

ROBOTICS ENGINEERING

The approved Programme Educational Objectives and Program Specific Outcomes Approved by the Board of Studies

Program Educational Objectives

PEO1: The graduates will demonstrate the skills to design, analyze and implement systems to solve real world problems through Robotics and Automation.

PEO2: The graduates are equipped with state-of-the-art technology in order to foster innovation, invention and entrepreneurship for societal needs.

PEO3: The graduates will be trained in multi-disciplinary technologies to demonstrate learning skills needed for a successful professional career

Program Specific Outcomes

B. Tech Robotics and Automation

1. Understand the industrial systems/problems and propose appropriate technology for better industrial ecosystem.
2. Apply Engineering skills to Model, Simulate and Implement Automation for improvement of the industrial productivity .
3. Design Indigenous systems using advanced hardware and software tools to solve problems faced in factory automation.
4. Develop the application of Robotics and Automation Engineering to solve societal problems.

Course Components and Curriculum

B. Tech Robotics and Automation- 2020-2021 Batch

Total Credit for all B.Tech. Programs : 165

Summary of Category-wise Credits

No.	Category	Credits
1	Humanities, Social Sciences and Management Courses	5
2	Entrepreneurship	7
3	Basic Sciences	17
4	Engineering Sciences	21
5	Professional Core	71
6	Professional Electives	18
7	Open Electives	6
8	MOOC & Online Courses	5
9	Internships, Projects, Patent and Products	15
10	Mandatory courses	0
	Total	165

I Curriculum Components

Category 1 : Humanities, Social Sciences and Management Courses

No.	Course Code	Courses	Credit
1		Soft Skills	1
2	20EN20xx	Technical Communication / Other Languages <ul style="list-style-type: none"> ● A Stream - Foreign Languages ● B Stream - Online Course ● C Stream - Classroom teaching including lab 	2
3	20MS20xx	Professional Ethics	2
		Total	5

Category 2 : Entrepreneurship

No.	Course Code	Courses	Credit
1	20MS20xx	Concepts of Entrepreneurship	1
2	20MS20xx	Entrepreneurship and Product Development	3
3	20MS20xx	Business Plan	3
		Total	7

Category 3 : Basic Sciences

No.	Course Code	Courses	L:T:P	Credit
1.	20MA1013	Applications of Calculus and Differential Equations in Robotics and Automation	2:0:2	3
2.	20MA1014	Applied Linear Algebra, Transforms and Numerical Methods for Robot Control	2:0:2	3
3.	20MA2008	Applications of Probability, Statistics and Random Process for Robotic Engineering	3:0:2	4
4.	20PH1015	Physics for Robotics Engineers	3:0:0	3
5.	20PH1016	Physics Laboratory for Robotics Engineers	0:0:2	1
6.	19RO1001	Material Science	3:0:0	3
		Total		17

Category 4 : Engineering Sciences

No.	Course Code	Courses	L:T:P	Credit
1.	18RO2002	Introduction to Mechanical Systems	3:0:0	3
2.	18ME1002	Engineering Graphics (AutoCAD)	0:0:2	1
3.	20RO1001	Engineering Practices	0:0:2	1
4.	20RO1002/ 20CS1001	Basic Course in Embedded C / Programming for Problem Solving	3:0:3	4.5
5.	20RO1003	Fundamentals of Python Programming for Robotics	3:0:3	4.5
6.	20RO1004	Introduction to Robotics and Automation	3:0:0	3
7.	20RO1005	Basic Robotics Laboratory	0:0:2	1
8.	18EC2032	Electron Devices and Circuits	3:0:0	3
		Total		21

Category 5 : Professional Core

S. No	Course Code	Courses	L:T:P	Credits
1.	20RO2001	Digital Electronics and Microprocessors	3:0:0	3
2.	20RO2002	Mechanics of Solids	3:0:0	3
3.	18EE2001	Electrical Circuit Analysis	3:1:0	4
4.	19RO2001	Theory and Programming of CNC Machines	3:0:0	3
5.	18EE2019	Electrical Machines and Drives	3:0:0	3
6.	18RO2003	Automatic Control Systems	3:1:0	4
7.	18EC2033	Electron Devices and Circuits Laboratory	0:0:2	1
8.	8RO2004	Electrical Machines and Control Systems Laboratory	0:0:2	1
9.	18RO2005	Sensor Signal Conditioning Circuits	3:0:0	3
10.	20RO2003	Sensors and Protocols for Instrumentation	3:0:0	3
11.	18ME2028	Hydraulics and Pneumatics	3:0:0	3

