NATIONAL INSTITUTE OF TECHNOLOGY PATNA

Course Structure

Bachelor of Technology (B.Tech.) Degree

in

Mechanical Engineering

DEPARTMENT OF MECHANICAL ENGINEERING

Effective for students admitted from July 2022 onward

INSTITUTE VISION AND MISSION

INSTITUTE VISION

"*To contribute to India and the World through excellence in scientific and technical education and research; to serve as a valuable resource for industry and society; and to remain a source of pride for all Indians*"

INSTITUTE MISSION

1. To generate new knowledge by engaging in cutting-edge research and to promote academic growth by offering state-of-the-art undergraduate, postgraduate and doctoral programme.

2. To identify, based on an informed perception of Indian, regional and global needs, areas of specialization upon which the Institute can concentrate.

3. To undertake collaborative projects which offer opportunities for long term interaction with academia and industry.

4. To develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders can emerge in a range of profession.

DEPARTMENT VISION AND MISSION

VISION OF DEPARTMENT

"To create well trained and skilled technocrats with life-long learning in the area of Mechanical Engineering"

MISSION OF DEPARTMENT

1. To provide education that transforms young minds through rigorous teaching and thought process to fulfil the needs of the society and Industry.
2. To collaborate with leading Industry partners and other academic and research Institutes around the world to strengthen the education and research ecosystem.
3. To prepare students with life-long learning for their career by fostering in them the ethical & technical capabilities pertinent to mechanical and allied engineering.

MAPPING OF DEPARTMENT VISION WITH INSTITUTE MISSION

DV \ IM	cutting-edge research	academic growth	long term interaction	intellectually capable and imaginatively
Well trained	√	√		√
Skilled technocrats	√	√		√
life-long learning	√	√	√	√

Program Educational Objectives (PEOs)

1. Graduates will have good fundamental and multidisciplinary knowledge with an ability to analyse, design, innovate and handle the realistic problems.
2. Graduates will have a strong foundation in academics, leadership qualities and lifelong learning for a prosperous professional career.
3. Graduates will have excellent communication skills, ethical conduct, sense of responsibility to serve society and to protect the environment.

Mapping of PEOs with Department Mission

DM \ PEO	fundamental & multidisciplinary knowledge analyse, design, innovate and handle the realistic problems	Academics, leadership qualities lifelong learning prosperous professional career	ethical conduct, sense of responsibility society environment
M1 rigorous teaching thought process needs of the society and industry	√		√
M2 strengthen the education and research ecosystem	√	√	
M3 life-long learning ethical & technical capabilities		√	√

Mapping of PEOs with Institute Mission

IM \ PEO	fundamental & multidisciplinary knowledge analyse, design, innovate and handle the realistic problems	Academic, leadership qualities lifelong learning prosperous professional career	ethical conduct, sense of responsibility society environment
IM1 cutting-edge research	√		
IM2 academic growth	√	√	
IM3 long term interaction		√	√
IM4 intellectually capable and imaginatively	√	√	√

Program Outcomes (POs)

PO 1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3: Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4: Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6: The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and receive clear instructions.

PO 11: Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in team, to manage projects and in multidisciplinary environments.

PO 12: Life-Long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

PSO1 - Ability to apply mechanical engineering principles to design, develop and implement a suitable manufacturing process to meet the volatile needs of the industry and society at large.

PSO2 - Ability to build the nation, by imparting technological inputs and managerial skills to become Technocrats and Entrepreneurs, build the attitude of developing new concepts on emerging fields and pursuing advanced education.

