



# SWARNANDHRA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

Accredited by National Board of Accreditation, AICTE, New Delhi, Accredited by NAAC with "A" Grade – 3.32 CGPA, Recognized under 2(f) & 12(B) of UGC Act 1956, Approved by AICTE, New Delhi, Permanent Affiliation to JNTUK, Kakinada Seetharampuram, W.G.DT., Narsapur-534280, (Andhra Pradesh)

## DEPARTMENT OF ROBOTICS

### TEACHING PLAN

Course Code	Course Title	Semester	Branches	Contact Periods /Week	Academic Year	Date of commencement of Semester
	FUNDAMENTALS OF ROBOTICS	III	ROBOTICS ENGINEERING	6	2024-25	30.07.2024
<b>COURSE OUTCOMES</b>						
1	<b>Demonstrate</b> the classification and basic components of robots. [K2]					
2	<b>Apply</b> various motion analysis principles to solve problems involving Manipulator Kinematics. [K3]					
3	<b>Apply</b> Jacobian and Lagrangian principles to solve manipulator Dynamics Problems. [K3]					
4	Know about various path planning techniques and <b>analyze</b> different motions of robotics systems [K3]					
5	<b>Discuss</b> robot programming techniques and common programming commands [K2]					
6	<b>Explain</b> various robotic applications in different fields and the working of various drive systems. [K2]					
UNIT	Outcomes / Bloom's Level	Topics No.	Topics/Activity	Text Book / Reference	Contact Hour	Delivery Method
I	CO1: Demonstrate the classification and basic components of robots. [K2]	<b>UNIT-I Introduction</b>				
		1.1	Introduction and History of robots,	T1,T2, R1,R2	2	Chalk and talk /ppt /quiz/ PBL/ Videos/ Animation
		1.2	Classification of robots based on several types like generations, coordinates and control system	T2,T3, R1,R3	2	
		1.3	Present status and future trends. Basic components of robotic system. Basic terminology	T1,T2, R1,R2	2	
		1.4	Accuracy, repeatability, resolution, Degree of freedom. Mechanisms and transmission,	T1,T3, R2,R3	2	
		1.5	End effectors, Grippers-different methods of gripping, Mechanical	T2,T3, R1,R2	2	



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			grippers-slider crank mechanism, screw type, rotary actuators			
		1.6	Gripper types : Cam type gripper, magnetic grippers, vacuum grippers, air operated grippers, Specifications of robot	T2,T3, R1,R2	2	
Content beyond Syllabus			Linkage 3.10 software for study of DOF of various mechanical grippers		1	
<b>Total</b>					<b>13</b>	
		<b>UNIT-II MOTION ANALYSIS and MANIPULATOR KINEMATICS:</b>				
<b>II</b>	CO2. Apply various motion analysis principles to solve problems involving Manipulator Kinematics. [K3]	2.1	Homogeneous transformations as applicable to rotation and translation, problems–Euler Angles	T1,T2, R1,R	3	Chalk and talk /ppt/web resources/PBL/ Videos/ Animation
		2.2	D-H Notations, joint coordinates and world coordinates	T1,T2, R1,R2	4	
		2.3	Forward and inverse kinematics, problems of simple robotic manipulators.	T1,T2, R1,R2	4	
			Roboanalyzer software for representing position and orientation of robots		1	
Content beyond Syllabus						
<b>Total</b>					<b>12</b>	
		<b>UNIT-III MANIPULATOR DYNAMICS:</b>				
<b>III</b>	Apply Jacobian and Lagrangian principles to solve manipulator Dynamics Problems. [K3]	3.1	Differential transformation of manipulators, Jacobians	T1,T2, R1,R3	3	Chalk and talk /ppt/web resources/PBL/ Videos/ Animation
		3.2	Lagrange, Euler and Newton, Euler formulations, Problems.	T2,T3, R1,R2	3	
		3.3	ROBOT CONTROLS: Point to point control, Continuous path control, Intelligent robot	T1,T2, R1,R3	2	
		3.4	Control system for robot joint, Control actions	T1,T3, R2,R3	2	
Content beyond Syllabus			Roboanalyzer software for representing IK an FK of robots		1	
<b>Total</b>					<b>14</b>	
		<b>UNIT-IV TRAJECTORY PLANNING:</b>				
<b>IV</b>	Know about various path planning	4.1	Joint space scheme- cubic polynomial fit, obstacle avoidance in operation	T1,T2, R2,R3	3	