12.	18ME2029	Hydraulics and Pneumatics Laboratory	0:0:2	1
13.	20ME20xx	Kinematics and Dynamics of Machinery	3:1:0	4
14.	18RO2007	Sensor Signal Conditioning Circuits Laboratory	0:0:2	1
15.	18RO2008	Robot Kinematics and Dynamics	3:0:0	3
16.	18ME2030	Mechanics and Engineering Design Laboratory	0:0:2	1
17.	19RO2016	Microcontrollers for Robotics	3:0:0	3
18.	19RO2017	Microcontrollers Laboratory for Robotics	0:0:2	1
19.	18RO2009	Vision Systems	3:0:0	3
20.	18RO2010	Programmable Logic Controllers	3:0:0	3
21.	18RO2011	Automation System Design	3:0:0	3
22.	18RO2012	PLC and Robotics Laboratory	0:0:2	1
23.	18RO2013	Totally Integrated Automation	3:0:0	3
24.	18RO2014	Totally Integrated Automation Laboratory	0:0:2	1
25.	18RO2015	Field and Service Robotics	3:0:0	3
26.	19RO2012	Artificial Intelligence in Robotics	3:0:0	3
27.	19RO2010	Machine Learning for Robotics	3:0:0	3
28.	20RO2004	AI and ML Laboratory for Robotics	0:0:4	2
29.	20RO2005	Robot Process Automation Laboratory	0:0:2	1
		Total Credits		71

Category 6 : Professional Electives

S. No.	Course Code	Courses	L:T:P	Credits
1	19RO2002	Autonomous Vehicles	3:0:0	3
2	19RO2003	Automotive Embedded Systems	3:0:0	3
3	19RO2004	Robotic Control System	3:0:0	3
4	19RO2005	Industrial Robotics and Material Handling Systems	3:0:0	3
5	19RO2006	Micro Robotics	3:0:0	3
6	19RO2007	Cognitive Robotics	3:0:0	3
7	19RO2008	Cloud Robotics	3:0:0	3
8	19RO2009	Medical Robotics	3:0:0	3
9	19RO2013	Industrial Energy Management System	3:0:0	3
10	19RO2014	Robotics and Automation in Food Industry	3:0:0	3
11	19RO2015	Neural Networks and Fuzzy Systems	3:0:0	3
12	20RO2006	Mobile Robots	3:0:0	3
13	19RO2020	Data Analytics for Robotics and Automation	3:0:0	3
14	19RO2021	Augmented Reality/Virtual Reality for Robotics	3:0:0	3
15	19RO2022	Block Chain Technology for Robotic Applications	3:0:0	3
16	20RO2009	Design Approach for Robotic Systems	3:0:0	3
17	20MS20xx	Artificial Intelligence for Business	3:0:0	3

Category 7 : Open Electives

S. No.	Course Code	Courses	L:T:P	Credits
1	20RO2007	Smart Sensors for IoT Applications	3:0:0	3
2	20RO2008	Basics of PLC Programming	3:0:0	3

Category 8 : MOOC & Online Courses

No.	Course Code	Courses	Credit
1		Semester 1	1
2		Semester 2	1

3		Semester 3	1
4		Semester 4	1
5		Semester 5	1
		Total	5

Category 9 : Internships, Projects, Patent and Products

No.	Course Code	Courses	Credit
1	20RO2998	Industry Internships	3
2	20RO2999	Projects, Patent and Products	12
		Total	15

Category 10 : Mandatory Courses

No.	Course Code	Courses	Credits
1		Value Education	0
2		Indian Constitution	0
3		Environmental Studies	0
3		Induction Program	0

Semester-wise Curriculum with Credits

Semester I (First year]

S. No	Course Code	Name of the Course	Hours per week			Total Credits
			L	T	P	
1	20EN20xx	Technical Communication / Other Languages	2	0	0	2
2	20CS1001/ 20RO1002	Programming for Problem Solving/ Basic Course in Embedded C	3	0	3	4.5
3	20MA1013	Calculus and Differential Equations for Robotic Engineering	2	0	2	3
4	20RO1001	Engineering Practices	0	0	2	1
5	20ME10xx/ 18ME1002	Engineering Graphics (AutoCAD)	0	0	4	1
6	20PH1015	Physics for Robotics Engineers	3	0	0	3
7	20PH1016	Physics Laboratory for Robotics Engineers	0	0	2	1
8		Mandatory Course I	0	0	0	0
		Total Credits				15.5

Semester II (First year]

