

B. Tech. – M. Tech. Dual Degree Programme from the Department of Mechanical Engineering

B. Tech. in Mechanical Engineering and M. Tech. in Mechatronics

Program Learning Objectives:	Program Learning Outcomes:
<ul style="list-style-type: none"> • Develop a comprehensive understanding of fundamental principles and advanced concepts in both mechanical engineering and mechatronics disciplines. • Acquire proficiency in applying theoretical knowledge to design, analyze, and optimize mechanical and mechatronic systems and components. • Cultivate practical skills in utilizing modern tools, techniques, and software for modeling, simulation, and prototyping of complex mechanical and mechatronic systems. • Foster interdisciplinary problem-solving abilities to address real-world challenges at the intersection of mechanical engineering and mechatronics. • Encourage innovation and creativity in the design and development of novel mechanical and mechatronic solutions to meet evolving industry and societal needs. 	<p>1. Comprehensive Understanding: Students will demonstrate a deep understanding of foundational principles and advanced concepts in mechanical engineering and mechatronics, including mechanics, dynamics, control systems, electronics, and robotics.</p> <p>2. Application of Knowledge: Students will be able to apply theoretical knowledge to design, analyze, and optimize mechanical and mechatronic systems and components, demonstrating proficiency in problem-solving and critical thinking.</p> <p>3. Practical Skills: Students will develop practical skills in using modern tools, techniques, and software for modeling, simulation, and prototyping of complex mechanical and mechatronic systems, effectively translating theoretical concepts into tangible solutions.</p> <p>4. Interdisciplinary Problem-Solving: Students will demonstrate the ability to tackle interdisciplinary challenges by integrating knowledge and techniques from mechanical engineering and mechatronics to develop innovative solutions that address real-world problems.</p> <p>5. Innovation and Creativity: Students will exhibit creativity and innovation in the design and development of novel mechanical and mechatronic solutions, showcasing originality and adaptability in addressing evolving industry and societal needs.</p>

Sl. No.	Subject Code	SEMESTER I	L	T	P	C
1.	MA1101	Calculus and Linear Algebra	3	1	0	4.0
2.	CS1101	Foundations of Programming	3	0	3	4.5
3.	PH1101/PH1201	Physics	3	1	3	5.5
4.	CE1101/CE1201	Engineering Graphics	1	0	3	2.5
5.	EE1101/EE1201	Electrical Sciences	3	0	3	4.5
6.	HS1101	English for Professionals	2	0	1	2.5
TOTAL			15	2	13	23.5

Sl. No.	Subject Code	SEMESTER II	L	T	P	C
1.	MA1201	Probability Theory and Ordinary Differential Equations	3	1	0	4
2.	CS1201	Data Structure	3	0	3	4.5
3.	CH1201/CH1101	Chemistry	3	1	3	5.5
4.	ME1201/ME1101	Mechanical Fabrication	0	0	3	1.5
5.	ME1202/ME1102	Engineering Mechanics	3	1	0	4
6.	IK1201	Indian Knowledge System (IKS)	3	0	0	3
TOTAL			15	3	9	22.5

Sl. No.	Subject Code	SEMESTER III	L	T	P	C
1.	ME2101	Dynamics	3	1	0	4
2.	ME2102	Thermodynamics	3	1	0	4
3.	ME2103	Fluid Mechanics	3	1	2	5
4.	ME2104	Engineering Materials	3	0	2	4
5.	HS21XX	HSS Elective - I	3	0	0	3
TOTAL			15	3	4	20

Sl. No.	Subject Code	SEMESTER IV	L	T	P	C
1.	ME2201	Kinematics and Dynamics of Mechanisms	3	1	2	5
2.	ME2202	Heat and Mass Transfer	3	1	2	5
3.	ME2203	Mechanics of Solids	3	1	0	4
4.	ME2204	Mechanical Measurements and Instrumentation	3	0	2	4
5.	XX22PQ	IDE-I	3	0	0	3
TOTAL			15	3	6	21

Sl. No.	Subject Code	SEMESTER V	L	T	P	C
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1.	ME3101	Data Analytics and Machine Learning Tools for Engineers	1	2	1	3.5
2.	ME3102	Design of Machine Elements	3	0	3	4.5
3.	ME3103	Manufacturing Technology- I	3	0	2	4
4.	ME3104	Engineering Software Laboratory	1	0	3	2.5
5.	ME3105	Numerical Methods for Engineers	3	0	0	3
6.	XX31PQ	IDE-II	3	0	0	3
TOTAL			14	2	9	20.5

Sl. No.	Subject Code	SEMESTER VI	L	T	P	C
1.	ME3201	Applied Thermodynamics and Turbomachinery	3	1	2	5
2.	ME3202	System Dynamics and Control	3	1	2	5
3.	ME3203	Manufacturing Technology -II	3	0	3	4.5
4.	ME3204	Industrial Engineering and Operations Research	3	1	0	4
5.	ME3205	Technical Writing and Presentations	0	0	4	2
TOTAL			12	3	11	20.5

Sl. No.	Subject Code	SEMESTER VII	L	T	P	C
1.	ME41XX	B.Tech. Elective - I	3	0	0	3
2.	ME41XX	B.Tech. Elective - II	3	0	0	3
3.	XX41PQ	IDE - III	3	0	0	3
4.	HS41PQ	HSS Elective - II	3	0	0	3
5.	ME4198	Summer Internship*	0	0	12	3
6.	MH4199	Mechatronics Project-I	0	0	12	6
7.	MH5101	Fundamentals of Mechatronics	3	0	0	3
8.	EC5105	Embedded System	3	0	2	4
TOTAL			18	0	26	28

*** For specific cases of internship after 6th Semester, the performance evaluation would be made on joining the VIIth Semester and graded accordingly in the VIIth Semester.**

Note:

a)

- i. Summer internship (*) period of at least 60 days' (8 weeks) duration begins in the intervening vacation between semester VI and VII that may be done in industry / R&D / Academic Institutions including IIT Patna. The evaluation would comprise **combined grading based on host supervisor evaluation, project internship report after plagiarism check and seminar presentation at the Department (DAPC to coordinate)** with equal weightage of each of the three components stated herein.

