

Course Code	Course Title	L	T	P	C				
BCSE427P	Cognitive Robotics Lab	0	0	2	1				
Pre-requisite	NIL	<b>Syllabus Version</b>		1.0					
<b>Course Objectives:</b>									
<ol style="list-style-type: none"> <li>1. To understand advanced methods for creating efficient and dynamic cognitive robots</li> <li>2. To apply one or more core reasoning methods to create a simple agent that is driven by goals or rewards</li> </ol>									
<b>Course Outcomes:</b>									
After the completion of the course, student will be able to:									
<ol style="list-style-type: none"> <li>1. Understand how our psychology and neuroscience understanding of behavior and intelligence informs the design of robotics models and applications</li> <li>2. Compare, select and apply different machine learning methods for intelligent behavior in robots.</li> <li>3. Apply the methods and software/hardware technologies for robotics research and applications.</li> <li>4. Implement the state of the art in cognitive and intelligent robotics models, and how this leads to the design of future robot applications.</li> </ol>									
<b>List of Challenging Experiments (Indicative)</b>									
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							
<b>Total Laboratory Hours</b> <b>30 hours</b>									
<b>Text Book(s)</b>									
1.	Learning Computing with Robots, Deepak Kumar, Institute for Personal Robots in Education, June 2008								
<b>Reference Books</b>									
1.	Programming Cognitive Robots, Hector J. Levesque, 2019								
2.	Learning Robotics Using Python, Lentin Joseph, 2015								
3.	<a href="https://www.ieee-ras.org/cognitive-robotics/resources">https://www.ieee-ras.org/cognitive-robotics/resources</a> (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