S. No	Course Code	Name of the Course	Hours per week			Total Credits
			L	T	P	
1	20MA1014	Linear Algebra, Transforms and Numerical Methods for Robot Control	2	0	2	3
2	19RO1001	Material Science	3	0	0	3
3	18RO2002	Introduction to Mechanical Systems	3	0	0	3
4	20RO1003	Fundamentals of Python Programming for Robotics	3	0	3	4.5
5	20RO1004	Introduction to Robotics and Automation	3	0	0	3
6	20RO1005	Basic Robotics Laboratory	0	0	2	1
7	20MS20xx	Concepts of Entrepreneurship	1	0	0	1
8		Mandatory Course II	0	0	0	0
9		MOOC Course 1	0	0	0	1

10		Internship				1
			Total Credits			20.5

Semester III (Second year)

S. No	Course Code	Name of the Course	Hours per week			Total Credits
			L	T	P	
1	20RO2001	Digital Electronics and Microprocessors	3	0	0	3
2	20MA2008	Probability, Statistics and Random Process for Robotic Engineering	3	0	2	4
3	18EC2032	Electron Devices and Circuits	3	0	0	3
4	18EE2001	Electrical Circuit Analysis	3	1	0	4
5	18EE2019	Electrical Machines and Drives	3	0	0	3
6	18EC2033	Electron Devices and Circuits Laboratory	0	0	2	1
7	18RO2004	Electrical Machines and Control Systems Laboratory	0	0	2	1
8	20SS20xx	Soft Skills	1	0	0	1
9	20MS20xx	Entrepreneurship and Product Development	3	0	0	3
10		MOOC Course 2	0	0	0	1
			Total Credits			24

Semester IV (Second year)

S. No	Course Code	Name of the Course	Hours per week			Total Credits
			L	T	P	
1	20ME20xx	Kinematics and Dynamics of Machinery	3	1	0	4
2	18RO2003	Automatic Control Systems	3	1	0	4
3	18RO2005	Sensor Signal Conditioning Circuits	3	0	0	3
4	20RO2003	Sensors and Protocols for Instrumentation	3	0	0	3
5	20RO2002	Mechanics of Solids	3	0	0	3
6	20MS20xx	Professional Ethics	2	0	0	2
7	18RO2007	Sensor Signal Conditioning Circuits Laboratory	0	0	2	1
8	18ME2030/20ME20xx	Mechanics and Engineering Design Laboratory	0	0	2	1
9		Mandatory Course 3	0	0	0	0
10		MOOC Course 3	0	0	0	1
11		Internship				1
			Total Credits			23

Semester V (Third year)

S. No	Course Code	Name of the Course	Hours per week			Total Credits
			L	T	P	
1	19RO2001	Theory and Programming of CNC Machines	3	0	0	3
2	18RO2008	Robot Kinematics and Dynamics	3	0	0	3
3	19RO2016	Microcontrollers for Robotics	3	0	0	3
1	18RO2009	Vision Systems	3	0	0	3
5	18ME2028/20ME20xx	Hydraulics and Pneumatics	3	0	0	3

6	18ME2029/20ME20xx	Hydraulics and Pneumatics Laboratory	0	0	2	1
7	19RO2017	Microcontrollers Laboratory for Robotics	0	0	2	1
8	20MS20xx	Business Plan	3	0	0	3
9		Open Elective 1	3	0	0	3
10		MOOC Course 4	0	0	0	1
Total Credits						24

Semester VI (Third year)

S. No	Course Code	Name of the Course	Hours per week			Total Credits
			L	T	P	
1	18RO2010	Programmable Logic Controllers	3	0	0	3
2	18RO2013	Totally Integrated Automation	3	0	0	3
3	18RO2015	Field and Service Robotics	3	0	0	3
4	18RO2011	Automation System Design	3	0	0	3
5	19RO2012	Artificial Intelligence in Robotics	3	0	0	3
6	18RO2012	PLC and Robotics Laboratory	0	0	2	1
7	18RO2014	Totally Integrated Automation Laboratory	0	0	2	1
8	20RO2005	Robot Process Automation Laboratory	0	0	2	1
9		Open Elective 2	3	0	0	3
10		Mandatory Course 4	0	0	0	0
12		MOOC Course 5	0	0	0	1
13		Internship				1
Total Credits						23

Semester VII (Fourth year)

