

NIT RAIPUR

MTECH (Machine Design)

Course Brochure

Master of Technology (Machine design)

Department of Mechanical Engineering,
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ABOUT THE INSTITUTION

Till as late as 1956, our Nation had only three technical institutes offering courses in the much-needed fields of Mining and Metallurgical Engineering. In view of this fact and also with an aim of harnessing the ample mineral resources of the region, this institute, presently recognized as NIT Raipur, was set-up on 1st May 1956 as Government College of Mining and Metallurgy. The first President of independent India honorable Dr. Rajendra Prasad laid the Foundation stone of the college building on 14th September 1956. The construction work was completed in 1962 and on 14th March 1963, India's first Prime Minister Pt. Jawaharlal Nehru performed the inauguration. The first session of the college commenced from 1st July 1956 with the admission of 15 students each in Mining and Metallurgy Engineering. In 1958-59 with the commencement of additional courses in Civil, Mechanical and Electrical Engineering the college came to be known as Government College of Engineering and Technology. Later graduate courses in Chemical Engineering (1965), Architecture (1984), Electronics (1985), Information Technology, Computer Science and Technology (2000), Biotechnology, Biomedical Engineering (2003) were also started. In view of its great past with 50 years old record of excellence and several strengths, the institute has been declared as National Institute of Technology (NIT) by the Central Government on 1st Dec. 2005.

National Institute of Technology, Raipur (NITRR), hence formed in the year 2006, is an Institute of national importance and presently runs academic courses in 12 disciplines in the form of graduate and post graduate courses. The institute also inducts regular and part-time scholars for PhD courses. In addition to these, the institute intends to provide continuing education in a very broad spectrum keeping in view the needs of industries, academic institutions, research organizations and, last but not the least, the society. The institute is committed to the challenging task of development of technical education by preparing seasoned graduates in highly sophisticated field of engineering and technology. Development of India as an emerging industrial power is a demanding exercise as it involves the combination of cost effectiveness and efficiency along with producing world-class technology at the cutting edge. For about five decades we have been doing it with utmost sincerity and commitment at NIT Raipur.

About the Department

Department of Mechanical Engineering, NIT Raipur, offers undergraduate program (B.Tech.) and three Postgraduate programs (M.Tech.). It is one of the largest departments of the institute with intake of 90 students for undergraduate course and (17+13+13=43) students for post graduate course. Department also offers Ph.D. program in all relevant discipline of Mechanical Engineering including Design, Production, Thermal and Industrial Management. The post graduate programs are offered in the following specializations:

1. Thermal Engineering
2. Industrial Engineering and Management
3. Machine Design

Vision:

“To produce innovative, entrepreneurial and successful engineers and technologists of high caliber for the nation, to serve as a valuable resource for industry, academia and society”

Mission:

1. To provide the students and the faculty with opportunities to create, interpret, and apply the knowledge in the field of Mechanical Engineering.
2. Provide technological service to local, national, and international communities.

Programme Educational Objectives (PEOs)

Under the Post-graduate Mechanical Engineering programme in Machine Design, the objectives aim to produce qualified Mechanical Engineering Post-graduates who will:

- I. Be successful professionals in resulting domains with proven expertise.
- II. Contribute to society as responsible, educated, expressive and ethical citizens.
- III. Achieve appraising peer-recognition; as an individual or in a team.
- IV. Thrive to pursue life-long reflective learning to fulfill their goals.

About the Programme

The Mechanical Engineering program requires the scholars attaining the M.Tech (Machine Design) degree to acquire the skills necessary to succeed in the engineering profession. The necessary skills were identified and approved by the DAC comprising of Faculty, Students and Professionals. These requirements also meet the Graduate Attributes laid by NBA for Mechanical Engineering programs. To make sure that the skills are delivered to the students, Program Outcomes have been established and related to the program's Educational Objectives.

Program Outcome

PO1: An ability to apply attained knowledge;

- a. identify, critically analyze, formulate and solve engineering problems,
- b. select modern engineering tools and techniques and use them with dexterity,
- c. design a system and process to meet desired needs within realistic constraints,
- d. contribute by research and innovation to solve engineering problems,
- e. devise and conduct experiments, interpret data and provide conclusions.

