SHIV NADAR

INSTITUTION OF EMINENCE DEEMED TO BE UNIVERSITY

DELHI NCR

DEPARTMENT OF MECHANICAL ENGINEERING

SCHOOL OF ENGINEERING

UNDERGRADUATE PROSPECTUS

(B. Tech. in Mechanical Engineering)

Effective from 2025-29 batch onwards

I. Overview of the Department of Mechanical Engineering

Mechanical Engineering plays a major role in structuring and building the systems used in the real world. The mechanical engineers play a crucial role by designing and manufacturing these systems. The career path of a mechanical engineer is largely determined by individual's choice – a unique advantage in an ever-changing competitive world. The mechanical engineering curriculum focuses on material science, solid and fluid mechanics, thermodynamics and heat transfer, automation and control, design and manufacturing. To summarize, the versatility, wide-ranging scope and universal relevance of mechanical engineering open up career avenues in all possible branches of the engineering profession. The department currently offers the following programs: Bachelor of Technology (B. Tech.) in Mechanical Engineering, with the option of minor in any other streams of interest, and Ph.D. in Mechanical Engineering.

Our core objective is to develop leaders of tomorrow and conduct translational research to address the major technological bottlenecks. The department has developed state-of-the-art laboratories that not only cater to the undergraduate curriculum but also foster research in various specialized and interdisciplinary areas. There is an array of specialized mechanical engineering subjects such as energy storage and conversion, functional materials, materials processing, microfluidic devices, additive manufacturing, robotics, tribology and vibrations. This creates potential career opportunities in diverse areas within an industry, government and R&D, such as automotive industries, power generation, medical and manufacturing industries. To achieve this goal, the department is absorbing the best talent globally by hiring faculty members who have wide-ranging experience of academics and research as well as in industry. In addition, we are focusing on collaborations with various industries to design relevant curricula and to provide students with an exposure to the real world.

Undergraduate Program

Bachelor of Technology (B. Tech.) in Mechanical Engineering with the option of doing minor in any other stream of interest.

Program Learning Goals (PLGs)

The Mechanical Engineering program at Shiv Nadar Institution of Eminence (deemed to be University) is designed to create and disseminate multidisciplinary strategic knowledge of the discipline and develop efficient, eco-friendly systems to cater the need of the industries and academic community.

The department is envisioned to nurture Mechanical Engineers in some emerging areas, namely Green Energy Technology Systems, High-Performance Computing, Advanced Materials and Manufacturing, Robotics & Industrial Automation, and Electric-Mobility domains by addressing the relevant needs and challenges of the country. The department is offering a plethora of subjects along with two programs (B. Tech and Ph. D.) and some state of the art laboratory facilities towards imparting complete knowledge through experiential learning and skill development so that students can face any technological challenges and can come up with *energy efficient* and *sustainable* solutions.

Our students and researchers are expected to:

- Understand fundamental theory and apply their engineering knowledge and critical thinking to solve real-world challenging Mechanical Engineering problems. The skills we impart to the

students will be extremely valuable for their professional growth or contribution in non-engineering fields or business.

- Work in a technical environment with an understanding and necessity for the personal integrity, ethical behavior, and continuous improvement for the benefit of the community.
- Disseminate technical information through scholarly publication, conferences and continuing education.

The following are the Program Learning Goals (PLGs) for Bachelor of Technology (B. Tech.) in Mechanical Engineering:

PLG-1: Develop competent Mechanical Engineers with a strong foundation of knowledge.

PLG-2: Foster transformed individuals who are not just informed, but capable of applying their knowledge strategically.

PLG-3: Equip students with cutting-edge research skills and the ability to tackle complex engineering challenges.

PLG-4: Enable students to apply theoretical concepts to solve real-world problems effectively.

PLG-5: Provide the necessary skills for successful and productive careers in Mechanical Engineering.

PLG-6: Cultivate the ability to work both independently and as collaborative team members.

PLG-7: Inspire a commitment to higher studies and lifelong learning throughout their professional careers.

II. Credit Break-up of Undergraduate Curriculum in Mechanical Engineering

Our balanced curriculum has a number of sub-categories from which the students need to secure minimum credits. Every student has to secure the minimum credits as given in Table 1.

Table 1. Credit distribution among different course categories.

S. No.	Course Category	Credits
1	Core Common Curriculum (CCC)*	16
2	University Wide Elective (UWE)	16
3	CCC/UWE	8
4	Major School (Engineering) Core**	34
5	Major Departmental (Mechanical) Core**	53
6	Major Departmental (Mechanical) Elective	21
7	Project I + Project II	12
Total Credits		**160**

* Includes the mandatory CCC on Environment & Sustainability (offered in the 2nd semester)
**Includes 08 credits of Experiential Learning.

