



Amrutvahini Sheti and Shikshan Vikas Sanstha's

AMRUTVAHINI COLLEGE OF ENGINEERING, SANGAMNER

(An Autonomous Institute Approved by AICTE and Affiliated to SPPU, Pune)

Amrutnagar, Ghulewadi, Sangamner – 422 608



Curriculum Structure

of

B. Tech. Automation & Robotics Engineering

Batch: 2025 - 2029




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Dept. Automation & Robotics Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608




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Preamble

The undergraduate curriculum structure has been designed in accordance with the National Education Policy (NEP) 2020 and the credit framework prescribed through the relevant Government Resolution (GR). The four-year undergraduate programme follows a semester-wise credit distribution that provides a balanced combination of Programme Core Courses, Programme Elective Courses, Multidisciplinary Courses, Ability Enhancement Courses, Vocational Skill Enhancement Courses, Open Electives, and experiential learning components. The structure ensures flexibility, multidisciplinary learning, skill development, and progressive attainment of programme-specific competencies while adhering to the prescribed credit requirements for each semester and the overall four-year undergraduate programme.

1. Credit Definition

The credit system adopted for the B.Tech. Automation & Robotics Engineering programme is based on the guidelines prescribed under the **NEP 2020 framework for Undergraduate Engineering programmes**. The following definitions are used for determining the credits assigned to theory, tutorial and practical components of a course.

Table 1: Credit Definition and Contact Hours

Academic Component	Contact Hours per Week	Credits
Lecture (L)	1 Hour	1 Credit
Tutorial (T)	1 Hour	1 Credit
Practical (P)	2 Hours	1 Credit

2. Programme Credit Requirement

As per the Government of Maharashtra guidelines for implementation of NEP 2020 in undergraduate engineering programmes, the four-year B.E./B.Tech. programme with a Multidisciplinary Minor carries a prescribed credit range of **160 to 176 credits**. The Institute has adopted a total of **168 credits** for the four-year B.Tech. Automation & Robotics Engineering programme, which falls within the prescribed range.

3. Semester-wise Credit Distribution

The following table presents the semester-wise credit distribution adopted for the four-year B.Tech. Automation & Robotics Engineering programme. The credit load is planned within the **20–22 credit range prescribed per semester** under the NEP 2020 framework.

Table 2 -Semester-wise total credits

Year	Semester	Credits
First Year	Semester I	22
	Semester II	22
Second Year	Semester III	22
	Semester IV	22
Third Year	Semester V	20
	Semester VI	20
Fourth Year	Semester VII	20
	Semester VIII	20
Total		168



4. Category-wise Credit Distribution

The following table presents the distribution of the total programme credits across various course categories. It compares the credit ranges prescribed under the NEP 2020 framework with the credits adopted by the Institute for the B.Tech. Automation & Robotics Engineering programme.

Table 3 – Category wise Credit Distribution

Sr. No.	Course Category	Credits as per NEP Guidelines	Proposed Credits	Share of total Credits (%)
1	Basic Sciences (BSC)	14 – 18	16	9.52
2	Engineering Sciences (ESC)	12 – 16	15	8.93
3	Program Core Courses and Labs (PCC)	44 – 56	53	31.55
4	Program Electives and Labs (PEC)	20	18	10.71
5	Multidisciplinary Courses and Labs (MDM)	14	14	8.33
6	Open Electives (OEC)	8	6	3.57
7	Vocational Skill Enhancement Courses (VSEC)	8	8	4.76
8	Ability Enhancement Courses (AEC)	4	4	2.38
9	Indian Knowledge System (IKS)	2	2	1.19
10	Co-curricular Courses (CC)	4	2	1.19
11	Entrepreneurship/Economics/Management (EEM)	4	4	2.38
12	Value Education Courses (VEC)	4	4	2.38
13	Community Engagement Project (CEP)	2	2	1.19
14	Research Methodology (RSM)	4	4	2.38
15	Major Project (PRJ)	4	4	2.38
16	Internship / OJT (INT)	12	12	7.14
		160–176	168	100%

5. Alignment with NEP 2020 Credit Framework

The B.Tech. Automation & Robotics Engineering programme of the Institute has been structured in alignment with the NEP 2020 Credit and Multidisciplinary Curricular Framework prescribed by the Government of Maharashtra. The Institute has adopted a total of 172 credits for the four-year programme, within the prescribed credit range of 160–176 credits for a four-year B.E./B.Tech. programme with a Multidisciplinary Minor. The curriculum incorporates Programme Core Courses, Programme Electives, Multidisciplinary Minor, Open Electives, Skill Enhancement Courses, Ability Enhancement Courses, Value Education, Internship, Project and other experiential learning components. The following table presents the credit distribution adopted by the Institute across various course categories.