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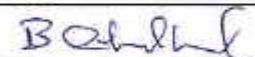
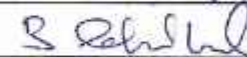
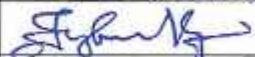

techniques and analyze different motions of robotics systems [K3] Discuss robot programming techniques and common programming commands [K2]	4.2	space-cubic polynomial fit with via point, blending scheme.	T1,T3, R1,R2	4	Chalk and talk /ppt/web resources/PBL/ Videos/ Animation
	4.3	Introduction To Robotic Programming	T1,T2, R1,R3	2	
	4.4	methods of robot programming, WAIT, SIGNAL and DELAY commands	T1,T2, R2,R3	2	
	4.5	Programming Languages: generations of robotic languages	T1,T2, R2,R3	1	
	4.6	introduction to various types of programming	T1,T2, R2,R3	1	
	4.7	Small programs to robot control based on VAL, RAIL, AML programming	T1,T2, R2,R3	2	
	Content beyond Syllabus		Robot programming languages		
<b>Total</b>				<b>16</b>	
<b>V</b>	<b>UNIT-V ROBOT APPLICATIONS</b>				
	5.1	Robot applications in Material Transfer, Machine loading and unloading operations	T1,T3, R1,R3	1	Chalk and talk /ppt/web resources/PBL/ Videos/ Animation
	5.2	Robots in processing operations - spot and continuous arc welding	T1,T2, R1,R3	1	
	5.3	Robots in spray painting, Assembly operations	T1,T2, R2,R3	1	
	5.4	Inspection, Safety in robotics, Training, maintenance	T1,T2, R1,R3	1	
	5.5	Applications of robot in Medical, agricultural and space applications.	T1,T2, R1,R2	2	
	5.6	Unmanned vehicles: Ground, Ariel and underwater applications	T1,T2, R1,R2	2	
	5.7	<b>DRIVE SYSTEM:</b> introduction to drive systems, working of hydraulic drive system	T1,T2, R1,R2	1	
	5.8	Working of pneumatic and electrical drive systems.	T1,T2, R1,R2	1	



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Content beyond Syllabus		Interfacing of sensors with Arduino board		1	
<b>Total</b>				11	
<b>Total no of hrs</b>				66	
<b>Text Books:</b>					
<b>S.No.</b>	<b>AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION</b>				
T1	Groover MP /Industrial Robotics/ 2 <sup>nd</sup> /Pearson Edu /2016				
T2	Mittal RK & Nagrath I J /Robotics and Control/3 <sup>rd</sup> / TMH/2015				
T3	Ganesh S. Hegde/ A Textbook on Industrial Robotics/3 <sup>rd</sup> / Lakshmi Publications/2015				
<b>Reference Books:</b>					
<b>S.No.</b>	<b>AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION</b>				
R1	Fu K S/Robotics/3 <sup>rd</sup> / Mc Graw Hill/2017				
R2	Asada and Slow time/Robot Analysis and Intelligence/ 3 <sup>rd</sup> /Wiley Inter Science/2017				
R3	John J Craig/Introduction to Robotics/3 <sup>rd</sup> / Pearson Edu/2015				
<b>Web Details</b>					
	1. <a href="https://www.galileo.org/robotics/intro.html">https://www.galileo.org/robotics/intro.html</a> 2. <a href="https://www.robotshop.com/en/robot-parts.html">https://www.robotshop.com/en/robot-parts.html</a> 3. <a href="https://en.wikipedia.org/wiki/Robot_kinematics">https://en.wikipedia.org/wiki/Robot_kinematics</a> 4. <a href="http://www.scholarpedia.org/article/Robot_dynamics">www.scholarpedia.org/article/Robot_dynamics</a> 5. <a href="https://www.robots.com/applications">https://www.robots.com/applications</a>				

		Name	Signature with Date
i.	Faculty	B MAHESH KRISHNA	
ii.	Course Coordinator	B MAHESH KRISHNA	
iii.	Module Coordinator	Dr. M FRANCIS LUTHER KING	
iv.	Programme Coordinator	Dr. A.GOPICHAND	

  
Principal