III. Semester-wise Credit Distribution

SEMESTER I: 20 Credits				
S. No.	**Course Code**	**Course Title**	**L:T:P**	**Credits**
1	PHY1011	Fields, Waves, and Quanta	3:1:1	5
2	MAT1003	Multivariate Calculus	3:1:0	4
3	CSD1001	Problem Solving Using Programming	3:0:1	4
4	ECE1001	The Electron's Path: Fundamentals of EEE	2:0:1	3
5	SOE4801	Introduction to Engineering: Ideas to Impact	1:0:1	2
6	SNS1001	Nature's Code: Chemistry and Biology	2:0:0	2
Semester Credits				**20**

SEMESTER II: 18 Credits				
S. No.	**Course Code**	**Course Title**	**L:T: P**	**Credits**
1	CED1001	Forces in Action	2:0:1	3
2	MAT1004	Linear Systems and Transforms	3:1:0	4
3	ECE1002	Connected Intelligence: Sensors and IoT	2:0:1	3
4	MED1001	The Matter of Materials	2:0:0	2
5	SOE4802	Design to Reality: CAD and 3D Printing	0:1:1	2
6	CCC	Environment & Sustainability	3:1:0	4
Semester Credits				**18**

SEMESTER III: 23 Credits				
S. No.	**Course Code**	**Course Title**	**L:T: P**	**Credits**
1	MED2001	Materials Science & Engineering	2:0:1	3
2	MED2002	Manufacturing Technology I	2:0:1	3
3	MED2003	Mechanics of Solids	3:0:1	4
4	MED2004	Mechanics of Fluids	3:0:1	4
5		CCC-1		3
6		CCC-2		3
7		UWE-1		3
Semester Credits				**23**

SEMESTER IV: 24 Credits				
S. No.	**Course Code**	**Course Title**	**L:T: P**	**Credits**
1	MED2005	Engineering Thermodynamics	2:1:0	3
2	MED2006	Principles of Industrial Engineering	3:0:0	3
3	MED3001	Kinematics & Dynamics of Machines	3:0:1	4
4	MED3002	Manufacturing Technology II	2:0:1	3
5	MED3003	Computer-Aided Design	2:0:1	3
6	MED4801	Computer-Aided Manufacturing [Experiential Learning: 2 credits]	2:0:0	2
7		CCC-3		3
8		UWE-2		3
Semester Credits				**24**

SEMESTER V: 23 Credits				
S. No.	**Course Code**	**Course Title**	**L:T: P**	**Credits**
1	MED3004	Applied Thermodynamics	2:1:0	3
2	MED3005	Heat and Mass Transfer	3:0:1	4
3	MED4001	Operations Research	2:1:0	3
4	MED4002/ MED4802	Mechatronics & Control System [Experiential Learning: 2 credits]	3:0:1	4
5	MED4003	Machine Design	3:0:0	3
6	MED33xx	Major Elective - 1		3
7		UWE-3		3
Semester Credits				**23**

SEMESTER VI: 22 Credits				
S. No.	**Course Code**	**Course Title**	**L:T: P**	**Credits**
1	MED4004	I. C. Engines & Automobiles	3:0:1	4
2	MED33xx	Major Elective - 2		3
3	MED33xx	Major Elective - 3		3
4	MED33xx	Major Elective - 4		3
5		CCC-4		3
6		UWE-4		3
7		UWE-5		3
Semester Credits				**22**

SEMESTER VII: 21 Credits				
S. No.	**Course Code**	**Course Title**	**L:T: P**	**Credits**
1	MED4901	Project I	0:0:6	6
2	MED42xx	Major Elective - 5		3
3	MED42xx	Major Elective - 6		3
4	MED42xx	Major Elective - 7		3
5		UWE-6		3
6		CCC/UWE		3
Semester Credits				**21**

SEMESTER VIII: 09 Credits				
S. No.	**Course Code**	**Course Title**	**L:T: P**	**Credits**
1	MED4902	Project II	0:0:6	6
2		CCC/UWE		3
Semester Credits				**9**

IV. Major Departmental (Mechanical) Core Courses

Table 3. Major departmental (Mechanical) core courses (2nd year onwards).