Table 4 - Semester-wise Credit Distribution

Course Category	Sem I	Sem II	Sem III	Sem IV	Sem V	Sem VI	Sem VII	Sem VIII	Total Credits
Basic Science Courses (BSC)	8	8	-	-	-	-	-	-	16
Engineering Science Courses (ESC)	9	6	-	-	-	-	-	-	15
Programme Core Courses (PCC)	-	3	11	10	11	8	10	-	53
Programme Elective Courses (PEC)	-	-	-	-	4	8	2	4	18
Multidisciplinary Minor (MDM)	-	-	3	2	3	2	2	2	14
Open Electives (OE)	-	-	2	2	2	-	-	-	6
Vocational & Skill Enhancement Courses (VSEC)	2	2	-	2		2	-	-	8
Ability Enhancement Course (AEC)	2	-	-	2	-	-	-	-	4
Humanities, Social Science & Management (HSSM)	-	-	2	2	-	-	-	-	4
Indian Knowledge System (IKS)	-	2	-	-	-	-	-	-	2
Value Education Course (VEC)	-	-	2	2	-	-	-	-	4
Research Methodology (RM)	-	-	-	-	-	-	4	-	4
Community / Field Project	-	-	2	-	-	-	-	-	2
Project (DP)	-	-	-	-	-	-	2	2	4
Internship / OJT	-	-	-	-	-	-	-	12	12
Co-curricular / Liberal Courses	1	1	-	-	-	-	-	-	2
Total Credits	22	22	22	22	20	20	20	20	168

The following figure presents the distribution of programme credits across various course categories in the B.Tech. Automation & Robotics Engineering programme. It provides a visual representation of the relative contribution of each category to the overall curriculum structure.

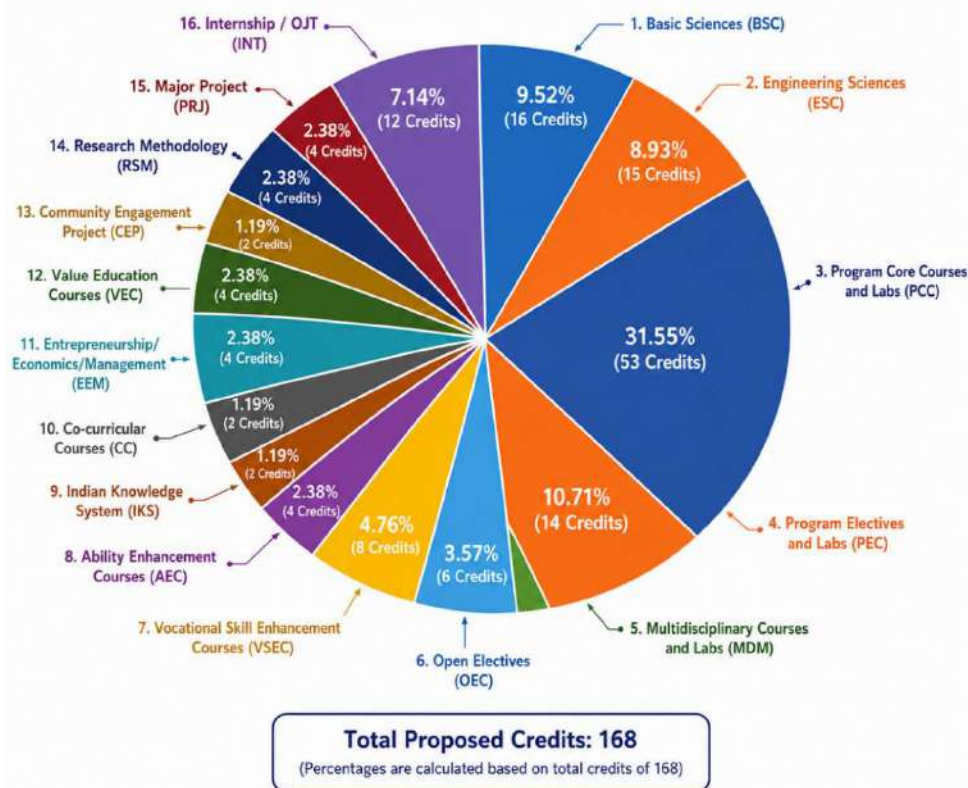
**Distribution of Credits by Course Category**

Fig 1 – Credit distribution by course category

The Institute offers multiple academic pathways within the four-year B.Tech. programme, providing students with flexibility to pursue multidisciplinary learning, advanced specialization, and research-oriented studies. The credit requirements for the different pathways are as follows

Table 5: Academic Pathways and Credit Requirements for B.Tech. Automation & Robotics Engineering

Programme Nomenclature	Credits	Main requirement
B.Tech. in Automation & Robotics Engineering	168 credits	Completion of the approved regular curriculum, project and internship/OJT.
B.Tech. in Automation & Robotics Engineering - Honors	168 regular credits + 18 Honors credits = Total 186 Credits	Six approved Honors courses across Semesters III-VIII.
B.Tech. in Automation & Robotics Engineering - Double Minor	168 regular credits + 18 credits of specialization Minor = Total 186 Credits	Six approved Honors courses across Semesters III-VIII.
B.Tech. in Automation & Robotics Engineering - Honors with Research	168 regular credits + 18 Honors with Research credits = Total 186 Credits	Approved fourth-year research-specific courses and a Research Project/Dissertation.



