1. Search the research papers related to the chosen problem using academic search engines like Google Scholar, Scopus search, Web of Science database, etc.
   a. Evaluate the venue of the source of research paper - Journals using citation metrics like CiteScore, SCImago Journal Rank (SJR)), Source Normalized Impact per Paper (SNIP) etc., Conferences venues are evaluated using indexing information, Core Ranking etc.
   b. Summarize the reviewed papers in a tabular format with columns: Paper Title, Author(s), Year, Key Findings, and Citation Count.
   c. Explore reference management tools like Mendley / Zotero / EndNote to organize, store, and manage references.

2. Practice data analysis techniques taught in the class and identify a suitable technique required to solve the chosen research problem.

3. Write the research report and prepare to write the research paper.

a. Choose a document writing software and prepare the report as per the format given by the teacher.
b. Use the plagiarism check tool to assess the similarity index of the report and ensure that it is less than 10%.
c. Explore the journal finder tools available for the publishers and select a suitable journal to submit the manuscript

DSE – 18
Robotics

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Robotics	**4**	**3**	**0**	**1**	**Class XII pass with Mathematics**	DSC-03(Mathematics for Computing-I) ,DSC-06(Mathematics for Computing-II)

Learning Objectives:

1. *To teach students the fundamentals of creating and programming a robot to interact with its environment.*
2. *To perform basic tasks involving motion, sensor data and decision-making.*

Learning Outcomes:

1. *Explain the fundamentals of robotics and its components*

2. *Explain sensors and actuators in robotics*
3. *Know about various communication modes used in robotics*

UNIT-I **(7 Hours)**

Programming Environments: Integrated Development Environment (IDE) for AVR microcontrollers, free IDEs like AVR studio, win AVR. Installing and configuring For Robotic programming, In System Programmer (ISP), loading programs on Robot.

UNIT-II **(8 Hours)**

Actuators: DC Motors, Gearing and Efficiency, Servo Motors, Stepper motors, Motor control and its implementations.

UNIT-III **(15 Hours)**

Sensors and LCD interfacing: White line sensors, IR Range sensor of different range, Analog IR proximity sensors, Analog directional light intensity sensors, position encoder, Servo mounted sensor pod/camera pod, wireless color camera, Ultrasound scanner, Gyroscope and accelerometer, Magnetometer, GPS receiver, Battery voltage sensing, current sensing.
LCD interfacing with the robot (2 x 16 Characters LCD), other indicators: Indicator LEDs.

UNIT-IV **(15 Hours)**

Timer / counter operations: PWM generation, Motor velocity control, servo control, velocity calculation and motor position control, event scheduling.
Communication: Wired RS232 (SERIAL) communication, Wireless ZigBee Communication, USB communication, Simplex infrared communication (IR remote to robot).

References:

1. *Saha, S.K, Introduction to robotics, 2 nd edition, McGraw-Hill Education, New Delhi, 2014*
2. *R.K Mittal, I.J Nagrath, -Robotics & Controll, Tata McGraw & Hills, 2015.*

Practicals:

1. Blink an LED using AVR microcontroller.
2. Run a DC motor in forward and reverse directions using motor driver.
3. Detect obstacle using IR sensor and turn ON an LED.
4. Display IR sensor values on a 16x2 LCD.
5. Control the angle of a servo motor using PWM.
6. Measure the speed of a DC motor using an encoder and display it.