- ii. Further, on return from internship, students will be evaluated for internship work through combined grading based on host supervisor evaluation, project internship report after plagiarism check, and presentation evaluation by the parent department with equal weightage of each component.

b)

- i. In the VIIth semester, students can opt for a semester long internship on recommendation of the DAPC and approval of the Competent Authority.
- ii. On approval of semester long internship, at the maximum two courses (properly mapped/aligned syllabus) at par with institute electives may be opted from NPTEL and / or SWAYAM and the other two more should be done at the institute through course overloading in any other semester (either before or after the internship) and/or during following summer semester.
- iii. The candidates opting two courses from NPTEL and / or SWAYAM would be required to appear in the examination at the Institute as scheduled in the Academic Calendar.

Sl. No.	Subject Code	SEMESTER VIII	L	T	P	C
1.	RM6201	Research Methodology	3	1	0	4
2.	MH5201	Sensors and Actuators	3	0	0	3
3.	MH5202	Modeling and Simulation of Mechatronics Systems	3	0	0	3
4.	XX62PQ	M. Tech. Elective – I	3	0	0	3
5.	MH4299	Project-II	0	0	12	6
		TOTAL	12	1	12	19

Sl. No.	Subject Code	SEMESTER IX	L	T	P	C
1.	ME51XX / ME61XX	M. Tech. Elective - II	3	0	0	3
2.	ME51XX / ME61XX	M. Tech. Elective - III	3	0	0	3
3.	ME51XX / EC51XX	M. Tech. Elective - IV	3	0	0	3
4.	MH5199	Mechatronics Project-III**	0	0	16	8
		TOTAL	9	0	16	17

Sl. No.	Subject Code	SEMESTER X	L	T	P	C
1.	MH5299	Mechatronics Project-IV**	0	0	36	18
		TOTAL	0	0	36	18

GRAND TOTAL (Semester I to X) : 210

****Note: M. Tech. Project outside the Institute**

In the IXth Semester, students can opt for a semester long M. Tech. project subject to confirmation from an Institution of repute for research project, on the assigned topic at any external Institution (Industry / R&D lab / Academic Institutions) based on recommendation of the DAPC provided:

- (i) The project topic is well defined in objective, methodology and expected outcome through an abstract and statement of the student pertaining to expertise with the proposed supervisor of the host institution and consent of the faculty member from the concerned department at IIT Patna as joint supervisor.
- (ii) The consent of both the supervisors (external and institutional) on project topic is obtained a priori and forwarded to the academic section through DAPC for approval by the competent authority for office record in the personal file of the candidate.
- (iii) Confidentiality and Non Disclosure Agreement (NDA) between the two organizations with clarity on intellectual property rights (IPR) must be executed prior to initiating the semester long project assignment and committing the same to external organization and vice versa.
- (iv) The evaluation in each semester at Institute would be mandatory and the report from Industry Supervisor will be given due weightage as defined in the Academic Regulation. Further, the final assessment of the project work on completion will be done with equal weightage for assessment of the host and Institute supervisors, project report after **plagiarism check**. The award of grade would comprise **combined assessment based on host supervisor evaluation, project report quality and seminar presentation at the Department (DAPC to coordinate)** with equal weightage of each of the components stated herein.
- (v) In case of poor progress of work and / or no contribution from external supervisor, the student need to revert back to the Institute essentially to fulfill the completion of M. Tech. project as envisaged at the time of project allotment. However, the recommendation of DAPC based on progress report and presentation would be mandatory for a final decision by the competent authority.

ELECTIVE GROUPS

B. Tech. Elective - I						
Sl. No.	Subject Code	Subject	L	T	P	C
1.	ME4101	Tribology and Surface Engineering	3	0	0	3
2.	ME4102	Basics of Computational Fluid Dynamics	3	0	0	3
3.	ME4104	Industrial Automation	3	0	0	3

B. Tech. Elective - II						
Sl. No.	Subject Code	Subject	L	T	P	C
1.	ME4104	Vehicle Dynamics	3	0	0	3
2.	ME4105	Mathematical Modelling of Computer Aided Design	3	0	0	3
3.	ME4106	Energy Engineering	3	0	0	3

M. Tech. Elective - I						
Sl. No.	Subject Code	Subject	L	T	P	C
1.	ME6208	Robot Motion Planning	3	0	0	3
2.	ME6209	Non-linear Systems Dynamics	3	0	0	3
3.	ME6215	Computer Numerical Controlled Machine Tools	3	0	0	3

M. Tech. Elective – II						
Sl. No.	Subject Code	Subject	L	T	P	C
1.	ME6105	Acoustics	3	0	0	3
2.	ME6106	Mobile Robotics	3	0	0	3
3.	ME6107	Digital Manufacturing and Industry 4.0	3	0	0	3

M. Tech. Elective - III						
Sl. No.	Subject Code	Subject	L	T	P	C
1.	ME6103	Continuum Mechanics	3	0	0	3
2.	ME6109	Vehicle Dynamics and Multi-body Systems	3	0	0	3

M. Tech. Elective - IV						
Sl. No.	Subject Code	Subject	L	T	P	C
1.	EC5114	Advanced Digital Image Processing	3	0	0	3
2.	EC6104	VLSI Signal Processing	3	0	0	3