



Shri Vile Parle Kelavani Mandal's

DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING

(Autonomous College Affiliated to the University of Mumbai)

NAAC Accredited with "A" Grade (CGPA : 3.18)



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Scheme and detailed Syllabus (DJ19)

of

Honours Degree Program

in

Robotics

Revision: 1 (2022)

With effect from the Academic Year: 2022-2023



**Proposed scheme for Honours in Robotics
 (Academic Year 2022-2023)**

Sr.	Course Code	Course	Teaching Scheme (hrs.)				Continuous Assessment (A) (marks)			Semester End Assessment (B) (marks)					(A+B)	Total Credits
			Th	P	T	Credits	Th	T/W	Total CA (A)	Th / Cb	O	P	O & P	Total SEA (B)		
Sem V																
1	DJ19MEHN2C1	Introduction to Robotics	4	--	--	4	25	--	25	75	--	--	--	75	100	4
Sem VI																
2	DJ19MEHN2C2	Modelling and Design of Robotics	4	--	--	4	25	--	25	75	--	--	--	75	100	4
3	DJ19MEHN2L1	Robotics Laboratory 1	--	2	--	1	--	25	25	--	--	--	25	25	50	1
Sem VII																
4	DJ19MEHN2C3	Advance Robotics	4	--	--	4	25	--	25	75	--	--	--	75	100	4
5	DJ19MEHN2L2	Robotics laboratory 2	--	2	--	1	--	25	25	--	--	--	25	25	50	1
Sem VIII																
6	DJ19MEHN2C4	AI and ML for Robotics	4	--	--	4	25	--	25	75	--	--	--	75	100	4
		Total	16	4	0	18	100	50	150	300	0	0	50	325	500	18



Honours in Robotics

Semester: V

Program: Common for All Programs (except Mechanical Engineering)

Course: Introduction to Robotics (DJ19MEHN2C1)

Pre-requisite:

1. Knowledge of basic elements of mechanical engineering
2. Knowledge of electrical engineering like motors & drives
3. Knowledge of instrumentation related topics like sensors & applications
4. Basic knowledge of control systems engineering

Objectives:

1. To impart knowledge of the fundamental concepts of robotics in the modern-day world from the olden days.
2. Make the student know the anatomical structure of the fixed & mobile robots with actuating systems.
3. To develop the student's knowledge in various types of sensors & its applications.
4. Making the robotic system to know how to do robotic manipulation using different types of end-effectors, viz., the tools & grippers.
5. To introduce the basic principles, techniques, state of art techniques in robot programming with control strategies.
6. Make the learner know about the different types of applications of robots in the modern-day world.

Outcomes: On completion of the course, the learner will be able to:

1. Remember the basic structure of robots with their mathematical interpretations in the 3-dimensional analysis.
2. Understand the kinematic analysis while doing the PNPO.
3. Apply the knowledge of mathematics in developing all possible solutions to the inverse kinematic analysis while doing the PNPO.
4. Analyze the area in which the robot can do the effective PNPO with a well-defined optimized shortest path trajectory.
5. Evaluate the performance of difference learning schemes used for solving a typical robotic application using AI concepts.
6. Create a typical robotic application to solve any type of automated works without human intervention.



