

Nirma University
Institute of Technology
School of Engineering
Mechanical Engineering Department

M.Tech in Mechanical Engineering (Design Engineering)

Semester I

3ME1109 Computer Aided Design [3 0 2 5]

Course Learning Outcome:

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

- select input and output devices for computer systems for mechanical engineering requirements.
- apply knowledge of mathematical concept for geometry manipulation and modeling of curves, surface and solids.
- operate CAD packages to prepare solid model of components, assemble them to represent complex mechanical systems.
- develop computer algorithm for design and analysis of mechanical systems.

3ME3103 Stress Analysis [3 0 0 3]

Course Learning Outcome:

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

- understand stress, strain and their relations.
- analyze stresses in mechanical structural components.
- explore the scope experimental stress analysis.

3ME3105 Mechanical Design - I [3 1 0 4]

Course Learning Outcome:

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

- select the appropriate design philosophy for design of a component. .
- design various mechanical systems incorporating the effect of fatigue, creep and fracture mechanics.
- incorporate friction, wear and lubrication consideration in the design.
- design rotating disc, rotating cylinders and corrected gears.

3ME3106 Applied Dynamics & Vibrations [3 0 2 5]

Course Learning Outcome:

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

- Apply principle of dynamics to spatial mechanisms.
- Formulate mathematical models of real life engineering systems for vibration studies.
- Evaluate vibratory response of multi degree freedom systems and continuous systems
- Illustrate the vibration characteristics through experiments.

3ME3205 Optimization Methods in Engineering Design [3 0 0 3]

Course Learning Outcome:

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

- understand the basic concepts of optimization
- Apply the various methods of optimization based on linear programming, non linear programming and stochastic programming for decision making.

- solve hard engineering problems which are interdisciplinary in nature using unconventional optimization techniques like genetic algorithm, simulated annealing, neural network based optimization techniques
- acquaint with capabilities of software tools used in the optimization process.

3ME3206 Finite Element and Boundary Element Methods [3 0 2 5]

Course Learning Outcome:

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

- formulate the structural engineering, heat transfer problem into finite element and boundary element model
- derive and solve the stiffness matrix, displacement matrix and load vectors for one/two dimension structural and heat transfer problem
- apply the capabilities of finite element software to solve the structural engineering, heat transfer problem
- interpretate and evaluate the quality of results obtained using FE software
- appreciate the application and limitation of FEA and Boundary Element Method

3ME3207 Design of Mechanisms & Manipulators [3 0 2 5]

Course Learning Outcome:

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

- Synthesis the planar mechanisms for required applications
- Analyze the mechanisms statically and dynamically under the action of various loading.
- Carry out the kinematic and dynamic analysis of robotic manipulator.

3ME3208 Mechanical Design – II [3 1 0 4]

Course Learning Outcome:

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

- design the components of crane structure and machine tool structure.
- apply the concepts of ergonomics and dynamics for the machine tools.
- design the pressure vessels as per various standard criterions.

3SP1204 Research Methodology (Supplementary Course) [0 1 0 0]

Course Learning Outcome:

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

- appreciate the importance of literature survey and problem identification for formulating an effective research topic
- integrate the functionality of Mathematical modeling and Statistical analysis for understanding intricacies of the research work
- prepare research plan inclusive of experimental design
- communicate effectively with peer groups and technical diaspora using technical research papers and thesis or reports

3SP1301 Practical Training (Supplementary Course) [0 0 0 0]

Course Learning Outcome:

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

- explore the preferred field of specialization and develop analytical / hardware / software / experimental skills

- manage the technical content and work
- prepare and present technical report

3ME3301

Major Project Part I – Full Time

[0 0 0 15]

Course Learning Outcome

The course provides an opportunity to the student to explore their knowledge in the area of their interest. Student will apply idea into application through experiments/ simulation. It will also help them to decide the project area / topic for further research work in their life. . As an outcome of the course, student will be able to develop:

- Problem formulation techniques.
- Analysis techniques of published data.
- Identification of scope and objectives of research work.
- Techniques for the design of experiments.
- Associated administration for project work.
- Development of compilation skill.
- Writing skill.
- Presentation skill.
- Technical Paper writing.
- Report preparation techniques.
- Fundamentals, information, reviews and in-depth knowledge in the desired area.

3ME3401

Major Project Part II – Full Time

[0 0 0 15]

Course Learning Outcome

The course provides an opportunity to the student to explore their knowledge in the area of their interest. Student will apply idea into application through experiments/ simulation. It will also help them to decide the project area / topic for further research work in their life. . As an outcome of the course, student will be able to develop:

- Problem formulation techniques.
- Analysis techniques of published data.
- Identification of scope and objectives of research work.
- Techniques for the design of experiments.
- Associated administration for project work.
- Development of compilation skill.
- Writing skill.
- Presentation skill.
- Technical Paper writing.
- Report preparation techniques.
- Fundamentals, information, reviews and in-depth knowledge in the desired area.