6. Multiple Entry and Multiple Exit – Credit Requirements

The NEP 2020 framework provides flexibility for students to exit the four-year undergraduate programme at specified stages after successful completion of the prescribed academic requirements. The following table presents the qualification/award, credit requirements, semester, and year of completion as adopted for the B.Tech. Automation & Robotics Engineering programme of the Institute.

Table 5 - Credit Requirements for Multiple Entry and Exit

Level	Qualification / Exit Award	Credit Requirements	Semester	Year
4.5	One-Year UG Certificate in Engineering/Technology	44	II	1
5.0	Two-Year UG Diploma in Engineering/Technology	88	IV	2
5.5	Three-Year Bachelor's Degree in Engineering/Technology	128	VI	3
6.0	Four-Year Bachelor's Degree (B.Tech.) with Multidisciplinary Minor	168	VIII	4

The following provisions shall apply to students who choose to exit the four-year B.Tech. programme after successful completion of an even semester.



B. Tech in Automation & Robotics Engineering



Sr. No.	Course Code	Course Type	Course Name	Teaching Scheme (Hrs./week)						Examination Scheme and Marks						Credit			
				TH	PR	TUT	Contact Hours	Self Learning	Total	CCE	ESE	TW	PR	OR	TOTAL	TH	PR	TUT	TOTAL
Semester-I																			
1	R25-SH-BSC-101	Basic Science Course	Linear Algebra and Calculus	4	-	-	60	60	120	40	60	-	-	-	100	4			4
2	R25-SH-BSC-103	Basic Science Course	Engineering Chemistry	3	2	-	45	45	120	40	60	25	-	-	125	3	1		4
3	R25-ME-ESC-104	Engineering Science Course	Systems of Mechanical Engineering	3	-	-	45	45	90	40	60	-	-	-	100	3			3
4	R25-EE-ESC-106	Engineering Science Course	Fundamentals of Electrical Engineering	2	2	-	30	30	90	40	60	25	-	-	125	2	1		3
5	R25-CO-ESC-108	Engineering Science Course	Programming & Problem-Solving Using Python	2	2	-	30	30	90	40	60	25	-	-	125	2	1		3
6	R25-ME-VSEC-109	Vocational & Skill Enhancement Course	Engineering Workshop Skills Lab	-	2	-	30	-	30	-	-	50	-	-	50		1		1
7	R25-ME-VSEC-110	Vocational & Skill Enhancement Course	Engineering Graphics Lab	-	2	-	30	-	30	-	-	50	-	-	50		1		1
8	R25-SH-AEC-113	Ability Enhancement Course	Indian Knowledge System	-	-	2	30	30	60	-	-	50	-	-	50			2	2
9	R25-SH-CC-114	Cocurricular Courses	Cocurricular Courses - I	-	2	-	30	-	30	-	-	25	-	-	25		1		1
			Total	14	12	2	330	240	660	200	300	250	0	0	750	14	6	2	22


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-Sr. No.	Course Code	Course Type	Course Name	Teaching Scheme (Hrs./week)						Examination Scheme and Marks						Credit			
				TH	PR	TUT	Contact Hours	Self Learning Hours	Total	CCE	ESE	TW	PR	OR	TOTAL	TH	PR	TUT	TOTAL
Semester-II																			
1	R25-SH-BSC-116	Basic Science Course	Differential Equation and Numerical Integration	4	-	-	60	60	120	40	60	-	-	-	100	4			4
2	R25-SH-BSC-102	Basic Science Course	Engineering Physics	3	2	-	45	45	120	40	60	25	-	-	125	3	1		4
3	R25-CE-ESC-105	Engineering Science Course	Engineering Mechanics and Civil Engineering Systems	3	-	-	45	45	90	40	60	-	-	-	100	3			3
4	R25-ET-ESC-107	Engineering Science Course	Fundamentals of Electronics Engineering	2	2	-	30	30	90	40	60	25	-	-	125	2	1		3
5	R25-AR-PCC-118	Program Core Course	Foundation of Automation & Robotics Engineering	2	-	-	30	30	60	40	60	-	-	-	100	2			2
6	R25-IT-PCC-119	Program Core Course Lab	Programming in C	-	2	-	30		30	-	-	25	-	-	25		1		1
7	R25-AR-VSEC-115	Vocational & Skill Enhancement Course	Digital Technology Lab	-	2	-	30	-	30	-	-	50	-	-	50		1		1



8	R25-CE-VSEC-111	Vocational & Skill Enhancement Course	Civil Engineering Lab	-	2	-	30	-	30	-	-	50	-	-	50		1		1
9	R25-SH-AEC-112	Indian Knowledge System	Professional Communication Skill or Foreign Language (Japanese/German)	-	-	2	30	30	60	-	-	50	-	-	50			2	2
10	R25-SH-CC-117	Cocurricular Courses	Cocurricular Courses - II	-	2		30	-	30	-	-	25	-	-	25		1		1
Total				14	12	2	360	240	660	200	300	250	0	0	750	14	6	2	22

Exit option: Award of UG Certificate in Major with 44 credits and an additional 8 credits from following Exit Courses

Course Code	Course Title	L	T	P	Credits	Contact Hrs	TW	OR	Total Marks
R25-AR-EXC-101A	Robot Operating and Programming	—	—	—	4	—	100		100
R25-AR-EXC-101B	Project	—	—	16	4	16	50	50	100
Total									200


