Short Syllabus

BCSE423L Robot Programming (2-0-0-2)

RSVP: Robot Scenario Visual Planning- Mapping the Scenario, Pseudocode and Flowcharting RSVP, State charts for Robots and Objects, checking the actual capabilities of your robot -Introduction to ROS - ROS Programming - Robots Sensing and Moving - Robots and Simulators, Sensing and Actuation, Wander-bot, Moving Around Using ROS, Teleop-bot- Keyboard Driver, Motion Generator, Velocity Ramps; Perception and Behavior - ROS Robotics Projects – Applications.

Course Code	Course Ttle	L	T	P	C
BCSE423L	Robot Programming	2	0	0	2
Pre-requisite	NIL	Syllabus Version			
		1.0			

Course Objectives:

1. To introduce the fundamentals of robotic programming
2. To understand the ROS fundamentals.
3. To introduce students the criteria for selecting a sensor and actuator for a particular ROS robotic application.
4. To familiarize with various hardware based robotic application

Course Outcomes:

After the completion of the course, student will be able to:

1. Understand the robotics design and implementation.
2. Gain the knowledge on fundamentals of robotic programming
3. Comprehend, classify and analyze the behavior of different types of sensors and actuators.
4. Understand the ROS fundamentals
5. Design robotic applications using ROS

Module:1	**Introduction**	**4 hours**
Robot Introduction- Seven Criteria of Defining a Robot, Robot controllers-major components, Giving the Robot Instructions, Robot vocabularies, RSVP: Robot Scenario Visual Planning-Mapping the Scenario, Pseudocode and Flowcharting RSVP, State charts for Robots and Objects, checking the actual capabilities of your robot		
Module:2	**Introduction to ROS**	**5 hours**
ROS Basics – ROS Equation, History of ROS, Sensors and robots supporting ROS, ROS architecture and concepts, roslaunch, catkin, Workspaces, and ROS Packages, Names, Namespaces, and Remapping, rosrun, Coordinate Transforms, Poses, Positions, and Orientations.		
Module:3	**ROS Programming**	**5 hours**
Topics- Publishing to a Topic, Subscribing to a Topic, Defining Your Own Message Types, Services - Defining a Service, Implementing a Service, Using a Service. Actions - Defining an Action, Implementing a Basic Action Server, Using an Action.		
Module:4	**Robots Sensing and Moving**	**4 hours**
Robots and Simulators, Sensing and Actuation: Wander-bot, Moving Around Using ROS: Teleop-bot- Keyboard Driver, Motion Generator, Velocity Ramps.		
Module:5	**Perception and Behavior**	**4 hours**
Perception and Behavior: Follow-bot- Acquiring Images, Detecting the Line, Following the Line.		
Module:6	**ROS Robotics Projects/ Applications**	**6 hours**
Assembling robot, Programming robot firmware, Face Detection and Tracking using ROS-hardware and software prerequisites, creating and working with face tracker ROS packages, Building a siri-like chatbot in ROS.		
Module:7	**Contemporary issues**	**2 hours**
	Total Lecture hours:	**30 hours**

Text Book(s)

1. Hughes, C. and Hughes, T., Robot programming: a guide to controlling autonomous robots. Que Publishing, 2016
2. Quigley, M., Gerkey, B. and Smart, W.D., Programming Robots with ROS: a practical introduction to the Robot Operating System. O'Reilly Media, Inc.", 2015

Reference Books	
1	Lentin Joseph, Robot Operating System (ROS) for Absolute Beginners: Robotics Programming Made Easy, 1st Edition, APress, 2018.
2	Jonathan Cacace; Lentin Joseph, Mastering ROS for Robotics Programming: Design, build, and simulate complex robots using the Robot Operating System, 2nd Edition, Packt Publishing, 2018.
3.	Anil Mahtani, Luis Sanchez, Enrique Fernandez, Aaron Martinez, Lentin Joseph. ROS Programming: Building Powerful Robots. Packt Publishing, 2018.
Mode of Evaluation: Continuous Assessment Test –I (CAT-I), Continuous Assessment Test –II (CAT-II), Digital Assignments/ Quiz / Completion of MOOC, Final Assessment Test (FAT).	

Recommended by Board of Studies	13-05-2022		
Approved by Academic Council	No. 66	Date	16-06-2022