MAJOR DEPARTMENTAL (MECHANICAL) CORE [2nd Year onwards]				53 credits
S. No.	**Course Code**	**Course Name**	**L:T:P**	**Credits**
1	MED2001	Materials Science and Engineering	2:0:1	3
2	MED2002	Manufacturing Technology I	2:0:1	3
3	MED2003	Mechanics of Solids	3:0:1	4
4	MED2004	Mechanics of Fluids	3:0:1	4
5	MED2005	Engineering Thermodynamics	2:1:0	3
6	MED2006	Principles of Industrial Engineering	3:0:0	3
7	MED3001	Kinematics and Dynamics of Machines	3:0:1	4
8	MED3002	Manufacturing Technology II	2:0:1	3
9	MED3003	Computer-Aided Design	2:0:1	3
10	MED4801	Computer-Aided Manufacturing [Experiential learning: 02 credits]	2:0:0	2
11	MED3004	Applied Thermodynamics	2:1:0	3
12	MED3005	Heat and Mass Transfer	3:0:1	4
13	MED4001	Operations Research	2:1:0	3
14	MED4002/ MED4802	Mechatronics & Control System [Experiential learning: 02 credits]	3:0:1	4
15	MED4003	Machine Design	3:0:0	3
16	MED4004	I. C. Engines & Automobiles	3:0:1	4
Total Credits				**53**

Table 4. Major project (4th year).

PROJECT [4th Year]				12 credits
S. No.	**Course Code**	**Course Name**	**L:T:P**	**Credits**
1	MED4901	Project I	0:0:6	6
2	MED4902	Project II	0:0:6	6
Total Credits				**12**

V. Major Departmental (Mechanical) Elective Courses & Specialization Tracks

Table 5. Major departmental (Mechanical) elective courses (3rd year onwards).

MAJOR DEPARTMENTAL (MECHANICAL) ELECTIVE [3rd Year onwards]				21 credits
S. No.	**Course Code**	**Course Name**	**L:T:P**	**Credits**
1	MED3301	Finite Element Method	3:0:0	3
2	MED3302	Mechanical Vibrations	3:0:0	3
3	MED3303	Fundamentals of Hydrogen Fuel Cells	2:0:1	3
4	MED3304	Energy Conversion Tech and Energy Management	3:0:0	3
5	MED3305	Soft Robotics	2:0:1	3
6	MED3306	Electric Vehicle Technology	3:0:0	3
7	MED3307	Adv. Comp. Programming & Numerical Techniques	2:0:1	3
8	MED3308	Computational Fluid Dynamics	3:0:0	3
9	MED3309	Solar Energy	2:0:1	3
10	MED3310	Industrial Automation	2:0:1	3
11	MED3311	Advanced Machine Design	3:0:0	3
12	MED3312	Fluid Machinery	2:0:1	3
13	MED3313	Mechanics of Soft Materials	3:0:0	3
14	MED4201	Mechanics of Composite Structures	3:0:0	3
15	MED4202	Power Plant Engineering	3:0:0	3
16	MED4203	Refrigeration and Air Conditioning	2:0:1	3
17	MED4204	Robotics	2:0:1	3
18	MED4205	Energy Storage & Conversion Devices for Electric Vehicles	2:0:1	3
19	MED4206	Supply Chain Management	3:0:0	3

V-A. Departmental Specialization Tracks

The students enrolled in B. Tech. Mechanical Engineering (4 year) would have an option to specialize in one the following emerging areas:

- **Computational Techniques in Mechanical Engineering**
- **Energy Technology**
- **Robotics and Industrial Automation**

The student must complete a minimum of 12 major elective credits in the chosen area of specialization. The list of major elective courses offered under each of the above specialization tracks are given in the tables below (see Tables 6-8). Note that obtaining a specialization is not mandatory.

Table 6. Major elective courses under 'Computational Techniques in Mechanical Engineering' (3rd year onwards).

Track 1: Computational Techniques in Mechanical Engineering [12 credits]				
S. No.	**Course Code**	**Course Name**	**L:T:P**	**Credits**
1	MED3301	Finite Element Method	3:0:0	3
2	MED3302	Mechanical Vibrations	3:0:0	3
3	MED3307	Adv. Comp. Programming & Num. Tech.	2:0:1	3
4	MED3308	Computational Fluid Dynamics	3:0:0	3
5	MED3313	Mechanics of Soft Materials	3:0:0	3
6	MED4201	Mechanics of Composite Structures: A Computational Approach	3:0:0	3

Table 7. Major elective courses under 'Energy Technology' (3rd year onwards).

Track 2: Energy Technology [12 credits]				
S. No.	**Course Code**	**Course Name**	**L:T:P**	**Credits**
1	MED3303	Fundamentals of Hydrogen Fuel Cells	2:0:1	3
2	MED3304	Energy Conversion Tech and Energy Management	3:0:0	3
3	MED3308	Computational Fluid Dynamics	3:0:0	3
4	MED3309	Solar Energy	2:0:1	3
5	MED3312	Fluid Machinery	2:0:1	3
6	MED4202	Power Plant Engineering	3:0:0	3
7	MED4203	Refrigeration and Air Conditioning	2:0:1	3
8	MED4205	Energy Storage & Conv. Devices for Elec Vehicles	2:0:1	3

Table 8. Major elective courses under 'Robotics & Industrial Automation' (3rd year onwards).

