

Course Code	Course Title	L	T	P	C
BCSE427P	Cognitive Robotics Lab	0	0	2	1
Pre-requisite	NIL	Syllabus Version			
		1.0			
Course Objectives:					
1. To understand advanced methods for creating efficient and dynamic cognitive robots					
2. To apply one or more core reasoning methods to create a simple agent that is driven by goals or rewards					
Course Outcomes:					
After the completion of the course, student will be able to:					
1. Understand how our psychology and neuroscience understanding of behavior and intelligence informs the design of robotics models and applications					
2. Compare, select and apply different machine learning methods for intelligent behavior in robots.					
3. Apply the methods and software/hardware technologies for robotics research and applications.					
4. Implement the state of the art in cognitive and intelligent robotics models, and how this leads to the design of future robot applications.					
List of Challenging Experiments (Indicative)					
1	Introduction to the Python language and Python libraries, including NumPy, SciPy and NXT Python • Introduction to numerical arrays and parallel arithmetic • Introduction to numerical data plotting • • Introduction to numerical regression techniques • Installing Raspbian OS on the Raspberry Pi 3				4 hours
2	Introduction to microcontrollers (32-bit ARM-based devices) in embedded applications used in automobiles and home appliances (such as washing machines, microwave ovens, telephones, and computer system peripherals) • Controlling GPIO pins (e.g., connected to LEDs) on the Raspberry Pi 3 using Python • Controlling motors • Collecting sensor data (such as light-color sensor, touch sensor, infrared proximity sensor and ultrasonic sensor) • Writing and uploading robotic control programs				4 hours
3	Interfacing data acquisition system hardware with computer to measure and control the robotic system.				4 hours
4	Robotic motion and autonomous responses • Path following, solving a Rubix cube, book scanning, and other fun problems				4 hours
5	Machine learning algorithms for neural network pattern recognition				4 hours
6	Extend the deep learning exercises (e.g. Multi-Layer Perceptron (MLP) and/or Convolutional Neural Network (CNN) exercises for image datasets) to optimize the training for robotics (vision) applications.				6 hours
7	SLAM in ROS				4 hours
Total Laboratory Hours					30 hours
Text Book(s)					
1.	Learning Computing with Robots, Deepak Kumar, Institute for Personal Robots in Education, June 2008				
Reference Books					
1.	Programming Cognitive Robots, Hector J. Levesque, 2019				
2.	Learning Robotics Using Python, Lentin Joseph, 2015				
3.	https://www.ieee-ras.org/cognitive-robotics/resources (Research Challenges)				

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