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Sr. No.	Course Code	Course Type	Name of the Subject	Teaching Scheme (Hrs./week)						Examination Scheme and Marks						Credit			
				TH	PR	TUT	Contact Hours	Self Learning	Total	CCE	ESE	TW	PR	OR	TOTAL	TH	PR	TUT	TOTAL
Semester-III																			
1	R25-AR-PCC-201	Program Core course - 1	Electrical drives and Control	3	-	-	45	45	90	40	60	-	-	-	100	3	-	-	3
2	R25-AR-PCC-202	Program Core course - 2	Industrial Automation Technology	3	-	-	45	45	90	40	60	-	-	-	100	3	-	-	3
3	R25-AR-PCC-203	Program Core course - 3	Manufacturing Engineering and Technology	3	-	-	45	45	90	40	60	-	-	-	100	3	-	-	3
4	R25-AR-MDM-204	Multidisciplinary Course-1	Applied Mathematics	3	-	-	45	45	90	40	60	-	-	-	100	3	-	-	3
5	R25-AR-OEC-205	Open Elective - 1	To be chosen from a basket of Open Elective- I finalized at college level	2	-	-	30	30	60	40	60	-	-	-	100	2	-	-	2
6	R25-AR-EEM-206	Entrepreneurship/ Economics/ Management course	Design Thinking and Entrepreneurship	1	2	-	15	15	60	25	-	25	-	-	50	1	1	-	2
7	R25-AR-VEC-207	Value Education Course	Universal Human Values & Ethics	2	-	-	30	30	60	50	-	-	-	-	50	2	-	-	2
8	R25-AR-PCC-208	Program Core Course-Lab	Drive and Control Technology Laboratory	-	2	-		-	30	-	-	25	-	25	50	-	1	-	1



9	R25-AR-PCC-209	Program Core Course Lab / Multidisciplinary Course-Lab	Industrial Automation Laboratory	-	2	-	-	-	30	-	-	25	25	-	50	-	1	-	1
10	R25-AR-CEP-210	Community Engagement Project / Field Project	Community Engagement Project	-	4	-	-	-	60	-	-	50	-	-	50	-	2	-	2
				17	10	0	255	255	660	275	300	125	25	25	750	17	5	0	22

Note: Open Elective basket and MDM Courses offered at college level, are enlisted after Sem-VIII.

Semester-IV																			
Sr. No.	Course Code	Course Type	Name of the Subject	Teaching Scheme (Hrs./week)						Examination Scheme and Marks						Credit			
				TH	PR	TUT	Contact Hours	Self Learning	Total	CCE	ESE	TW	PR	OR	TOTAL	TH	PR	TUT	TOTAL
1	R25-AR-PCC-211	Program Core course - 4	Fundamentals of Industrial Robotics	3	-	-	45	45	90	40	60	-	-	-	100	3	-	-	3
2	R25-AR-PCC-212	Program Core course - 5	Mechanism and Robot Kinematics	3	-	-	45	45	60	40	60	-	-	-	100	3	-	-	3
3	R25-AR-PCC-213	Program Core course - 6	Materials and Machine Elements	2	-	-	30	30	90	40	60	-	-	-	100	2	-	-	2
4	R25-AR-MDM-214	Multidisciplinary Course - 2	Data Science & Visualization	2	-	-	30	30	60	40	60	-	-	-	100	2	-	-	2
5	R25-AR-OEC-215	Open Elective - 2	To be chosen from a basket of Open Elective- II finalized at college level	2	-	-	30	30	60	40	60	-	-	-	100	2	-	-	2


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6	R25-AR-VSC-216	Vocational Skill Course	Material Testing and Characterization	1	2	-	15	15	60	-	-	25	-	25	50	1	1	-	2
7	R25-AR-AEC-217	Ability Enhancement Course	Modern Indian Language and Technical Writing	1	2	-	15	15	60	-	-	50	-	-	50	1	1	-	2
8	R25-AR-EEM-218	Entrepreneurship/Economics/Management course	Engineering Economics and Financial Management	2	-	-	30	30	60	50	-	-	-	-	50	2	-	-	2
9	R25-AR-PCC-219	Program Core Course- Lab	Robots Programming Laboratory - I	-	2	-	30	-	30	-	-	-	25	-	25	-	1	-	1
10	R25-AR-PCC-220	Program Core Course Lab	Mechanism and Robot Kinematics Lab	-	2	-	30	-	30	-	-	25	-	-	25	-	1	-	1
11	R25-AR-VEC-221	Value Education Course	Environmental Science and Sustainable Development	2	-	-	30	30	60	50	-	-	-	-	50	2	-	-	2
				18	8	0	330	270	660	300	300	100	25	25	750	18	4	0	22

Exit option: Award of UG Diploma in Major with 88 credits and an additional 8 credits from following Exit Courses

Course Code	Course Title	L	T	P	Credits	Contact Hrs	TW	OR	Total Marks
R25-AR-EXC-101A	Aerial Robotics	-	-	-	4	-	100		100
R25-AR-EXC-101B	Project	-	-	16	4	16	50	50	100
Total									200


