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 Advanced Machinery Design

Programme Code: 028

Programme Outcome (PO)
Programme Specific Outcome (PSO)
Program Educational Objectives (PEO)
Course Outcomes (CO)

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Faculty of Engineering and Technology (FET)

Programme Name: M.Tech. (Advanced Machinery Design)

Programme Outcomes (POs)

M.Tech. graduates will be able to:

PO 1. Summarize machinery design concepts for farming equipment, construction machinery, general engineering machines, material handling equipment, etc.

PO 2. Explain underlying engineering principles for design and control of machinery

PO 3. Identify materials and processing knowledge for design of machine elements

PO 4. Use CAE tools to model, simulate and analyze the behavior of machinery systems for design optimization and performance improvement

PO 5. Design and develop machinery systems to meet varied functional and operational requirements

PO 6. Develop a career in Advanced Machinery Design

PO 7. Practise Teamwork, lifelong learning and continuous improvement

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 the importance of various engineering materials and processing techniques

PSO2: Discuss the design principles applied to advanced machinery systems

PSO3: Identify the types of load acting on machine elements and explain their effect

PSO4: Identify the scope for optimisation for improved design

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

PSO5: Synthesise a mechanism for development of a machine

PSO6: Plan and arrive at detailed engineering design of a machine and its components

PSO7: Create models, simulate, analyse and optimise the design

PSO8: Design, model and simulate appropriate controls for machine operation

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

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PSO9: Use commercially available tools for simulation and analysis of mechanisms, structures and controls

PSO10: Select materials for machine elements using commercially available database based on functionality

PSO11: Conduct tests of machine systems and structures

PSO12: Estimate life of components using simulation

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

PSO13: Manage information, develop technical reports and make presentations

PSO14: Build, Manage and Lead a team to successfully complete a project and communicate across teams and organizations to achieve professional objectives

PSO15: Work under various constraints to meet project targets

PSO16: Adopt to the chosen profession by continuously upgrading his/her knowledge and understanding through Life-long Learning philosophy

Course Outcomes (COs)

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

After undergoing this course students 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 anengineering 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

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Course Outcomes (COs)

Course Title & Code: Advanced Mechanics of Materials **(19MDC501A)**

After undergoing this course students will be able to:

- **CO-1.** Discuss material behaviour under various loading conditions
- **CO-2.** Perform stress analysis for given loading and boundary condition from first principles
- **CO-3.** Identify the critical region of a structure and use appropriate failure model to analyse the failure
- **CO-4.** Develop mathematical models to predict material behaviour under various loading conditions
- **CO-5.** Predict material behaviour using MATLAB

Course Outcomes (COs)

Course Title & Code: Synthesis and Dynamics of Mechanisms **(19MDC502A)**

After undergoing this course students will be able to:

- **CO-1.** Discuss kinematics, kinetics and dynamics and their importance in machinery design
- **CO-2.** Perform kinematic and dynamic analysis of well-known planar mechanisms
- **CO-3.** Synthesize mechanisms to achieve desired motion in 2D spaces
- **CO-4.** Evaluate spatial mechanisms
- **CO-5.** Simulate kinematic and dynamic behaviour of mechanisms using MATLAB and ADAMS software

Course Outcomes (COs)

Course Title & Code: Finite Element Analysis of Mechanical Structures **(19MDC503A)**

After undergoing this course students will be able to:

- **CO-1.** Recognize the scope for finite element analysis in mechanical structural design
- **CO-2.** Develop finite element formulations and solve structural, contact and composite problem
- **CO-3.** Perform finite element modeling and analysis of linear, non- linear, thermal and dynamic problems
- **CO-4.** Apply appropriate algorithm for optimizing weight of structures
- **CO-5.** Model and analyse practical problems using Hypermesh and Ansys software

Course Outcomes (COs)

Course Title & Code: Drives and Controls **(19MDC504A)**

After undergoing this course students will be able to:

- **CO-1.** Discuss the various electrical, electromechanical, hydraulic and pneumatic control devices as applied to machinery
- **CO-2.** Design control circuit for motion control and identify appropriate drive system
- **CO-3.** Analyze the machine applications for selecting the appropriate sensors, microcontrollers and drive components for control circuit
- **CO-4.** Create models and simulate a control circuit to achieve desired motion and arrive at specifications
- **CO-5.** Select appropriate hydraulic and pneumatic components for a given application
- **CO-6.** Model and simulate hydraulic and pneumatic circuits using Simulink software

Course Outcomes (COs)

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

After undergoing this course students 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 undergoing this course students will be able to:

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

Course Outcomes (COs)

Course Title & Code: Vibrations in Machinery **(19MDC505A)**

After undergoing this course students will be able to:

- **CO-1.** Discuss the fundamentals of vibration and vibration effects on machinery components
- **CO-2.** Interpret vibration signals captured from machinery components
- **CO-3.** Analyse vibration response in machinery systems and control using appropriate methods
- **CO-4.** Design various machinery components as per applicable standards and guidelines to minimize vibration
- **CO-5.** Solve practical machinery vibration problems

Course Outcomes (COs)

Course Title & Code: Fatigue and Fracture **(19MDE511A)**

After undergoing this course students will be able to:

- **CO-1.** Discuss fatigue and fracture phenomena and governing laws as applied to metals
- **CO-2.** Analyse failure of machinery components using various fatigue design approaches
- **CO-3.** Apply theory of fracture mechanics to model crack and analyse crack tip stress conditions
- **CO-4.** Predict crack growth rate characteristics and evaluate/improve fatigue life of machinery components
- **CO-5.** Estimate life of machinery components using FEA tools

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Course Outcomes (COs)

Course Title & Code: Industrial Tribology (19MDE512A)

After undergoing this course students will be able to:

- **CO-1.** Discuss friction, mechanisms of friction, wear and methods of lubrication for design of machine elements
- **CO-2.** Identify and analyse tribological issues at component and machine level
- **CO-3.** Select appropriate type of lubricant and method of lubrication for a given application
- **CO-4.** Recommend suitable type of bearing for a given application
- **CO-5.** Propose bearings for precision applications

Course Outcomes (COs)

Course Title & Code: Engineering System Design (19MDE522A)

After undergoing this course students will be able to:

- **CO-1.** Demonstrate knowledge and understanding of product development process and related methodologies and methods
- **CO-2.** Analyze the sequence of steps involved in the systems engineering of complex systems
- **CO-3.** Develop detailed set of component design specifications from high-level customer needs and carry out detailed design
- **CO-4.** Asses manufacturability, risk, safety, reliability and cost of a designed component/ system employing appropriate methods
- **CO-5.** Select and apply appropriate design methods for a product development project

Course Outcomes (COs)

Course Title & Code: Design of Machinery (19MDE513A)

After undergoing this course students will be able to:

- **CO-1.** Discuss the functionality of various systems/subsystems/elements of construction, farm and industrial machinery
- **CO-2.** Review design philosophies adopted for the development of a machine for a given application
- **CO-3.** Arrive at specifications and generate conceptual design
- **CO-4.** Design components, develop geometric models and perform engineering analysis
- **CO-5.** Select drives, controls and perform machine integration

Course Outcomes (COs)

Course Title & Code: Machine Tool Design (19MDE523A)

After undergoing this course students will be able to:

- **CO-1.** Discuss design principle of machine tool components and drive systems
- **CO-2.** Identify the types of forces acting on the machine tool and its drive components
- **CO-3.** Analyze the behavior of machine tool components under static and dynamic conditions
- **CO-4.** Propose drives, controls and perform machine integration
- **CO-5.** Select material and processes for machine tool and its drive components using a software

Course Outcomes (COs)

Course Title & Code: Optimization Techniques (19MDE514A)

After undergoing this course students will be able to:

- **CO-1.** Discuss the fundamental concepts, techniques and scope for optimisation in machinery design
- **CO-2.** Select appropriate functions, constraints and algorithms to solve optimization problem through numerical techniques
- **CO-3.** Apply suitable optimization technique for machinery component design
- **CO-4.** Interpret optimization results for design decision making
- **CO-5.** Solve optimization problems using MATLAB, EXCEL sheets and CAE tools

Course Outcomes (COs)

Course Title & Code: Industrial Machinery Design (19MDE524A)

After undergoing this course students will be able to:

- **CO-1.** Discuss the functionality, design philosophies of different systems/subsystems of various machines
- **CO-2.** Apply standard design procedures to design components and sub systems of a given machine
- **CO-3.** Develop geometric model of components and subsystems of a given machine
- **CO-4.** Evaluate alternative designs of components and subsystems through engineering analysis
- **CO-5.** Select drives, controls and perform machine integration

Course Outcomes (COs)

Course Title & Code: Value Education (19FET510A)

After undergoing this course students 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 (19MDP521A)

After undergoing this course students will be able to:

- **CO-1.** N/A

Course Outcomes (COs)

Course Title & Code: Group Project (19MDP522A)

After undergoing this course students 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

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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 (19MDP523A)

After undergoing this course students 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

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