

M.S. Ramaiah University of Applied Sciences

New BEL Road, MSR Nagar, Bangalore – 560054



**RAMAIAH
UNIVERSITY**
OF APPLIED SCIENCES

PO, PSO, PEO & CO

**Programme: M.Tech. in Manufacturing Technologies and
Engineering Management**

Programme Code: 121

Programme Outcome (PO)

Programme Specific Outcome (PSO)

Program Educational Objectives (PEO)

Course Outcomes (CO)

Dean
Faculty of Engineering and Technology
M.S. Ramaiah University of Applied Sciences
Bangalore-560058

Registrar
M.S. Ramaiah University of Applied Sciences
Bangalore - 560 054

Faculty of Engineering and Technology (FET)

Programme Name: M.Tech. (Manufacturing Technologies and Engineering Management)

Programme Outcomes (POs)

M.Tech. graduates will be able to:

- PO 1. Resolve manufacturing issues after considering strategic and financial implications
- PO 2. Select the appropriate materials and manufacturing processes for efficient and effective manufacturing
- PO 3. Optimize the manufacturing operations by applying advanced concepts of manufacturing technologies and engineering management in a shop-floor
- PO 4. Analyze and suggest suitable manufacturing technologies for the relevant functional applications
- PO 5. Develop manufacturing and automation strategies for efficient operations
- PO 6. Design robust manufacturing systems for achieving excellence
- PO 7. Practice team work, effective communication of ideas and lifelong learning

Programme Specific Outcomes (PSOs)

The programme specific outcomes are listed under four headings:

- 1. Knowledge and Understanding
- 2. Cognitive skills
- 3. Practical skills and
- 4. Capability/Transferable skills

Knowledge and Understanding: After undergoing this programme, a student will be able to:

- PSO1: Explain principles of project management, manufacturing management, materials and process selections
- PSO2: Explain the impact of operational strategies and process specifications on the overall goals of the organization
- PSO3: Discuss the significance of modelling and simulation for manufacturing processes
- PSO4: Discuss manufacturing technologies and competitive manufacturing management concepts

Cognitive Skills: After undergoing this programme, a student will be able to:

- PSO5: Analyse and improve the operational performance of an organization through analytical modelling and simulations
- PSO6: Analyze the suitability of the appropriate manufacturing technologies for enhancing organizational competitiveness
- PSO7: Analyse process parameters and their effect on resultant component features and production rate
- PSO8: Examine the projects and manufacturing operations with a systems approach and analyze the scope for continuous improvement

oo
Dean
Faculty of Engineering and Technology
M.S. Ramaiah University of Applied Sciences
Bangalore-560058



Practical Skills: After undergoing this programme, a student will be able to:

- PSO9: Select appropriate materials and the corresponding processes for producing a component/product
- PSO10: Work with simulation tools to model and simulate casting, forging, sheet metal forming and welding
- PSO11: Optimize the operations, control the quality of products and services in an organization and evaluate the performance of a system
- PSO12: Formulate manufacturing strategies to meet business objectives

Capability Skills / Transferrable Skills: After undergoing the programme, a student will be able to:

- PSO13: Manage information, develop technical reports and make presentations
- PSO14: Work under various constraints to meet business objectives
- PSO15: Work in sync with a team for achieving the organizational objectives
- PSO16: Effectively communicate and facilitate smooth transfer of technical know-how between individuals and groups for addressing knowledge gaps

Course Outcomes (COs)

Course Title & Code: Computer Aided Design and Engineering (19MME501A)

After the successful completion of this course, the student will be able to:

- CO-1. Specify and evaluate tools and techniques of CAE and their role in product development cycle
- CO-2. Create geometric models and generate manufacturing drawings of engineering components
- CO-3. Create rapid prototype model of a reverse engineered engineering component
- CO-4. Develop finite element model for different types of analysis using Hyper-Mesh software
- CO-5. Perform discretisation and engineering analysis using geometric modelling tools like CATIA and ANSYS software

Course Outcomes (COs)

Course Title & Code: Engineering Materials and Processes (19MME502A)

After the successful completion of this course, the student will be able to:

- CO-1. Identify different metallic and non-metallic materials and their application areas
- CO-2. Arrive at material properties and requirements for achieving intended functionality in an engineering product
- CO-3. Critically evaluate and select suitable materials / alternate materials based on the performance of the component
- CO-4. Analyse the correlation between materials and processes and recommend suitable manufacturing process to produce a component
- CO-5. Construct a process flow for manufacturing the component
- CO-6. Select appropriate combination of materials and manufacturing process for a specified application using CES Software


Dean
Faculty of Engineering and Technology
M.S. Ramaiah University of Applied Sciences
Bangalore-560058
Po. PEO, PSO & CO



Course Outcomes (COs)

Course Title & Code: Project Management (19MEC501A)

After the successful completion of this course, the student will be able to:

- CO-1. Discuss the principles of project management
- CO-2. Prepare project plan, perform feasibility study and analyze the tradeoffs for project acceptance
- CO-3. Apply the concepts of project management to monitor, determine most economical route/s to execute projects and carryout post completion audits
- CO-4. Estimate the accurate cost of the overall project and evaluate the worthiness of the project using capital budgeting techniques
- CO-5. Formulate a comprehensive project management plan for real life projects using MS Project tool

Course Outcomes (COs)

Course Title & Code: Quality Management and Six Sigma (19MEC501A)

After the successful completion of this course, the student will be able to:

- CO-1. Discuss various aspects of inspection, Quality Control, Quality Assurance and TQM
- CO-2. Evaluate maturity level of an organization's quality program including cultural and leadership aspects
- CO-3. Assess customer focus and market forces as basis for all quality related activities
- CO-4. Develop a roadmap for implementation of TQM in an organization
- CO-5. Apply Six sigma -DMAIC methodology for analyzing and solving industry problems
- CO-6. Analyse data and identify root causes for a given problem using Minitab and Six sigma suite software

Course Outcomes (COs)

Course Title & Code: Manufacturing Systems and Automation (19MEC503A)

After the successful completion of this course, the student will be able to:

- CO-1. Discuss the significance of manufacturing systems and automation for a successful business
- CO-2. Develop plant, department, line and machine level KPIs for improving manufacturing systems
- CO-3. Recommend the degree of automation required for the application and perform cost-benefit analysis
- CO-4. Evaluate the smart and green solutions for manufacturing excellence
- CO-5. Design an automation solution for the given manufacturing operation using PLC and SCADA systems



Dean
Faculty of Engineering and Technology
M.S. Ramaiah University of Applied Sciences
Bangalore-560058



Course Outcomes (COs)

Course Title & Code: Research methodology and IPR (19FET508A)

After the successful completion of this course, the student will be able to:

- CO-1. Explicate the value, scope, relevance and mandatory steps of research as well as principles of effective research, Nature of Intellectual Property
- CO-2. Discuss the guidelines to progress from the choice of broad field of research to specific topic of research, patent rights, process of patenting at National and International level, New Developments in IPR
- CO-3. Demonstrate the application and utility of the Systematic approach and out of box thinking concepts for research to be effective
- CO-4. Adapt ,Analyze and prepare well-structured research proposal and research paper invoking clearly outlined principles

Course Outcomes (COs)

Course Title & Code: Professional Communication (19FET509A)

After the successful completion of this course, the student will be able to:

- CO-1. Compose effective written business communication
- CO-2. Practice the techniques of presentation

Course Outcomes (COs)

Course Title & Code: Quality by Design (19MEC504A)

After the successful completion of this course, the student will be able to:

- CO-1. Discuss various principles and concepts of statistically designed experiment and their applications for building robustness in product/process
- CO-2. Interpret given situation and select appropriate design - single and multi-factor, factorial, Taguchi or special techniques for experimentation
- CO-3. Formulate problems to conduct experiments for arriving at optimal solutions
- CO-4. Apply experimental designs to determine optimal process parameters for a given problem/criteria and interpret results
- CO-5. Model the given situation using appropriate software tool and compare results

Course Outcomes (COs)

Course Title & Code: Metal Casting Technologies (19MEE511A)

After the successful completion of this course, the student will be able to:

