

M.Tech. in Machine Design

University-Style Syllabus (2 Years / 4 Semesters)

Programme Duration: 2 Years (4 Semesters)

Programme Level: Postgraduate (M.Tech.)

Credits: 68–80 (Typical AICTE/NEP Pattern)

Semester I

Subject Code	Subject	L	T	P	Credits
MMD101	Advanced Machine Design	3	1	0	4
MMD102	Theory of Elasticity and Plasticity	3	1	0	4
MMD103	Advanced Engineering Materials	3	0	2	4
MMD104	Research Methodology	2	0	2	3
MMD105	CAD/CAM Laboratory	0	0	4	2
MMD106	Seminar – I	0	0	2	1

Total Credits: 18

Semester II

Subject Code	Subject	L	T	P	Credits
MMD201	Finite Element Analysis	3	1	0	4
MMD202	Computer Aided Machine Design	3	0	2	4
MMD203	Tribology and Surface Engineering	3	0	2	4

Subject Code	Subject	L	T	P	Credits
MMD204	Mechanical System Design	3	0	2	4
MMD205	Machine Design Laboratory	0	0	4	2
MMD206	Seminar – II	0	0	2	1

Total Credits: 19

Semester III

Subject Code	Subject	L	T	P	Credits
MMD301	Fracture Mechanics and Fatigue Analysis	3	1	0	4
MMD302	Optimization Techniques in Machine Design	3	0	2	4
MMD303	Advanced Manufacturing Technology	3	0	2	4
MMD304	Elective – I	3	0	0	3
MMD305	Dissertation Phase – I	0	0	12	8

Elective – I (Choose One)

- MMD311 – Composite Materials
- MMD312 – Product Design and Development
- MMD313 – Mechatronics Systems
- MMD314 – Additive Manufacturing
- MMD315 – Computational Fluid Dynamics

Total Credits: 23

Semester IV

Subject Code	Subject	L	T	P	Credits
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Subject Code	Subject	L	T	P	Credits
MMD401	Dissertation Phase – II	0	0	24	16
MMD402	Viva Voce	0	0	2	2
MMD403	Industrial Internship	0	0	8	4

Total Credits: 22

Laboratory Courses

Code	Laboratory
MMD105	CAD/CAM Laboratory
MMD205	Machine Design Laboratory
MMD305	Research and Dissertation Work
MMD401	Dissertation and Project Implementation

Detailed Unit-Wise Syllabus

MMD101 – Advanced Machine Design

Unit I

- Design Philosophy
- Failure Theories
- Design for Reliability

Unit II

- Design of Shafts, Keys and Couplings
- Bearings and Power Screws

Unit III

- Design of Gears
- Belt and Chain Drives

Unit IV

- Springs
- Pressure Vessel Design

Unit V

- Design Optimization
- Case Studies in Machine Design

MMD201 – Finite Element Analysis

Unit I

- Fundamentals of Finite Element Method
- Discretization Techniques

Unit II

- Element Formulation
- Structural Analysis

Unit III

- Thermal Analysis
- Dynamic Analysis

Unit IV

- Nonlinear Finite Element Analysis

Unit V

- FEA Applications Using Commercial Software

MMD203 – Tribology and Surface Engineering

- Friction and Wear
- Lubrication Theory

- Surface Coatings
 - Surface Characterization
 - Industrial Applications
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MMD204 – Mechanical System Design

- Design Methodology
 - Transmission Systems
 - Material Selection
 - Reliability Engineering
 - Mechanical System Integration
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Practical List

Students should perform practical exercises such as:

- 3D Modelling using SolidWorks/Creo/CATIA
 - Finite Element Analysis using ANSYS
 - CAD/CAM Programming
 - Gear Design and Analysis
 - Bearing Selection and Design
 - Stress and Fatigue Analysis
 - Tribology Testing
 - Reverse Engineering
 - Product Design and Optimization
 - Rapid Prototyping and 3D Printing
 - Mechanical System Simulation
 - Industry-Oriented Capstone Project
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Examination Scheme

Component	Marks
End Semester Examination	70
Internal Assessment	30
Practical Examination	100

Component	Marks
Seminar	100
Dissertation	300
Viva Voce	100

Recommended Reference Books

- Mechanical Engineering Design
- Machine Design
- Concepts and Applications of Finite Element Analysis
- Engineering Tribology
- Product Design and Development

Programme Outcomes

Upon successful completion of the programme, graduates will be able to:

1. Design and analyze advanced mechanical components and systems.
2. Apply finite element analysis and optimization techniques to engineering problems.
3. Select appropriate engineering materials and manufacturing processes.
4. Develop innovative products using CAD/CAM and simulation tools.
5. Analyze tribological behavior and improve machine performance.
6. Conduct independent research in machine design and mechanical engineering.
7. Lead product development and design engineering projects in industry.
8. Pursue doctoral research or advanced professional careers in Machine Design, Product Development, and Mechanical Engineering.