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Course Code	Course Type	Course Name	Teaching Scheme (Hrs./week)						Examination Scheme and Marks						Credit			
			TH	PR	TUT	Contact Hours	Self-Learning Hours	Total	CCE	ESE	TW	PR	OR	TOTAL	TH	PR	TUT	TOTAL
Semester-V																		
R25-AR-PCC-301	Program Core course - 7	Design of Robot Elements	3			45	45	90	40	60				100	3			3
R25-AR-PCC-302	Program Core course - 8	Robot Kinematics & Dynamics	3			45	45	90	40	60				100	3			3
R25-AR-PCC-303	Program Core course - 9	Sensors and Vision System	3			45	45	90	40	60				100	3			3
R25-AR-PEC-304	Program Elective Course - I	Program Elective-I	3			45	45	90	40	60				100	3			3
R25-AR-MDM-305	Multidisciplinary Course-3	Robot Operating System (ROS)	2			30	30	60	50					50	2			2
R25-AR-OEC-306	Open Elective - III	To be chosen from a basket of Open Elective- III finalized at college level	2			30	30	60	40	60				100	2			2
R25-AR-PCC-307	Program Core Course Lab	Robot Programming Lab-II		2		30		30				50		50		1		1
R25-AR-PCC-308	Program Core Course Lab	Sensors and Machine Vision lab		2		30		30				50		50		1		1


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R25-AR-PEC-309	Program Elective Course - I lab	Program Elective Course - I lab		2		30		30					50	50		1		1
R25-AR-MDM-310	Multidisciplinary Course-3 Lab	ROS Lab		2		30		30				50		50		1		1
			16	8	0	360	240	600	250	300	0	150	50	750	16	4	0	20

Semester-VI

Sr. No.	Course Code	Course Type	Course Name	Teaching Scheme (Hrs./week)						Examination Scheme and Marks						Credit			
				TH	PR	TUT	Contact Hours	Self Learning	Total	CCE	ESE	TW	PR	OR	TOTAL	TH	PR	TUT	TOTAL
1	R25-AR-PCC-311	Program Core course - 10	Fluid Power Automation	3			45	45	90	40	60				100	3			3
2	R25-AR-PCC-312	Program Core course - 11	Artificial Intelligence in Robotics	3			45	45	90	40	60				100	3			3
3	R25-AR-PEC-313	Program Elective -II	Program Elective- II	3			45	45	90	40	60				100	3			3
4	R25-AR-PEC-314	Program Elective -III	Program Elective - III	3			45	45	90	40	60				100	3			3
5	R25-AR-MDM-315	Multidisciplinary Course-4	Advanced Manufacturing Technology	2			30	30	60	40	60				100	2			2
6	R25-AR-PCC-316	Program Core Course Lab	Industrial Automation & Control Lab		2		30		30					50	50		1		1
7	R25-AR-PCC-317	Program Core Course Lab	Artificial Intelligence in Robotics Lab		2		30		30				50		50		1		1


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8	R25-AR-PEC-318	Program Elective -II lab	Program Elective- II Lab		2		30		30					50	50		1		1
9	R25-AR-PEC-319	Program Elective -III lab	Program Elective- III Lab		2		30		30					50	50		1		1
10	R25-AR-VSC-320	Vocational and Skill Enhancement Course	Simulation and Modeling Laboratory		2		30		30				25		25		1		1
11	R25-AR-VSC-321	Vocational and Skill Enhancement Course	Advanced Manufacturing Workshop		2		30		30			25			25		1		1
				14	12	0	390	210	600	200	300	25	75	150	750	14	6	0	20
		Program Elective-I		Program Elective-II															
		R25-AR-PEC-304 A	Finite Element Analysis	R25-AR-PEC-313 A				Metrology & GD&T											
		R25-AR-PEC-304 B	Product Life Cycle Management	R25-AR-PEC-313 B				Reliability & Maintenance Engineering											
		R25-AR-PEC-304 C	Computer Aided Product Development	R25-AR-PEC-313 C				Additive manufacturing											
		R25-AR-PEC-304 D	Industrial Engineering	R25-AR-PEC-313 D				Soft Computing Techniques											
		Program Elective-III																	
		R25-AR-PEC-314 A	Control System Engineering																
		R25-AR-PEC-314 B	Microprocessor and Microcontroller																
		R25-AR-PEC-314 C	Industrial Internet of Things (IIoT)																
		R25-AR-PEC-314 D	Battery Management Systems																


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Exit option: Award of UG Diploma in Major with 128 credits and an additional 8 credits from following Exit Courses									
Course Code	Course Title	L	T	P	Credits	Contact Hrs	TW	OR	Total Marks
R25-AR-EXC-301A	Autonomous Mobile Robots	–	–	–	4	–	100		100
R25-AR-EXC-301B	Project	–	–	16	4	16	50	50	100
Total									200


