



SWARNANDHRA COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

Narsapur, West Godavari District, A.P. 534 280

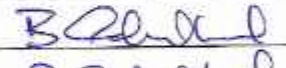
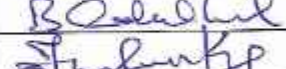
Department of ROBOTICS

TEACHING PLAN

Course Code	Course Title	Semester	Branches	Contact Periods /Week	Academic Year	Date of commencement of Semester
23RB6T01	ROBOT OPERATING SYSTEMS	VI	ROBOTICS ENGINEERING	5	2025-26	10.12.2025
COURSE OUTCOMES						
1	Describe the history, architecture, and core concepts of ROS and its difference from other operating systems. [K2]					
2	Execute essential Linux/Unix commands related to file handling, process control, and compilation. [K3]					
3	Explain ROS file structure, packages, services, and workspace architecture. [K2]					
4	Demonstrate working with ROS computation graph components such as nodes, topics, and services. [K3]					
5	Utilize ROS tools for debugging, visualization (RViz, Gazebo), and robot modeling (URDF, Xacro). [K3]					
6	Interface sensors and actuators with ROS using appropriate drivers and launch files. [K4]					
UNIT	Outcomes / Bloom's Level	Topics No.	Topics/Activity	Text Book / Reference	Contact Hour	Delivery Method
I	CO1: Describe the history, architecture, and core concepts of ROS and its difference from other operating systems. [K2]	UNIT-I INTRODUCTION TO ROS				
		1.1	Introduction to Robotics Middleware & Need for ROS	T1,T2, R1,R2	2	Chalk and talk /ppt /quiz/ PBL/ Videos/ Animation
		1.2	What is ROS? Meta-operating system concept	T2,T2, R1,R3	1	
		1.3	ROS Equation (ROS = Plumbing + Tools + Capabilities + Ecosystem) with examples	T1,T2, R1,R2	1	
		1.4	History and Development of ROS (Willow Garage, OSRF, Open Robotics)	T1,T2, R2,R3	1	
		1.5	ROS Distributions (Kinetic, Melodic, Noetic, Foxy, Humble, Jazzy)	T2,T2, R1,R2	1	
		1.6	Difference between ROS and other Meta Operating Systems (Orocos, Player/Stage, YARP)	T1,T2, R1,R2	2	
Content beyond Syllabus			Real-time support and Quality of Service (QoS)		1	
					Total	09

II	CO2:Execute essential Linux/Unix commands related to file handling, process control, and compilation. [K3]	UNIT-II INTRODUCTION TO LINUX COMMANDS				
		2.1	Introduction to Linux OS & UNIX philosophy	T1,T2, R1,R	3	Chalk and talk /ppt/web resources/PBL/ Videos/ Animation
		2.2	File system commands (ls, pwd, cd, tree, mkdir, rmdir)File handling commands (cp, mv, rm, touch, cat, less, nano), Redirection of input/output	T1,T2, R1,R2	3	
		2.3	File system security & access rights (chmod, chown, umask), Process commands (ps, top, kill, bg, fg), environment variables	T1,T2, R1,R2	3	
			Introduction to SLAM (Simultaneous Localization and Mapping)		1	
Content beyond Syllabus			Total		10	
III	CO3: Explain ROS file structure, packages, services, and workspace architecture. [K2]	UNIT-III ARCHITECTURE OF OPERATING SYSTEM				
		3.1	ROS File System Architecture ,Packages, Stacks, Nodes – Structure and importance	T1,T2, R1,R3	3	Chalk and talk /ppt/web resources/PBL/ Videos/ Animation
		3.2	Messages & Services – Concept and usage, Catkin build system & workspace structure	T2,T2, R1,R2	3	
		3.3	Creating and working with Catkin workspace,	T1,T2, R1,R3	3	
		3.4	Introduction to ROS Navigation stack & listing ROS commands	T1,T2, R2,R3	1	
Content beyond Syllabus		ROS integration with Python ML libraries		1		
			Total	11		
IV	CO4: Demonstrate working with ROS computation graph components such as nodes, topics, and services. [K3]	UNIT-IV COMPUTATION GRAPH LEVEL:				
		4.1	ROS Computation Graph overview	T1,T2, R2,R3	2	Chalk and talk /ppt/web resources/videos
		4.2	Nodes – creation, execution, communication, Topics & Message passing mechanism	T1,T2, R1,R2	3	
		4.3	Services & Actions – synchronous vs asynchronous	T1,T2, R1,R3	2	
		4.4	ROS Bags – recording and playback of data	T1,T2, R2,R3	2	
		4.5	ROS Master & Parameter Server	T1,T2, R2,R3	1	
Content beyond Syllabus		Robot localization improvement techniques		1		
			Total	11		
V	Utilize ROS tools for debugging, visualization (RViz, Gazebo) and robot modeling (URDF, Xacro).[K3]	UNIT-V DEBUGGING, VISUALIZATION & HARDWARE INTERFACE:				
		5.1	Debugging ROS nodes, topics, services & messages	T1,T2, R1,R3	2	Chalk and talk /ppt/web resources/PBL/ Videos/ Animation
		5.2	ROS command-line debugging tools (rostopic, rosnod, rosservice)	T1,T2, R1,R3	2	
			Visualization using RViz	T1,T2,	1	

		5.3		R2,R3		
		5.4	Simulation using Gazebo	T1,T2, R1,R3	1	
		5.5	URDF modeling, Xacro& Launch files	T1,T2, R1,R2	2	
		5.6	Hardware Interface: Sensor & Actuator interfacing, motor drivers	T1,T2, R1,R2	2	
Content beyond Syllabus			ROS-IoT integration using MQTT		1	
					Total	11
					CUMULATIVE PROPOSED PERIODS	52
Text Books:						
S.No.	AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION					
T1	Lentin Joseph, "Robot Operating Systems (ROS) for Absolute Beginners, 1st edition, Apress, 2018.					
T2	Aaron Martinez, Enrique Fernandez, "Learning ROS for Robotics Programming", 2nd edition, Packt Publishing Ltd, 2013.					
Reference Books:						
S.No.	AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION					
R1	AnisKoubaa, "Robot Operating System (ROS) – The Complete Reference (Vol.3), Springer, 2018.					
R2	Kumar Bipin, "Robot Operating System Cookbook", Packt Publishing, 2018.					
R3	Wyatt Newman, "A Systematic Approach to learning Robot Programming with ROS", CRC Press, 2017					
Web Details						
1.	https://www.geeksforgeeks.org/introduction-to-ros-robot-operating-system/					
2.	https://www.toptal.com/robotics/introduction-to-robot-operating-system					
3.	https://roboticsbiz.com/robot-operating-system-ros-explained/					

		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. M Francis Luther King	


Principal