Module	Introduction to Robotics - DJ19MEHN1C1	Hours
1	Introduction to Robotics : to automation & its types, History & evolution of robotics, Definition of robots, Robotic manipulators, Types of robots, Generations of robots, Laws of robotics, Classification of robots & its applications, Specifications of robots.	9
2	Robot Anatomy : Anatomy of robots, Drive systems, Actuators and Power Transmission systems, Types of drives & its applications, Hydraulic drives, Pneumatic drives, Electric drives, Hybrid drives, Robot activation & feedback components.	9
3	Sensors in robotics : Touch Sensors, Tactile Sensors, Proximity & Range Sensors, Sensor Based Systems, Force Sensors, Light sensors, Pressure sensors, Ultrasonic sensors, Infra-red sensors, Pots, Encoders, Position & Velocity Sensors.	9
4	Articulated Mechanical System: Materials used for robot design & its properties, Transmission devices in robots & its types, End effectors, Types of end effectors, Tools & Grippers, Classification of tools & grippers, Types of tool & gripper actuations.	9
5	Robot Controllers & Programming : Robot brain, Controller & its types, Need for controller in robots, Robot simulation, Robot software, Robot Programming & the Languages, Types of robot programming, Industrial robot programming.	8
6	Robot Applications : Industrial applications of robots, Medical, Household, Entertainment, Space, Underwater, Defense, Social, Environmental & economic issues in robot applications, Advantages & Disadvantages of Robotization.	8
	Total	52

Books Recommended:*Text books:*

1. Dr. T.C.Manjunath, "Fundamentals of Robotics", Nandu Publishers, 5th Edn., India, 2005.
2. Elaine Rich & Kevin Knight, "Artificial Intelligence", Mac Graw Hill, Singapore, 3rd Edn., 2017.
3. Dr. T.C.Manjunath, "Fast Track to Robotics", Nandu Publishers, 2nd Edn., Mumbai, Maharashtra, India, 2005.
4. K.S. Fu, R.C. Gonzalez, C.S.G. Lee, "Robotics: Control Sensing Vision & Intelligence", Mac Graw Hill, USA, 5th Edition, 2010.
5. Robin R. Murphy, "Introduction to AI and Robotics", MIT Press, Second Edition, 648 pp., Oct. 2019.

Reference Books:

1. Industrial Robotics, Technology, Programming & Applications, Grover, Weiss, Nagel, Ordey, Mc Graw Hill.
2. Robotic technology & Flexible Automation, S R Deb. TMH.



3. Robotics for Engineers, Yoram Koren, Mc Graw hill.
4. Fundamentals of Robotics, Larry Health.
5. Robot Analysis & Control, H Asada, JJE Slotine.
6. Robot Technology, Ed. A Pugh, Peter Peregrinus Ltd. IEE, UK. 8. Handbook of Industrial Robotics, Ed. Shimon. John Wiley
7. Roland Siegwart, Illah Reza Nourbakhsh, and Davide Scaramuzza, "Introduction to Autonomous Mobile Robots", Bradford Company Scituate, US
8. Fundamentals of Robotics – Analysis & Controls, Robert Schilling, Prentice Hall Inc, India.
9. Robotics – Amitaabh Bhattacharya
10. P.A. Janaki Raman, "Robotics and Image Processing an Introduction", Tata McGraw Hill Publishing company Ltd., 1995.

**Continuous Assessment (A):**

Course	Assessment Tools	Marks	Time (hrs.)
Theory	One Term test (based on 40 % syllabus)	25 each (Avg.25)	1
	Second Term test (next 40 % syllabus) / presentation / assignment / course project / group discussion / any other.		as applicable
Audit course	Performance in the assignments / quiz / power point presentation / poster presentation / group project / any other tool.	--	
Laboratory	Performance in the laboratory and documentation.	25	
Tutorial	Performance in each tutorial & / assignment.	25	
Laboratory & Tutorial	Performance in the laboratory and tutorial.	25	

The final certification and acceptance of term work will be subject to satisfactory performance upon fulfilling minimum passing criteria in the term work / completion of audit course.

Semester End Assessment (B):

Course	Assessment Tools	Marks	Time (hrs.)
Theory / * Computer based	Written paper based on the entire syllabus.	75	3
	* Computer based assessment in the college premises.		
Oral	Questions based on the entire syllabus.	25	as applicable
Practical	Performance of the practical assigned during the examination and the output / results obtained.	25	2
Oral & Practical	Project based courses - Performance of the practical assigned during the examination and the output / results obtained. Based on the practical performed during the examination and on the entire syllabus.	as per the scheme	2