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Sr. No.	Course Code	Course Type	Course Name	Teaching Scheme (Hrs./week)						Examination Scheme and Marks						Credit			
				TH	PR	TUT	Contact Hours	Self Learning Hours	Total	CCE	ESE	TW	PR	OR	TOTAL	TH	PR	TUT	TOTAL
	Semester-VII																		
1	R25-AR-PCC-401	Program Core course - 12	Embedded System in Robotics	3			45	45	90	40	60				100	3			3
2	R25-AR-PCC-402	Program Core course - 13	Robot Process Automation & Design	3			45	45	90	40	60				100	3			3
3	R25-AR-PCC-403	Program Core course - 14	Autonomous Robotic Systems	2			30	30	60	40	60				100	2			2
4	R25-AR-PEC-404	Program Elective - IV	Program Elective - IV (Enlisted below)	2			30	30	60	40	60				100	2			2
5	R25-AR-MDM-405	Multidisciplinary Course-5	Applied Data Analytics	2			30	30	60	40	60				100	2			2
6	R25-AR-RSM-406	Research methodology	Engineering Research and Innovation	3	2		45	45	120	50		50			100	3	1		4
7	R25-AR-PCC-407	Program Core course Lab	Embedded System in Robotics lab		2				30					50	50		1		1
8	R25-AR-PCC-408	Program Core course Lab	Process simulator Lab		2				30				50		50		1		1
9	R25-AR-PRJ-409	Project	Project Stage I		4				60			50			50		2		2


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				15	10	0	225	225	600	250	300	100	50	50	750	15	5	0	20
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Semester-VIII

Sr. No.	Course Code	Course Type	Course Name	Teaching Scheme (Hrs./week)						Examination Scheme and Marks						Credit			
				TH	PR	TUT	Contact Hours	Self Learning Hours	Total	CCE	ESE	TW	PR	OR	TOTAL	TH	PR	TUT	TOTAL
1	R25-AR-PEC-410	Program Elective -V	Program Elective -V (Enlisted below: Complete online course on SWAYAM NPTEL) - 8 to 12 Weeks	2				30	30	40	60*				100	2			2
2	R25-AR-PEC-411	Program Elective -VI	Program Elective -VI (Enlisted below: Complete online course on SWAYAM NPTEL) - 8 to 12 Weeks	2				30	30	40	60*				100	2			2
3	R25-AR-MDM-412	Multidisciplinary Course-6	Machine Learning and Deep Learning	2			30	30	60	40	60				100	2			2
4	R25-AR-PRJ-413	Project	Project Stage II	-	-	-		60	60			100		50	150		2		2
5	R25-AR-INT-414	Internship/OJT	Full-time Internship of one semester	-	-	-		360	360			200		100	300		12		12
				6	0	0	30	510	540	120	180	300	0	150	750	6	14	0	20


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Program Elective -IV		Program Elective -V	
R25-AR-PEC-404 A	Robot Material Handling Systems	R25-AR-PEC-410 A	Collaborative Robotics
R25-AR-PEC-404 B	Micro-Electro-Mechanical Systems	R25-AR-PEC-410 B	Robot Cognitive and Medical
R25-AR-PEC-404 C	Flexible Manufacturing Systems	R25-AR-PEC-410 C	Service Robots
R25-AR-PEC-404 D	Cyber Physical Systems	R25-AR-PEC-410 D	Bio-Inspired and Soft Robotics
Program Elective -VI			
R25-AR-PEC-411 A	Artificial Neural Network and Fuzzy logic		
R25-AR-PEC-411 B	Autonomous Mobile Robots		
R25-AR-PEC-411 C	Intelligent robot control		
R25-AR-PEC-411 D	Humanoid Robotics		


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**Open Elective Courses:**

In accordance with the principles of NEP 2020, Open Elective (OEC) courses provide students with an opportunity to acquire knowledge beyond their major discipline and promote multidisciplinary and interdisciplinary learning. Students can choose courses offered by other disciplines/programmes according to their interests, subject to the prescribed credit requirements and availability. The Open Elective Basket is designed to provide flexibility in academic choices and enable students to develop broader knowledge and skills relevant to their personal, professional, and career interests.

Table 6 – Open Elective Course Baskets

Sr. No.	Open Elective subject offered by Department	Semester III	Semester IV
1.	Artificial Intelligence and Data Science	Road Safety and Civic Responsibility	Digital Marketing and E-business
2.	Automation and Robotics	Supply Chain Management	Farm Automation
3.	Civil Engineering	Mechanical Electrical and Plumbing Systems	Interior Design
4.	Computer Engineering	Financial Literacy and Investment Planning	Digital Governance and Management Information Systems
5.	Electrical Engineering	Project Management	Sustainable Rural Entrepreneurship and Development
6.	Electronics and Computer Engineering	Leadership and Organizational Behaviour	Dairy and Food Process Technology
7.	Electronics and Telecommunication Engineering	Business Analytics	Remote Sensing and GIS
8.	Information Technology	Cyber Security and Laws	Data Ethics and Visualization
9.	Mechanical Engineering	Principles and Practices of Management	Agri-Tech Systems

Multidisciplinary Minor Courses:

A Multidisciplinary Minor (MDM) is a structured set of courses that allows students to gain additional knowledge and skills in a discipline other than their major/branch of study. It promotes interdisciplinary learning and enables students to apply concepts from multiple fields to solve real-world problems. Each department shall offer one multidisciplinary minor course in every semester from Semester III to Semester VIII. The courses offered under the Multidisciplinary Minor shall be proposed and approved by the Board of Studies (BoS) of the respective offering department.