Track 3: Robotics & Industrial Automation [12 credits]				
S. No.	**Course Code**	**Course Name**	**L:T:P**	**Credits**
1	MED3305	Soft Robotics	2:0:1	3
2	MED3310	Industrial Automation	2:0:1	3
3	MED3311	Advanced Machine Design	3:0:0	3
4	MED4204	Robotics	2:0:1	3
5	MED4206	Supply Chain Management	3:0:0	3

V-B. Interdisciplinary Specialization Tracks

In addition to the 'departmental specialization tracks' mentioned above, the students enrolled in B. Tech. in Mechanical Engineering also get an opportunity to pursue an interdisciplinary specialization. The elective credit requirement to obtain an interdisciplinary specialization are the same as that for the departmental specialization mentioned above. The following tables (Tables 9 and 10) show the elective courses under the interdisciplinary specializations offered by the Mechanical Engineering Department (MED) together with Electrical and Computer Engineering (ECE) and Computer Science and Engineering (CSE) departments.

Table 9. Elective courses under 'E-Mobility' (3rd year onwards).

Interdisciplinary Track 1 : E-Mobility [12 credits] | MED-ECE-CSE				
S. No.	**Course Code**	**Course Name**	**L:T:P**	**Credits**
1	MED3306	Electric Vehicle Technology	3:0:0	3
2	ECE3310	EV Converters and Power Train	2:0:1	3
3	CSD4236	Connected Car Technology	2:0:1	3
4	MED4205	Energy Storage & Conversion Devices for Electric Vehicles	2:0:1	3
5	CSD4209	Computer Vision	2:0:1	3
6	ECE4203	Digital Control of Power Converter	2:0:1	3

1-3: Mandatory courses; 4-6: One out of these courses to be credited.

Table 10. Elective courses under 'Cognitive Robotics' (3rd year onwards).

Interdisciplinary Track 2 : Cognitive Robotics [12 credits] | MED-ECE-CSD				
S. No.	**Course Code**	**Course Name**	**L:T:P**	**Credits**
1	MED4204	Robotics	2:0:1	3
2	ECE3318	Modern Control Systems	2:0:1	3
3	MED3305	Soft Robotics	2:0:1	3
4	CSD4209	Computer Vision	2:0:1	3
5	MED3310	Industrial Automation	2:0:1	3
6	ECE3311	IoT- Architecture, Communication Technology and Applications	2:0:1	3
7	ECE4206/ CSD4210	Foundations of Deep Learning	3:0:0	3

1-2: Mandatory courses; 3-7: Two out of these courses to be credited.

VII. Minor in Mechanical Engineering

The Minor in Mechanical Engineering provides students from diverse academic backgrounds with a foundational understanding of core areas such as mechanics, thermodynamics, manufacturing, industrial engineering, and system design. It is structured in a manner to help broaden technical competence, foster interdisciplinary learning, and enhance problem-solving skills by integrating mechanical principles with students' primary fields of study. By combining theoretical knowledge with practical applications, the program equips students to address real-world challenges, pursue interdisciplinary research, and expand professional opportunities in engineering-related fields and advanced graduate study.

Total credit requirement: at least 20

Minor core (mandatory) credits: 14 | Minor elective: at least 06

Minor CGPA requirement: at least 5.0/10

MINOR CORE (MANDATORY): 14 credits				
S. No.	**Course Code**	**Course Title**	**L:T:P**	**Credits**
1.	SOE4802	Design to Reality: CAD & 3D Printing	0:1:1	2
2.	CED1001	Forces in Action	2:0:1	3
3.	MED2002	Manufacturing Technology I	2:0:1	3
4.	MED2005	Engineering Thermodynamics	2:1:0	3
5.	MED2006	Principles of Industrial Engineering	3:0:0	3
			Total:	**14**
MINOR ELECTIVE: 06 credits				
S. No.	**Course Code**	**Course Title**	**L:T:P**	**Credits**
1.	MED2003	Mechanics of Solids	3:0:1	4
2.	MED2004	Mechanics of Fluids	3:0:1	4
3.	MED3001	Kinematics & Dynamics of Machines	3:0:1	4
4.	MED3002	Manufacturing Technology II	2:0:1	3
5.	MED3005	Heat & Mass Transfer	3:0:1	4
6.	MED4001	Operations Research	2:1:0	3
7.	MED4003	Machine Design	2:0:1	3
			Total:	**at least 06 out of 24**