- CO-1. Explicate the technologies pertaining to metal casting processes and additive manufacturing
- CO-2. Select and discuss suitable casting/ additive manufacturing process based on material, component features and application
- CO-3. Propose appropriate heat treatment process and non -destructive testing technique for a component


Dean
Faculty of Engineering and Technology
M.S. Ramaiah University of Applied Sciences
Bangalore-560058
Po. PEO, PSO & CO



- CO-4. Design riser and gating system for a casting development
- CO-5. Analyse and identify the reasons for defects and suggest suitable remedies for reducing the casting defects
- CO-6. Create model and simulate casting process using process simulation software

Course Outcomes (COs)

Course Title & Code: Kaizen and Lean Operations (19MEE521A)

After the successful completion of this course, the student will be able to:

- CO-1. Explicate the salient qualities of world class manufacturing companies
- CO-2. Discuss significance of change management and the need for Kaizen culture along with interrelationship between Gemba and Management for an organization
- CO-3. Apply the techniques of lean manufacturing to reduce wastes and improve flow of value (Point Kaizens)
- CO-4. Develop current and future value stream maps for products and deduce action plans
- CO-5. Build roadmap for Kaizen and lean journey

Course Outcomes (COs)

Course Title & Code: Polymers and Composites (19MEE514A)

After the successful completion of this course, the student will be able to:

- CO-1. Identify and explicate polymers and composite materials used in engineering applications
- CO-2. Discuss the effects of matrix and reinforcements on the properties of composites
- CO-3. Recommend suitable processing methods for polymers and composites to achieve required properties
- CO-4. Perform process simulation to select process parameters in polymer/composite moulding
- CO-5. Prepare polymer and composite specimens and characterise them

Course Outcomes (COs)

Course Title & Code: Metal Forming Technologies (19MEE512A)

After the successful completion of this course, the student will be able to:

- CO-1. Explicate metal forming and welding processes and process parameters based on the materials, components features and production volume
- CO-2. Select and discuss suitable forming process based on material, component feature, production volume and application
- CO-3. Perform simulation studies to optimize the forming and welding process parameters iteratively
- CO-4. Asses the importance, principles, and applications of high energy rate forming
- CO-5. Analyse and identify the reasons for forming and welding defects and suggest suitable remedies for reducing the defects


 Dean
 Faculty of Engineering and Technology
 M.S. Ramaiah University of Applied Sciences
 Bangalore-560058



Course Outcomes (COs)

Course Title & Code: Supply Chain Management (19MEE522A)

After the successful completion of this course, the student will be able to:

- CO-1. Discuss the concepts of logistics, Value Chain and supply chain management
- CO-2. Explicate the role of supply chain drivers in achieving competitive advantage at various decision phases
- CO-3. Determine capacity and inventory requirements for optimality and interpret results
- CO-4. Select factors and analyse their impact on supply chain design, planning and operations for managing supply and demand
- CO-5. Apply principles and concepts of logistics and supply chain in manufacturing and service based organizations for performance improvement
- CO-6. Demonstrate given supply chain process using ERP software

Course Outcomes (COs)

Course Title & Code: Material Testing and Characterization (19MEE532A)

After the successful completion of this course, the student will be able to:

- CO-1. Explicate the properties, deformation mechanisms and testing of various engineering materials
- CO-2. Discuss usage of appropriate material and testing methods for a given application
- CO-3. Evaluate ductile to brittle transition behaviour related to fracture of metals
- CO-4. Arrive at different non-destructive testing methods and their importance for engineering applications
- CO-5. Perform micro examination of specimens and characterise for functionality

Course Outcomes (COs)

Course Title & Code: Machining Technologies (19MEE513A)

After the successful completion of this course, the student will be able to:

- CO-1. CO 1. Discuss the need for advanced material removal and micro/nano fabrication technologies
- CO-2. CO 2. Select suitable CNC machine tools and develop appropriate programming based on material to achieve the desirable component quality
- CO-3. CO 3. Recommend suitable non-traditional machining process based on the process capability and economy
- CO-4. CO 4. Analyse and select suitable micro/ Nano fabrication process for a specified device/application
- CO-5. Generate CNC codes of CAD models/drawings and automate manufacturing of component using multi-axes CNC machines