Table 7 – List of MDMs offered by different department

MDM Offered by Department	To be Opted by Department	Sr. No.	Course Code	Course Name	Semester
Artificial Intelligence and Data Science	Students other than AI&DS department	1	R25-AI-MDM-204	Foundational Mathematics for AI & DS	III
		2	R25-AI-MDM-214	Embedded System & Internet of Things	IV
		3	R25-AI-MDM-305	Image processing	V
		4	R25-AI-MDM-315	Robotics & Automation	VI
		5	R25-AI-MDM-403	Computer Vision	VII
		6	R25-AI-MDM-411	Industrial IOT	VIII
Automation and Robotics	Students other than A&R department	1	R25-AR-MDM-204	Applied Mathematics	III
		2	R25-AR-MDM-214	Data Science & Visualization	IV
		3	R25-AR-MDM-305	Robot Operating System (ROS)	V
		4	R25-AR-MDM-315	Advanced Manufacturing Technology	VI
		5	R25-AR-MDM-405	Applied Data Analytics	VII
		6	R25-AR-MDM-412	Machine Learning and Deep Learning	VIII
Civil Engineering	Students other than Civil department	1	R25-CE-MDM-204	Computational and Applied Mathematics	III
		2	R25-CE-MDM-214	Digital Modelling and Visualization	IV
		3	R25-CE-MDM-305	Geospatial Technologies and Spatial Analytics	V
		4	R25-CE-MDM-315	Data Analytics and Digital Information	VI
		5	R25-CE-MDM-405	Artificial Intelligence and Machine Learning	VII
		6	R25-CE-MDM-412	AI, IoT and Digital Twin	VIII
Computer Engineering	Students other than Computer department	1	R25-CO-MDM-204	Probability and Statistics	III
		2	R25-CO-MDM-214	Embedded Systems & Internet of Things	IV
		3	R25-CO-MDM-305	Smart Communication Technologies	V
		4	R25-CO-MDM-315	Signal Processing for Intelligent Systems	VI
		5	R25-CO-MDM-403	Edge Computing & Cyber Systems	VII
		6	R25-CO-MDM-411	Intelligent Autonomous Systems	VIII
Electrical Engineering	Students other than Electrical department	1	R25-EE-MDM-204	Applied Mathematics	III
		2	R25-EE-MDM-215	Principles of Data Science & Machine Learning	IV
		3	R25-EE-MDM-305	Foundations of Artificial Intelligence	V
		4	R25-EE-MDM-315	Evolutionary Algorithms and Optimization	VI
		5	R25-EE-MDM-405	Deep Learning	VII
		6	R25-EE-MDM-412	Intelligent Electrical Systems and Applications	VIII
		1	R25-EC-MDM-204	Fundamentals of IoT	III



Electronics and Computer Engineering	Students other than ECE department	2	R25-EC-MDM-215	Applied Mathematics	IV
		3	R25-EC-MDM-304	Programming for IoT Systems	V
		4	R25-EC-MDM-315	Embedded Systems for Robotics	VI
		5	R25-EC-MDM-405	Robotics and Automation	VII
		6	R25-EC-MDM-412	Industry 4.0 and smart manufacturing (online mode)	VIII
Electronics and Telecommunication Engineering	Students other than E&TC department	1	R25-ET-MDM-204	Data Structures and Algorithms	III
		2	R25-ET-MDM-214	Object Oriented Programming with Java	IV
		3	R25-ET-MDM-305	Advanced Java Programming	V
		4	R25-ET-MDM-315	Database Management Systems	VI
		5	R25-ET-MDM-405	Web Technologies and Full Stack Development	VII
		6	R25-ET-MDM-412	Cloud Computing and DevOps	VIII
Information Technology	Students other than IT department	1	R25-IT-MDM-204	Digital Electronics and Logic Design	III
		2	R25-IT-MDM-214	Applied Mathematics	IV
		3	R25-IT-MDM-305	Industrial Internet of Things (IoT)	V
		4	R25-IT-MDM-315	Augmented and Virtual Reality	VI
		5	R25-IT-MDM-405	Wireless Communication	VII
		6	R25-IT-MDM-412	Digital Transformation and Industry 5.0	VIII
Mechanical Engineering	Students other than Mechanical Engg. department	1	R25-ME-MDM-204	Computational and Statistical Methods	III
		2	R25-ME-MDM-214	Mechatronics	IV
		3	R25-ME-MDM-305	Artificial Intelligence and Machine Learning	V
		4	R25-ME-MDM-315	Computer Aided Engineering	VI
		5	R25-ME-MDM-403	Computer Integrated Manufacturing	VII
		6	R25-ME-MDM-411	Smart Manufacturing and Industry 4.0	VIII



B.Tech. in Automation and Robotics Engineering - Honors

**Honor Courses:**

Students who wish to pursue an Honors qualification shall complete additional courses carrying a minimum of 18 credits over and above the 168 credits prescribed for the regular B.Tech. programme.