S. No	Course Code	Name of the Course	Hours per week			Total Credits
			L	T	P	
1	19RO2010	Machine Learning for Robotics	3	0	0	3
2		Professional Elective – 1	3	0	0	3
3		Professional Elective – 2	3	0	0	3
4		Professional Elective – 3	3	0	0	3
5		Professional Elective – 4	3	0	0	3
6		Professional Elective – 5	3	0	0	3
		Professional Elective – 6	3	0	0	3
7	20RO2004	AI and ML Laboratory for Robotics	0	0	4	2
Total Credits						23

Semester VIII (Fourth year)

S. No	Course Code	Name of the Course	Hours per week			Total Credits
			L	T	P	
1	20RO2999	Projects/Patents/Products	0	0	24	12
Total Credits						12

S. No.	Category	Credits
1	Professional Core courses	25
2	Professional Elective courses	15
3	Open Courses – Electives from other Technical and /or Emerging Courses	3
4	Mini Project / Industrial Training	2
5	Project – Phase I & II	23
6	Audit Courses 1 & 2	(non-credit)
Total Credits		68

S. No	Course Code	Programme Core	L:T:P	Credits
		Name of the Course		
1.	20RO3001	Robotics : System and Analysis	3:0:0	3
2.	20RO3002	Industrial Automation	3:0:0	3
3.	20RO3003	Computer Aided Modelling and Design	3:0:0	3
4.	20RO3004	Drivers and control system for automation	3:0:0	3
5	20RO3005	Embedded Systems for Automation	3:0:0	3
6	20RO3006	Advanced Automation Lab	0:0:4	2
7	20RO3007	Advanced Robotic Process Automation Lab	0:0:4	2
8	20RO3008	Embedded and IOT LAB	0:0:4	2
9	20RO3009	Advanced AI and ML lab	0:0:4	2
10	18MS3104	Research Methodology and IPR	2:0:0	2
Total				25
11	MP3951	Mini Project with seminar	0:0:4	2
12	20RO3998	Project – Phase I	0:0:16	8
13	20RO3999	Project – Phase II	0:0:30	15
Audit Courses				
1	18EN3001	Value Education	2:0:0	0
2	18EI3025	Entrepreneurship Development for Robotics and Automation	3:0:0	0

S. No	Course Code	Professional Electives	L:T:P	Credits
		Name of the Course		
1.	20RO3010	Computer Aided Production and Operation Management	3:0:0	3
2.	20RO3011	Rapid-Prototyping	3:0:0	3
3.	20RO3012	Mobile Robotics	3:0:0	3
4.	20RO3013	Advanced Embedded Processors	3:0:0	3
5.	20RO3014	Industrial Internet of Things	3:0:0	3
6.	20RO3015	Optimization Techniques	3:0:0	3
7.	20RO3016	Product Design & Development	3:0:0	3
8.	20RO3017	Image Processing and Machine Vision	3:0:0	3
9.	20RO3018	Artificial Intelligence in Robotics and Automation	3:0:0	3
10.	20RO3019	Advanced Machine learning	3:0:0	3
11.	20RO3020	Design of Mechatronics System	3:0:0	3
12.	20RO3021	Deep Learning for Computer Vision	3:0:0	3
13.	20RO3022	Robot Programming	3:0:0	3
14.	20RO3023	Virtual Reality and Augmented Reality	3:0:0	3
15.	20RO3024	Real Time Operating System	3:0:0	3

16.	20RO3025	Entrepreneurship Development for Robotics and Automation	3:0:0	0
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SEMESTERWISE CURRICULUM

SEMESTER I							
S. No.	Core/ Elective	Course code	Name of the Course	L	T	P	Credit
1	CORE1	20RO3001	Robotics : System & Analysis	3	0	0	3
2	CORE2	20RO3002	Industrial Automation	3	0	0	3
3	CORE 3	20RO3005	Embedded system for Automation	3	0	0	3
4	PE1	20RO3018/ 20RO3010/ 20RO3015	Artificial Intelligence in Robotics and Automation/ Computer Aided Production and Operation Management/ Optimization Techniques	3	0	0	3
5	PE2	20RO3020/ 20RO3023/ 20RO3012	Design of Mechatronics System/ Virtual Reality and Augmented Reality /Mobile Robotics	3	0	0	3
6		18MS3104	Research Methodology and IPR	3	0	0	2
7	Lab1	20RO3006	Advanced Automation Lab	0	0	4	2
8	Lab 2	20RO3007	Advanced Robotic Process Automation Lab	0	0	4	2
9	Audit I	18EN3001	Value education	2	0	0	0
Total Credits							21