Mapping of PEOs with PSOs

PSO \ PEO	fundamental & multidisciplinary knowledge analyse, design, innovate and handle the realistic problems	Academic, leadership qualities lifelong learning prosperous professional career	ethical conduct, sense of responsibility society environment
PSO1 design, develop and implement, needs of the industry and society	√		√
PSO2 build the nation, managerial skills developing new concepts advanced education	√	√	

COURSE STRUCTURE

FIRST SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	Credits	Dept.
1	HS12101	Communicative English	3	0	2	4	HSS
2	PH12101	Engineering Physics	3	0	2	4	PH
3	ME12101	Engineering Graphics	2	0	2	3	ME
4	ME12102	Workshop Practice – I	2	0	2	3	ME
5	ME12103	Introduction to Metal Machining Processes	1	0	2	2	ME
6	ME12104	Engineering Mechanics	3	0	0	3	ME
7	EAA12101	EAA I - Sports/Innovative project/NCC/NSS	0	0	2	1	-
	Total		**14**	**0**	**12**	**20**	

SECOND SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	Credits	Dept.
1	CS22101	Fundamentals of Information Technology	3	0	2	4	CSE
2	MA22101	Engineering Mathematics	3	1	0	4	MA
3	CH22101	Engineering Chemistry	3	0	2	4	CH
4	ME22101	Elements of Mechanical Engineering	2	0	2	3	ME
5	ME22105	Workshop Practice – II	2	0	2	3	ME
6	ME22103	Advanced Metal Machining Processes	0	0	2	1	ME
7	EAA22102	EAA II Swachha Bharat Mission (SBM)	0	0	2	1	-
	Total		**13**	**1**	**12**	**20**	

THIRD SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	Credits	Dept.
1	ME32101	Material Science & Engineering	3	0	0	3	ME
2	ME32102	Thermodynamics	3	0	0	3	ME
3	ME32103	Manufacturing Process - I	3	0	2	4	ME
4	ME32104	Strength of Materials	3	0	2	4	ME
5	CE32101	Environmental Engineering	3	0	0	3	CE
6	MA32101	Numerical Methods for Engineers	3	0	0	3	Math
	Total	-	18	0	4	20	

MOOC/ Swayam Course: Two courses are compulsory for award of B. Tech Degree. Students can opt two MOOC/Swayam courses according to their preferences from 3rd semester onwards till 6th semester. These two MOOC/ Swayam courses are registered in 6th semester.

FOURTH SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	Credits	Dept.
1	ME42101	Applied Thermodynamics	3	0	2	4	ME
2	ME42102	Fluid Mechanics & Machinery	3	0	0	3	ME
3	ME42103	Manufacturing Process - II	3	0	2	4	ME
4	ME42104	Kinematics of Machines	3	0	0	3	ME
5	ME42105	Industrial Engineering and Management	3	0	0	3	ME
6	ME4210X	Professional Elective - I	3	0	0	3	ME
	Total		18	0	4	20	-

Professional Elective – I (List)

Sl. No	Course Code	Course Title	L	T	P	Credits	Dept.
1	ME42106	Introduction to Robotics	3	0	0	3	ME
2	ME42107	Advanced Strength of Materials	3	0	0	3	ME
3	ME42108	Measurement and Metrology	3	0	0	3	ME

MOOC/ Swayam Course: Two courses are compulsory for award of B. Tech Degree. Students can opt two MOOC/Swayam courses according to their preferences from 3rd semester onwards till 6th semester. These two MOOC/ Swayam courses are registered in 6th semester.

FIFTH SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	Credits	Dept.
1	ME52101	Machine Design-I	3	0	0	3	ME
2	ME52102	Heat and Mass Transfer	3	0	2	4	ME
3	ME52103	CAD/CAM	3	0	2	4	ME
4	ME52104	Dynamics of Machinery	3	0	2	4	ME
5	HS52101	Universal Human Values & Ethics	2	0	0	2	HS
6	OE080x	Open Elective - I	3	0	0	3	-
	Total		17	0	6	20	-

MOOC/ Swayam Course: Two courses are compulsory for award of B. Tech Degree. Students can opt two MOOC/Swayam courses according to their preferences from 3rd semester onwards till 6th semester. These two MOOC/ Swayam courses are registered in 6th semester.

