robots, robot physical configurations, robot motions, motion planning, trajectory planning, technical features, drive systems.</p>	No Change

		features, drive systems.		
25	-	-	<p>MTMEPE301B: Supply chain practice & procedure Syllabus</p> <p>UNIT 1 Concept of supply chain, Integrated supply chain, Growth of Supply chain, Strategic decision in supply chain.</p> <p>UNIT 2 Definition of Supply Chain Management, Scope, Supply Chain Management as a Management Philosophy, Function of SCM, Why Supply Chain Management, Value chain for Supply Chain Management.</p> <p>UNIT 3 Customer focus in Supply Chain Management, Buyers Perspective, Suppliers Perspective, Stages of Development in Supplier Relations.</p> <p>UNIT 4 Supply Chain Strategies – (i) Cycle View (ii) Push & Pull View. Achievement of strategic fit through different steps, Obstacles to achieving Strategic Fit.</p> <p>UNIT 5 Role of Forecasting in a supply chain, Factors of Demand Forecast, Basic approach to Demand Forecasting, Role of Aggregate Planning in a Supply Chain, Problems, Planning Strategies.</p>	Code Change
26	MTMEPE 302	<p>SUPPLY CHAIN PRACTICE & PROCEDURE</p> <p>UNIT 1 Concept of supply chain, Integrated supply chain, Growth of Supply chain, Strategic decision in supply chain.</p> <p>UNIT 2 Definition of Supply Chain Management, Scope, Supply Chain Management as a Management Philosophy, Function of SCM, Why Supply Chain Management, Value chain for Supply Chain Management.</p> <p>UNIT 3 Customer focus in Supply Chain Management, Buyers Perspective, Suppliers Perspective, Stages of Development in Supplier Relations.</p> <p>UNIT 4 Supply Chain Strategies – (i) Cycle View (ii) Push & Pull View. Achievement of strategic fit through different steps, Obstacles to achieving Strategic Fit.</p>	<p>MTMEPE302A: Business Analytics</p> <p>Unit-1: Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organization, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modeling, sampling and estimation methods overview.</p> <p>Unit-2: Trendiness and Regression Analysis: Modeling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.</p> <p>Unit-3: Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predictive</p>	New Course

		<p>UNIT 5 Role of Forecasting in a supply chain, Factors of Demand Forecast, Basic approach to Demand Forecasting, Role of Aggregate Planning in a Supply Chain, Problems, Planning Strategies.</p>	<p>Modeling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.</p> <p>Unit-4: Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.</p> <p>Unit-5: Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making. Recent Trends in : Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.</p>	
27	-	-	<p>MTMEPE302B: Industrial Safety Syllabus</p> <p>Unit-1: Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.</p> <p>Unit-2: Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.</p> <p>Unit-3: Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed</p>	New Course

			<p>lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.</p> <p>Unit-4: Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, i. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler,vi. Electrical motors, Types of faults in machine tools and their general causes.</p> <p>Unit-5: Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: i. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance</p>	
28			<p>MTMEPE302C: Operations Research Syllabus</p> <p>Unit-1: Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models.</p> <p>Unit-2: Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming.</p> <p>Unit-3: Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT.</p> <p>Unit-4: Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.</p> <p>Unit-5: Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation</p>	New Course
29	-	-	MTMEPE302D : Cost Management of Engineering	New Course

			<p>Projects</p> <p>Unit-1: Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.</p> <p>Unit-2:Project: meaning, Different types, why to manage, cost overruns centers, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member.</p> <p>Unit-3: Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach.</p> <p>Unit-4: Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking, Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.</p>	
30	-	-	<p>MTMEPE302E:Composite Materials Syllabus</p> <p>Unit-1: INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.</p> <p>Unit-2: REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures.Isostrain and Isostress conditions.</p>	New Course

			<p>Unit-3: Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.</p> <p>UNIT–4: Manufacturing of Polymer Matrix Composites: Preparation of Molding compounds and prepress – hand layup method – Autoclave method – Filament winding method – Compression molding – Reaction injection molding. Properties and applications.</p> <p>UNIT – 5: Strength: Lamina Failure Criteria- strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hydrothermal failure. Laminate first ply failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.</p>	
31	-	-	<p>MTMEPE302F: Waste to Energy</p> <p>Unit-1: Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forestresidue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors.</p> <p>Unit-2: Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods -Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.</p> <p>Unit-3: Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kineticconsideration in gasifier operation.</p> <p>Unit-4: Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs,Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design,construction and operation - Operation of all the above biomass combustors.</p> <p>Unit-5: Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technologyand status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion -</p>	New Course

			biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy program in India.	
32	MTMEPE 303	<p>ROBOTICS</p> <p>UNIT 1 Fundamentals of Robots: Introduction, definition of robot, classification of robots, History of robotics, robot components, degree of freedom, robot joints, robot coordinates, reference frames, programming modes, robot characteristics, robot work space, robot languages, advantages, disadvantages and applications of robots.</p> <p>UNIT 2 Dynamic analysis and forces: Introduction, Lagrangian mechanics, Effective moments of inertia, dynamic equations for multi-degree of freedom robots-kinetic energy, potential energy, the Lagrangian, robot's equations of motion, static force analysis of robots.</p> <p>UNIT 3 Trajectory planning: Introduction, path Vs trajectory, basics of trajectory planning, joint space trajectory planning-third order polynomial trajectory planning, fifth order polynomial trajectory planning, Cartesian-space trajectories.</p> <p>UNIT 4 Robot Actuators: Introduction, characteristic of Actuating systems-weight, power to weight ratio, operating pressure, stiffness Vs compliance, comparison of actuating systems, hydraulic devices, pneumatic devices, servomotors, stepped motors.</p> <p>UNIT 5 Robot sensors: Introduction, sensor characteristics, LVDT, Velocity sensors- Encoders, Tachometers, Accelerating sensors, strain gauges, Torque sensors, light and infrared sensors, touch and tactile sensors, optical proximity sensors, Ultrasonic proximity sensors.</p>	MTMEPE303: Dissertation-I /Industrial Project	Code Change
33	MTMEPE 304.A	<p>INVENTORY MANAGEMENT</p> <p>UNIT 1</p>	-	-

		<p>Definition, Importance, Function, Classification of Inventory, Inventory related Cost, Objectives of Inventory Control, Planning for Inventory Control, Types of Inventory Situations .</p> <p>UNIT 2 Selective Inventory Control Model- ABC Analysis, VED, XYZ, FSN, SOS, GOLF, EOQ Model, P & Q System, Concept of JIT.</p> <p>UNIT 3 Inventory Control Process – Perpetual Review, Periodic Review, Modified Control, Distribution Requirement Planning (DRP), Process of DRP, Benefits & limitation of DRP.</p> <p>UNIT 4: Classification of W.I.P Inventories, Factors influencing, W.I.P inventory, Problems, Controlling Method.</p> <p>UNIT 5 Factors influencing Finished Goods inventory, Requirement of inventory control Systems, Multi echelon Inventory Model, Use of Information Technology in Inventory Management.</p>		
34	MTMEPE 304.B	<p>CELLULAR MANUFACTURING SYSTEMS</p> <p>UNIT 1 Cellular manufacturing: Introduction, Group machining Concept, Principle, Terminology, characteristics, Perspectives, Objectives, Techniques, Applications, Factors to be considered for implementation, factors influencing the success of cellular manufacturing.</p> <p>UNIT 2 Cell formation techniques: Design and Manufacturing Attributes, Cell Design and Representation of the Problem. Cell Formation Techniques – Traditional methods, Similarity coefficient methods, Array based methods. Cell Design Considerations, Data Structure and Influence on the Solution.</p> <p>UNIT 3 Processing the Exceptional Components: Introduction, Processing Exceptional Components, Models for Eliminating Exceptional Components.</p> <p>UNIT 4 Evaluation of Cellular Manufacturing</p>	-	-

		<p>Solutions: Introduction, Static Evaluation of Cells, Measure of flexibility (MF), Selection of Solution, VEDO Analysis, Comparison of Different Methods.</p> <p>UNIT 5 Line Balancing in Cellular manufacturing: Line balancing for cells, Design Factor in Line Balancing, Bowl Phenomena in Cellular Manufacturing environment, effect on production rates.</p>		
35	MTMEPE 304.C	<p>CONCURRENT ENGINEERING AND PRODUCT LIFECYCLE MANAGEMENT</p> <p>UNIT 1 Introduction: Extensive definition of Concurrent Engineering (CE), CE design methodologies, Review of CE techniques like DFM (Design for manufacture), DFA (Design for assembly), QFD (Quality function deployment), RP (Rapid prototyping), TD (Total design), for integrating these technologies, Organizing for CE, CE tool box, Collaborative product development.</p> <p>UNIT 2 Use of Information Technology: IT support, Solid modeling, Product data management, Collaborative product coMTMErce, Artificial Intelligence, expert systems, Software hardware component design.</p> <p>UNIT 3 Design Stage: Lifecycle design of products, Opportunities for manufacturing enterprises, Modality of concurrent engineering design, Automated analysis Idealization control, CE in optimal structural design, Real time constraints.</p> <p>UNIT 4 Need for PLM: Importance of PLM, Implementing PLM, Responsibility for PLM, Benefits to different managers, Components of PLM, Emergence of PLM, Lifecycle problems to resolve, Opportunities to seize.</p> <p>UNIT 5 Components of PLM: Components of PLM, Product lifecycle activities, Product organizational structure, Human resources in product lifecycle, Methods, techniques, Practices, Methodologies, Processes, System components in lifecycle, slicing and dicing the systems, Interfaces, Information, Standards.</p>	-	-

36	MTMEPE 305	Seminar	-	No Change
37	MTMEPE 401	Dissertation	MTMEPE401: Dissertation-II	No Change