SEMESTER II							
S. No.	Core/ Elective	Course code	Name of the Course	L	T	P	Credit
1	CORE3	20RO3004	Drives and control system for automation	3	0	0	3
2	CORE4	20RO3003	Computer Aided Modelling and Design	3	0	0	3
4	PE3	20RO3014/ 20RO3013/ 20RO3016	Industrial Internet of Things/ Advanced Embedded Processors / Product Design & Development	3	0	0	3
5	PE4	20RO3021/ 20RO3017/ 20RO3022	Deep Learning for Computer Vision / Image Processing and Machine Vision/Robot Programming	3	0	0	3
6		MP3951	Mini Project With Seminar	0	0	4	2
7	Lab 3	20RO3008	Embedded and IOT Lab	0	0	4	2
8	Lab4	20RO3009	Advanced AI and ML lab	0	0	4	2
9	Audit II	20RO3025	Entrepreneurship Development for Robotics and Automation	0	0	0	0
Total Credits							18

SEMESTER III							
S. No.	Core/ Elective	Course Code	Course Name	L	T	P	Credit
1	PE5	20RO3011/ 20RO3024/ 20RO3019	Rapid-Prototyping / Real time operating system / Advanced Machine learning	3	0	0	3
2	OE		1. Business Analytics 2. Industrial Safety 3. Operations Research 4. Cost Management of Engineering Projects	3	0	0	3
3	Project	20RO3998	Project – Phase I	0	0	16	8
Total Credits							14

SEMESTER IV							
S.No.	Core/ Elective	Code No.	Name of the Course	L	T	P	CREDIT
1	Project	20RO399	Project – Phase II			30	15
Total Credits							15

List of New Courses

S. No.	Course Code	Name of the Course	L:T:P	Credits
1.	20RO1001	Engineering Practices	0:0:2	1
2.	20RO1002	Basic Course in Embedded C	3:0:3	4.5
3.	20RO1003	Fundamentals of Python Programming for Robotics	3:0:3	4.5
4.	20RO1004	Introduction to Robotics and Automation	3:0:0	3
5.	20RO1005	Basic Robotics Laboratory	0:0:2	1
6.	20RO2001	Digital Electronics and Microprocessors	3:0:0	3
7.	20RO2002	Mechanics of Solids	3:0:0	3
8.	20RO2003	Sensors and Protocols for Instrumentation	3:0:0	3
9.	20RO2004	AI and ML Laboratory for Robotics	0:0:4	2
10.	20RO2005	Robot Process Automation Laboratory	0:0:2	1
11.	20RO2006	Mobile Robots	3:0:0	3
12.	20RO2007	Smart Sensors for IoT Applications	3:0:0	3
13.	20RO2008	Basics of PLC Programming	3:0:0	3
14.	20RO2009	Design Approach for Robotic Systems	3:0:0	3
15.	20RO3001	Robotics : System and Analysis	3:0:0	3
16.	20RO3002	Industrial Automation	3:0:0	3
17.	20RO3003	Computer Aided Modelling and Design	3:0:0	3
18.	20RO3004	Drivers and control system for automation	3:0:0	3
19.	20RO3005	Embedded Systems for Automation	3:0:0	3
20.	20RO3006	Advanced Automation Lab	0:0:4	2
21.	20RO3007	Advanced Robotic Process Automation Lab	0:0:4	2
22.	20RO3008	Embedded and IOT LAB	0:0:4	2
23.	20RO3009	Advanced AI and ML lab	0:0:4	2
24.	20RO3010	Computer Aided Production and Operation Management	3:0:0	3
25.	20RO3011	Rapid-Prototyping	3:0:0	3
26.	20RO3012	Mobile Robotics	3:0:0	3
27.	20RO3013	Advanced Embedded Processors	3:0:0	3
28.	20RO3014	Industrial Internet of Things	3:0:0	3
29.	20RO3015	Optimization Techniques	3:0:0	3
30.	20RO3016	Product Design & Development	3:0:0	3
31.	20RO3017	Image Processing and Machine Vision	3:0:0	3
32.	20RO3018	Artificial Intelligence in Robotics and Automation	3:0:0	3
33.	20RO3019	Advanced Machine learning	3:0:0	3
34.	20RO3020	Design of Mechatronics System	3:0:0	3
35.	20RO3021	Deep Learning for Computer Vision	3:0:0	3
36.	20RO3022	Robot Programming	3:0:0	3
37.	20RO3023	Virtual Reality and Augmented Reality	3:0:0	3
38.	20RO3024	Real Time Operating System	3:0:0	3

39.	20RO3025	Entrepreneurship Development for Robotics and Automation	3:0:0	0
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