PO2: An ability to understand the impact of engineering solutions;

- a. in a contemporary, global, economical, environmental and societal context,
- b. for sustainable development.

PO3: An ability to function professionally with ethical responsibility;

- a. as an individual as well as in multidisciplinary teams with positive attitude,
- b. an ability to communicate effectively.

PO4: An ability to appreciate;

- a. the importance of goal setting.
- b. to recognize the need for life-long reflective learning

Table below illustrates relationship between the PEOs and the program outcomes.

PEO 	I	II	III	IV
PO 				
1	Y, 0.40	Y, 0.30	Y, 0.15	Y, 0.15
2	Y, 0.30	Y, 0.40	Y, 0.15	Y, 0.15
3	Y, 0.15	Y, 0.15	Y, 0.50	Y, 0.20
4	Y, 0.15	Y, 0.15	Y, 0.20	Y, 0.50

Programme Scheme

National Institute of Technology , Raipur (C.G.)													
M. Tech. in Mechanical Engineering with specialization in <u>Machine Design</u>													
Course of Study & Scheme of Examination										M. Tech. 1 st Semester			Branch: Mechanical
S. No.	Board of Studies	Sub. Code	Subject Name	Periods / week			Examination Scheme					Total Marks	Credits
				L	T	P	TA	FE	SE	ESE	Pract. ESE		
1	Mechanical	ME42111ME	Advanced Numerical Techniques	3	1	-	20	15	15	100	-	150	4
2	Mechanical	ME42112ME	Optimization Techniques	3	1	-	20	15	15	100	-	150	4
3	Mechanical	ME42113ME	Stress and Deformation analysis	3	1	-	20	15	15	100	-	150	4
4	Mechanical	ME42131ME	Elective-I	3	1	-	20	15	15	100	-	150	4
5	Mechanical	ME42132ME	Elective-II	3	1	-	20	15	15	100	-	150	4
6	Mechanical	ME42121ME	Experimental Lab-I	-	-	3	75	-	-	-	50	125	2
7	Mechanical	ME42122ME	Computational Lab-I	-	-	3	75	-	-	-	50	125	2
Total				15	5	6	250	75	75	500	100	1000	24

National Institute of Technology , Raipur (C.G.)													
M. Tech. in Mechanical Engineering with specialization in <u>Machine Design</u>													
Course of Study & Scheme of Examination										M. Tech. 2 nd Semester			Branch: Mechanical
S. No.	Board of Studies	Sub. Code	Subject Name	Periods / week			Examination Scheme					Total Marks	Credits
				L	T	P	TA	FE	SE	ESE	Pract. ESE		
1	Mechanical	ME42211ME	Advanced Dynamics	3	1	-	20	15	15	100	-	150	4
2	Mechanical	ME42212ME	Advanced Machine Design	3	1	-	20	15	15	100	-	150	4
3	Mechanical	ME42213ME	Composite Mechanics	3	1	-	20	15	15	100	-	150	4
4	Mechanical	ME42231ME	Elective III	3	1	-	20	15	15	100	-	150	4
5	Mechanical	ME42232ME	Elective-IV	3	1	-	20	15	15	100	-	150	4
6	Mechanical	ME42221ME	Experimental Lab-II	-	-	3	75	-	-	-	50	125	2
7	Mechanical	ME42222ME	Computational Lab-II	-	-	3	75	-	-	-	50	125	2
Total				15	5	6	250	75	75	500	100	1000	24

National Institute of Technology , Raipur (C.G.)													
M. Tech. in Mechanical Engineering with specialization in <u>Machine Design</u>													
Course of Study & Scheme of Examination										M. Tech. 3 rd Semester			Branch: Mechanical
S. No.	Board of Studies	Sub. Code	Subject Name	Periods / week			Examination Scheme					Total Marks	Credits
				L	T	P	TA	FE	SE	ESE	Pract. ESE		
1	Mechanical	ME42321ME	Preliminary Dissertation Work	-	-	24	100	-	-	-	200	300	12
2	Mechanical	ME42322ME	Comprehensive Examination	-	-	-	-	-	-	-	200	200	4
Total				-	-	24	100	-	-	-	400	500	16