SIXTH SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	Credits	Dept.
1	ME62101	Machine Design-II	3	0	0	3	ME
2	ME62102	Internal Combustion Engine	3	0	2	4	ME
3	ME62115	Seminar & Technical Writing	0	0	2	1	ME
4	ME621xx	Professional Elective-II	3	0	0	3	ME
5	ME621xx	Professional Elective-III	3	0	0	3	ME
6	ME0000	MOOC/Swayam course - 1	3	0	0	3	NPTEL/ Swayam
7	ME0000	MOOC/Swayam course - 2	3	0	0	3	NPTEL/ Swayam
	Total	-	18	0	4	20	-

Professional Elective – II (List)

Sl. No	Course Code	Course Title	L	T	P	Credits	Dept.
1	ME62105	Finite Element Methods	3	0	0	3	ME
2	ME62106	Metal Forming Processes	3	0	0	3	ME
3	ME62107	Operations Research	3	0	0	3	ME
4	ME62108	Total Productive Maintenance	3	0	0	3	ME
5	ME62109	Renewable Energy	3	0	0	3	ME

Professional Elective – III (List)

Sl. No	Course Code	Course Title	L	T	P	Credits	Dept.
1	ME62110	Additive Manufacturing & 3D Printing	3	0	0	3	ME
2	ME62111	Power Plant Engineering	3	0	0	3	ME
3	ME62112	Mechanical Vibration	3	0	0	3	ME
4	ME62113	Introduction to Mechatronics	3	0	0	3	ME
5	ME62114	Artificial Intelligence for Design and Manufacturing	3	0	0	3	ME

MOOC/ Swayam Course: Two courses are compulsory for award of B. Tech Degree. Students can opt two MOOC/Swayam courses according to their preferences from 3rd semester onwards till 6th semester. These two MOOC/ Swayam courses are registered in 6th semester.

SEVENTH SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	Credits	Dept.
1	ME72127	Research Project - I	0	0	8	4	ME
2	ME72102	Industrial Training	-	-	-	2	ME
3	ME72126	Refrigeration and Air Conditioning	3	0	2	4	ME
4	ME72109	Automobile Engineering	3	0	0	3	ME
5	ME721xx	Professional Elective-IV	3	0	0	3	ME
6	ME721xx	Professional Elective-V	3	0	0	3	ME
7	ME721xx	Professional Elective-VI	3	0	0	3	ME
	Total	-	15	0	10	22	-

Professional Elective – IV (List)

Sl. No	Course Code	Course Title	L	T	P	Credits	Dept.
1	ME72103	Data Analytics	3	0	0	3	ME
2	ME72104	Design for Additive Manufacturing	3	0	0	3	ME
3	ME72105	Heat Exchanger Design	3	0	0	3	ME

Professional Elective – V (List)

Sl. No	Course Code	Course Title	L	T	P	Credits	Dept.
1	ME72106	Gas Turbines	3	0	0	3	ME
2	ME72107	Non-Conventional Machining Processes	3	0	0	3	ME
3	ME72108	Quality Control and Assurance	3	0	0	3	ME

Professional Elective – VI (List)

Sl. No	Course Code	Course Title	L	T	P	Credits	Dept.
1	ME72110	Introduction to Biomechanics	3	0	0	3	ME
2	ME72111	Micro-electromechanical System	3	0	0	3	ME
3	ME72112	Sustainable Manufacturing	3	0	0	3	ME

EIGHTH SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	Credits	Dept.
1	ME82101	Major Project	0	0	36	18	ME
2	ME82102	Comprehensive Viva-Voce	-	-	-	2	ME
	Total	-	0	0	36	20	

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List of Open Elective Offered by Department of Mechanical Engineering

Sl. No	Course Code	Course Title	L	T	P	Credits	Sem.
1	OE0801	Elements of Mechanical Engineering	3	0	0	3	V
2	OE0802	Renewable Energy	3	0	0	3	V
3	OE0803	Introduction to Operations Research	3	0	0	3	V
4	OE0804	Introduction to Power Plants	3	0	0	3	V
5	OE0805	Additive Manufacturing & 3D Printing	3	0	0	3	V
6	OE0806	Data Analytics	3	0	0	3	V