

Ameya Centre for Robotics & Embedded Technology

DIPLOMA IN ROBOTICS

Syllabus

Objective: To prepare the students for a career in Robotics

Duration: 16 Weeks, Total 320 Hrs.

Fees: Rs. 35,000/-

Eligibility: B.Sc. / B.E. / B. Tech. or equivalent (including current students)

Presentation Introduction to Robotics (Compulsory)

Robotics: History, Concepts, principles and applications of Robots, different types of Robots, degrees of freedom. Kinematics and Inverse Kinematics (definitions), Robot classification, Robotic vision, Controlling robot movements, Autonomous versus controlled robots.

Robotics Hardware:

Sensors: IR sensors, Proximity Sensor, Ultrasonic Sensor, White line sensor, Temperature Sensor, Touch sensor, Tilt Sensor, Accelerometer, Gyroscopic Sensor etc.

Actuators: DC motor (brushed and brushless dc motor (BLDC), Servo motor, Stepper Motor, their working.

Different types of gears, Spur gear worm gear, bevel gear, helical gear, planetary gears, gear train, gear ratio, speed verses torque, crank and shaft arrangement, lever, pulley, sprocket etc.

Module I:

a) Level 1 robot

- i. To assemble two Geared DC Motors & wheels to the chassis of the Robot

- ii. Making of remote using DPDT switches & battery clips.
- iii. Making Wired connection between Chassis & remote.
- iv. Function: Control forward, Backward, Left, Right Motions.

b) Lego Mindstorm NXT 2.0

- Study of Lego Mind storm NXT 2 Robot. Hardware features, Assembling models, developing application programs in Lego environment.
 - i. Making a Basic Lego car
 - ii. Making Humanoid Robot & programming it through software.
 - iii. Making of Color sorter, Guitar(**Optional**)

Module II

1. Introduction to Spark V Robot

Running VPL programs on Spark V platform

- i. Introduction to Microsoft Robotics Developer Studio Software.
- ii. Introduction to Visual programming Language.
- iii. Basic tutorials in VPL e.g. Addition, Subtraction, Counter etc.
- iv. **Tutorials to perform on spark V robot**
 - a. Buzzer On/Off
 - b. Commands for Driving Motors
 - c. White line Follower
 - d. Robo Joystick
 - e. Obstacle avoidance.

2. Level 2 Robot

- a. Assembling same as level 1 Robot.
- b. This is wireless Robot. We have to put RF 315 Transmitter Circuitry on Remote & Receiver circuitry on the Chassis of the Robot.

- c. Soldering of the necessary Components on PCB for making Transmitter & receiver Circuit.
- d. Function: Control forward, Backward, Left, Right Motions

Module III: Finch Robot & Dextor Arm

- Presentation on Introduction to Finch Robot.
Introduction to Finch Robot and its objectives, Hardware features of Finch robot, Languages supported on Finch robot.
- Study of Hardware of Finch Robot.
- Study of Finch Dreams software environment, developing programs and executing them on Finch Robot.
 - Study of **Finch Dreams & Create Lab Visual programmer** Software Environment, Developing programs & Executing them on Finch robot
 - **List of Experiments For Finch dreams Software**
 - Program for Controlling Left & Right Sensor.
 - Program for obstacle avoidance
 - Program for controlling Finch through Keyboard of computer
 - Program for accelerometer sensor working
- ✓ **Java Programming on Finch**
 - Introduction to Netbeans
 - Experiments on Finch Ex: Obstacle avoidance & Finch Control by mouse pointer.
- **Dexter Robot Arm:** Introduction to Dexter robot arm from Nex-robotics, Hardware features, degrees of freedom, workspace, Pick and place applications.

- Familiarization with visual interface, controlling the robot arm, writing a movement sequence for the robot arm, loading the sequence and executing it.

Module IV

Introduction to Microcontrollers

ATmega 16 microcontroller

- Introduction to AVR architecture, Comparison of AVR with other CISC & RISC based systems and Microprocessors, AVR family Categories and importance (AT tiny/ ATmega/ Xmega), Atmega 16 pin details and specifications (with package detail), Instruction set / Bus architecture, RAM, FLASH, UART and other peripherals, Interrupts, timer, Counters,.

Software: Introduction to AVR studio, Writing C programs in AVR studio, Compiling, Linking and Simulating these programs, AVR bootloader, burning the hex file in to the flash memory of AVR Microcontroller.

1. Interfacing discrete LEDs
2. Interfacing switch and LEDs
3. Interfacing seven segment
4. Interfacing LCD
5. Hex keypad Interfacing
6. Timer with polling mode
7. Timer with interrupt mode
8. Serial communication with interrupt mode
9. DC motor interfacing

Module V

C Programming on Spark V:

USB port for programming and control of Spark V.

Study of algorithms & C programs for Spark V. obstacle avoidance, direction control, cruise control, white line follower, etc. Use of Spark V as a platform for ZigBee wireless control. Using a wireless camera with Spark V & capturing the video.

List of Experiments:

1. Buzzer Bip
2. LCD Interfacing
3. Motion Control Simple & using PWM
4. White line & Black line following
5. Serial Communication using Zigbee
6. Position Control Meter & degree

Module VI:

Presentation on Swarm Robotics, Fire detector, Alcohol detector sensor & Accelerometer.

- Light detector Spark V Robot
- Vertical Stick position using accelerometer.
- Gesture controlled Robot
- Alcohol detector Robot
- Fire detector Robot
- Maze solver Robot
- Robotics motion planning algorithm
- Swarm Robotics
- Android phone based robot control via Bluetooth

Module VII: Project