National Institute of Technology , Raipur (C.G.)													
M. Tech. in Mechanical Engineering with specialization in <u>Machine Design</u>													
Course of Study & Scheme of Examination										M. Tech. 4 th Semester			Branch: Mechanical
S. No.	Board of Studies	Sub. Code	Subject Name	Periods / week			Examination Scheme					Total Marks	Credits
				L	T	P	TA	FE	SE	ESE	Pract. ESE		
1	Mechanical	ME42421ME	Dissertation + Seminar	-	-	32	200	-	-	-	300	500	16
Total				0	0	32	200	-	-	-	300	500	16

List of Electives

List of Electives offered in First Semester of the Specialization:

Elective-I AND II

ME42131ME	Advanced Finite Element Method
ME42132ME	Engineering Tribology
ME42133ME	Experimental Methods for Engineers
ME42134ME	Advanced Mechanism Design
ME42135ME	Product Design
ME42136ME	Computer Aided Design
ME42137ME	Rotor Dynamics

List of Electives offered in Second Semester of the Specialization:

Elective-III AND IV

ME42231ME	Industrial Robotics
ME42232ME	Experimental Stress Analysis
ME42233ME	Biomechanics
ME42234ME	Fault Diagnosis and Condition Monitoring
ME42235ME	Pressure Vessel Design
ME42236ME	Design for Manufacturing
ME42237ME	Advanced Material

Note :-{The elective subjects mentioned in the above list may be increased/changed as per the specialization of the faculties available from time to time. Electives of interdisciplinary/open nature may also be included.}

Details of faculties involved with PG Programme in Machine Design

The Department comprises of 24 regular faculties with different specializations and all contribute to the fruitful conduction of the PG course. Of these, 9 regular faculties, belonging to the Machine Design specialization in a broader sense, are the major contributors. The details of these faculties are as follows.

- 1. Dr. Shubhashis Sanyal, Professor**
Area of Interest: Synthesis of Mechanisms, Machine Design, Stress Concentration Factor.
- 2. Dr. Surendra Pal Singh Matharu, Professor**
Area of Interest: Machine Design, Tribology of Rolling Element Bearings.
- 3. Dr. Nitin Jain, Associate Professor**
Area of Interest: Solid Mechanics, Composites.
- 4. Dr. Shubhankar Bhowmick, Associate Professor**
Area of Interest: Structural Mechanics, Functional grading of materials, Fluid-Structure interaction and Finite element method.
- 5. Dr. N.V. Swamy Naidu, Associate Professor**
Area of Interest: Mechanical Design, Biomechanics, Nano-composites structures.
- 6. Dr. Somnath Bhattacharya, Assistant Professor**
Area of Interest: Design, FEM, XFEM, Computational Continuum Mechanics and Dynamics.
- 7. Dr. G Srinivasu, Assistant Professor**
Area of Interest: Material characterization (Titanium alloys), Tribology, Composite materials, Finite element modeling, Artificial neural networks.
- 8. Dr. Raj Kumar Sahu, Assistant Professor**
Area of Interest: Smart materials, Mechanical characterization, Electro active Polymers, and application of smart materials in actuator design.
- 9. Dr. Rajana Suresh Kumar, Assistant Professor**
Area of Interest: Structural Dynamics, Piezo-electric materials, Finite element method.

Laboratories

Being a major department, there are a number of laboratories with a diversified variety of equipment with latest technologies. Students have open access to the labs, to understand as well as apply their knowledge to explore their engineering skills. The facilities available are as follows.

1. Tribology Lab with four ball tester, rolling element bearing tester.
2. Dynamics of Machines Lab.
3. Material testing lab with UTM, Brinell hardness, Rockwell Hardness tester, Compression testing machine, Impact testing machines and Fatigue and cupping testing machines.
4. Instrumentation lab.
5. CAD Lab with access to design and simulation software CATIA, DELMIA, SOLIDWORKS, ANSYS and Autodesk Inventor.
6. Computing lab with programming environments in MATLAB, C++ and PYTHON.
7. Workshop with latest CNC trainer and production capacity Lathe and Milling machine.