Thus, for the award of B.Tech. with Honors, a student shall successfully earn a minimum total of 186 credits, comprising:

- 168 credits prescribed under the regular B.Tech. programme, and
- 18 additional credits through the Honor courses.

The Department of Automation & Robotics Engineering offers an Honors Track in Advanced Artificial Intelligence (18 Credits) to provide students with advanced and specialized knowledge and skills in the field of Artificial Intelligence.

Table 8 – Honors in Advanced Artificial Intelligence

Year	Semester	Course Code	Course Name	Credits
Second Year	Sem III	R25-AR-HOC-201	Robotics & Intelligent Automation	3
	Sem IV	R25-AR-HOC-202	Robot Sensing and Actuation	3
Third Year	Sem V	R25-AR-HOC-301	Autonomous Robotics	3
	Sem VI	R25-AR-HOC-302	Intelligent Robot Control	3
Final Year	Sem VII	R25-AR-HOC-401	AI & Cognitive Robotics	3
	Sem VIII	R25-AR-HOC-402	Collaborative & Industrial Robotics	3
Total				18



B.Tech. in Automation and Robotics Engineering- Double Minor

**Double Minor Course:**

- The Double Minor provides an opportunity for students to gain additional knowledge and skills in a discipline other than their parent programme.
- The department offers its approved Honors specialization/course basket as a Double Minor to eligible students from other departments.
- A student opting for a Double Minor shall complete six prescribed courses, each carrying 3 credits, for a total of 18 additional credits.
- The courses shall be completed from Semester III to Semester VIII.
- The courses shall be completed along with the regular B.Tech. programme and shall follow the prescribed sequence and prerequisites, wherever applicable.
- On successful completion of all the prescribed courses and earning the required 18 credits, the student shall be eligible for the award of a Double Minor in the respective specialization/track, as per the academic regulations of the institution.

Table 9 – Double Minor

Year	Semester	Course Code	Course Name	Credits
Second Year	Sem III	R25-AR-DMC-201	Double Minor Course - I	3
	Sem IV	R25-AR-DMC-202	Double Minor Course – II	3
Third Year	Sem V	R25-AR-DMC-301	Double Minor Course – III	3
	Sem VI	R25-AR-DMC-302	Double Minor Course – IV	3
Final Year	Sem VII	R25-AR-DMC-401	Double Minor Course – V	3
	Sem VIII	R25-AR-DMC-402	Double Minor Course - VI	3
Total				18



The following tracks are offered by the respective departments under the Honors/Double Minor Programme.

Eligible students shall choose the track offered by their parent/offering department as an Honors Course. **The same track shall be available to eligible students of other departments as a Double Minor.**

Sr. No.	Offering Department	Track Offered
1	Artificial Intelligence & Data Science	Advanced Artificial Intelligence and Data Science
2	Automation & Robotics	Industrial Robotics and Intelligent Automation
3	Civil Engineering	Architecture and Town Planning
4	Computer Engineering	Advanced Artificial Intelligence
5	Electronics & Computer Engineering	Semiconductor Manufacturing and Chip Technology
6	Electronics & Telecommunication	Intelligent and Emerging Communication Technologies
7	Electrical Engineering	Electric Vehicles
8	Information Technology	Cyber Security
9	Mechanical Engineering	Lean Manufacturing

**For more details, please refer to the track of honor courses provided by other departments.*



B.Tech. in Automation and Robotics Engineering – Honors with Research

**Honors with research:**

The student will work on a Research Project or Dissertation for 18 Credits in the Fourth Year in the respective discipline.

- The distribution of 18 Credits for Research projects in Sem-VII and Sem-VIII is given below.
- To get a B.Tech. in Automation & Robotics Engineering with Multidisciplinary Minor and Research Honors -Students need to earn a total of 178 Credits which consist of 160 credits of regular Multidisciplinary Minor courses, 18 Credits of Honor with Research courses.

Course Code	Course Type	Course Name	Teaching Scheme (Hrs./week)			Examination Scheme and Marks				Credit			
			TH	PR	TUT	CCE	ESE	TW	TOTAL	TH	PR	TUT	TOTAL
Sem -VII (HRC)													
R25-AR-HRC-401	Honors With Research	Intellectual Property Right (IPR)	2	-	-	50	50	-	100	2		-	2
R25-AR-HRC-402	Honors With Research	Research Project Phase-I	-	4	-	-	-	50	50	-	2	-	2
R25-AR-HRC-403	Honors With Research	Research Specific Core Course-I (Online NPTEL Course#)	3	-	-	50	50	-	100	3	-	-	3
			5	4		100	100	50	250	3	4		7

Course Code	Course Type	Course Name	Teaching Scheme (Hrs./week)			Examination Scheme and Marks				Credit			
			TH	PR	TUT	CCE	ESE	TW	TOTAL	TH	PR	TUT	TOTAL
Sem -VII (HRC)													
R25-AR-HRC-404	Honors With Research	Research Project Phase-II		22	-			50	50	-	11	-	11
				22				50	50		11		11