Course Title	Programming Lab using Robotics				
Course Code	CSE110				
Course Type	Compulsory				
Level	Bachelor (1st Cycle)				
Year / Semester	1st Year / 1st Semester				
Teacher's Name	TBA				
ECTS	6	Lectures / week	None	Laboratories / week	3 hours/14 weeks
Course Purpose and Objectives	The objective of this course is to provide students with a practical introduction to programming using robotics platforms. The students will learn how to solve real life problems by applying programming concepts learned in theory. A programming language such as RobotC will be used to control LEGO Mindstorms EV3 or Arduino-based robotic platforms.				
Learning Outcomes	Upon successful completion of this course, students should be able to: • Describe the various problem-solving characteristics and skills required by a scientist or engineer • Describe techniques available to clearly define real problems • Explain how to use programming concepts to solve problems • Describe the implementation process of a solution for a problem • Understand how to control robots using simple programming commands				
Prerequisites	None	Co-requisites	CSE100		
Course Content	<u>There will be 13 sessions dealing with specific aspects of structural programming.</u> <u>Introduction to robotics:</u> Understanding the hardware associated with a robotics platform such as the LEGO Mindstorms EV3 or the Arduino platform. Understanding what sensors and actuators are and how they can be used to solve problems. <u>Flowcharts and Pseudocode</u>: Building simple programs using flowcharts and pseudocode by analysing the intended operation of a robot and the required result. Understanding the sequential flow of program operation and how that can be transferred to pseudocode and then to real code. <u>Variables and strings</u>: Initializing variables of different datatypes such as integers, floats and strings to be used as memory storage containers in the robot. Understanding how to input and output values through the serial monitor.				

	Building a simple robot program: Learning how to formulate a simple C program that can control a basic robot. Understanding the program structure from variable declarations of basic data types, controlling power to the motors and viewing the movement of a robot. Moving forward, changing speed and direction. Actuators: Understanding how actuators can be used to output information to a robot. Learning how to use DC motors, servo motors, stepper motors and other types of output devices. Sensing: Understanding how sensors work and how the input received can be used to influence actuators. Wall detection using touch sensors. Wall detection using ultrasonic sensors. Moving forwards until a specified distance. Learning how to use a color sensor. Moving forward until dark. Line tracking using color or reflected light. Creating a simple PID line following algorithm. Advanced variables: Building variable arrays to store information. Developing programs for robots based on multiple values. Reading sensor values and storing them for later use on actuators. Troubleshooting: Using methods to troubleshoot problems that can be identified in a robot solution. Implementing more advanced robotic solutions: Identifying a more advanced problem and formulating a solution using flowcharts and pseudocode. Implementing a solution using sensors and actuators to develop a more advanced solution to a problem identified and troubleshooting the solution.
Teaching Methodology	Face-to-Face
Bibliography	"*Teaching ROBOTC for LEGO MINDSTORMS". Carnegie Mellon University Press* "*Programming Arduino: Getting Started with Sketches",* by Simon Monk "*Learn to Program in Arduino C: 18 Lessons, From setup() to Robots"* by William P. Osborne "*Beginning C for Arduino: Learn C Programming for the Arduino (Technology in Action)"* by Jack Purdum Ph.D. **PIC Microcontroller Projects in C: Basic to Advanced"* by Dogan Ibrahim
Assessment	Final Examination 30% Assignments/Lab 60% Class Participation and attendance 10% 100%
Language	English