Dean
Faculty of Engineering and Technology
M.S. Ramaiah University of Applied Sciences
Bangalore-560058

Po. PEO, PSO & CO



Course Outcomes (COs)

Course Title & Code: Manufacturing System Simulation (19MEE523A)

After the successful completion of this course, the student will be able to:

- CO-1. Discuss the concepts of probability, statistics, mathematics and simulation with reference to manufacturing system simulation
- CO-2. Model and simulate a factory floor and evaluate performance and identify areas for improvement
- CO-3. Plan resources for specified level of performance using simulation
- CO-4. Conduct enterprise level simulation based on lean six sigma frame work
- CO-5. Simulate the events of a given manufacturing line and shop-floor using ARENA tool

Course Outcomes (COs)

Course Title & Code: Surface Engineering Techniques (19MEE533A)

After the successful completion of this course, the student will be able to:

- CO-1. Explicate the importance of concepts of surface properties for solid surface
- CO-2. Discuss different type of corrosions occurring in components
- CO-3. Analyse different types of surface engineering methods and their importance for engineering applications
- CO-4. Evaluate and recommend appropriate coating methods based on the applications
- CO-5. Arrive at appropriate range for coating process variables
- CO-6. Perform coating on specimens and characterize for functionality

Course Outcomes (COs)

Course Title & Code: Polymers and Composites (19MEE514A)

After the successful completion of this course, the student will be able to:

- CO-1. Identify and explicate polymers and composite materials used in engineering applications
- CO-2. Discuss the effects of matrix and reinforcements on the properties of composites
- CO-3. Recommend suitable processing methods for polymers and composites to achieve required properties
- CO-4. Perform process simulation to select process parameters in polymer/composite moulding
- CO-5. Prepare polymer and composite specimens and characterise them

Course Outcomes (COs)

Course Title & Code: Manufacturing Strategy and Business Economics (19MEE524A)

After the successful completion of this course, the student will be able to:

- CO-1. Discuss relationship between Business, manufacturing and corporate strategy
- CO-2. Evaluate a business scenario using appropriate business economics models
- CO-3. Develop SWOT analysis of a company for competitive advantage
- CO-4. Assess business performance and develop manufacturing strategies for competitive advantage
- CO-5. Develop strategy to turn around the companies, carryout product portfolio analysis and performance assessment to solve problems in a business



Course Outcomes (COs)

Course Title & Code: Value Education (19FET510A)

After the successful completion of this course, the student will be able to:

- CO-1. Discuss the role of Values and Ethics in Self-Development
- CO-2. Appreciate the importance of Universal Brotherhood

Course Outcomes (COs)

Course Title & Code: Internship (19MEP521A)

After the successful completion of this course, the student will be able to:

- CO-1. N/A

Course Outcomes (COs)

Course Title & Code: Group Project (19MEP522A)

After the successful completion of this course, the student will be able to:

- CO-1. Work in a team and undertake a project in their area of specialization
- CO-2. Apply their knowledge of general and automotive engineering and application, develop a system for automotive application
- CO-3. Apply appropriate research methodology while formulating a project
- CO-4. Prepare specifications, design, analyse, synthesize, prototype and assess the system
- CO-5. Prepare and present appropriate forms of audio-visual and verbal presentations, and written document, to describe the project, its execution and outcome

Course Outcomes (COs)

Course Title & Code: Dissertation and Publication (19MEP523A)

After the successful completion of this course, the student will be able to:

- CO-1. Critically review scholarly literature collected from various sources for the project purpose and formulate a research
- CO-2. Prepare and present a research proposal
- CO-3. Conduct research to achieve research objectives
- CO-4. Propose new ideas/methodologies or procedures for further improvement of the research undertaken
- CO-5. Create research document and write research papers for publications
- CO-6. Defend the research findings in front of scholarly audience



Dean
Faculty of Engineering and Technology
M.S. Ramaiah University of Applied Sciences
Bangalore-560058



Registrar
M.S. Ramaiah University of Applied Sciences
Bangalore - 560 054

Po. PEO, PSO & CO