P.G. Certificate in Industrial Automation

Curriculum and Scheme of Evaluation

Code	Course Unit	Credits[1]	Evaluation[2]	
			Assignments	Final Exam
	Term 1			
EE5900	Control Systems	2	40±20	60±20
EE5901	Applied Robotics	2	40±20	60±20
EE5902	Mathematics for Control Systems	2	40±20	60±20
EE5903	Electrical Machines and Drives	2	40±20	60±20
	Term 2			
EE5904	Industrial Sensors and Transducers	2	40±20	60±20
EE5905	Computer Aided Design in Automation	2	40±20	60±20
EE5906	Microcontroller based Systems	2	40±20	60±20
EE5907	Industrial Electronics	2	40±20	60±20
EE5908	Project	4	100	
	Total	**20**		

[1] 1 credit corresponds to 14 hours of lectures or equivalent

[2] The mean value in the evaluation scheme is the default value. It can be changed by the Lecturer/Examiner concerned, within the specified range, by announcement to the students at the commencement of the course unit.

Brief Syllabi for Modules

1. Control Systems

Learning Outcomes

At the end of this module, the student should be able to

1. Derive mathematical models of a variety of electrical, mechanical, and electro-mechanical systems.
2. Compare the open loop and closed loop (feedback) systems
3. Understand the concept of stability of a dynamic system
4. Draw the pole-zero diagram and the root loci, which are the change in location of the poles as parameters are of a system are varied.
5. Estimate time response of systems to impulse, step, ramp, and sinusoidal inputs from the transfer function.
6. Apply PID controller concepts for industrial automation processes
7. Use software tools for analysis and design of control systems.

Outline Syllabus

1. Introduction to control systems
2. Modelling of systems
3. Feedback control systems
4. Root Locus Techniques
5. Frequency Response Techniques
6. Stability in the frequency domain

2. Applied Robotics

Learning Outcomes

At the end of this module, the student should be able to

1. Decide whether a certain process should be automated or not based on Technical, Economical and Social facts.
2. Identify the steps involved in practical automation.
3. Apply the knowledge gained in a real automation exercise.
4. Assess future trends and needs of automation.
5. Design a simple Robot

Outline Syllabus

1. Introduction
2. Actuator Systems
3. Architecture of Industrial Automation Systems
4. Sequence and digital Control
5. Integration of Sensors, Actuators and Controllers.
6. Introduction to Production Control Systems.
7. Social Aspects and future trends in Automation.
8. Simple Robot Design

3. Mathematics for Control Systems

Learning Outcomes

At the end of this module, the student should be able to

1. Solve engineering problems using linear algebra, Non linear differential equations, vector calculus, matrix , Laplace/Z transform and Fourier analysis

Outline Syllabus

1. Linear Algebra.
2. Non linear differential equations.
3. Vector Calculus
4. Matrix Algebra
5. Laplace and Z Transforms
6. Fourier analysis

4. Electrical Machines and Drives

Learning Outcomes

At the end of this module, the student should be able to

1. Compare performance of different types of industrial motors and select the most suitable motor type for a given application.
2. Identify essential operational constraints in motors and design drive systems to comply with them
3. Design a DC motor drive system for one, two or four quadrant operation.
4. Distinguish between conventional and brushless DC drive options in terms of cost and performance.
5. Select the best DC drive system for a given application to meet specified performance standards.

Outline Syllabus

1. Operating principles of industrial motors
2. DC motor drives
3. Brushless DC motor drives
4. Stepper and Switch reluctance motor drives

5. Industrial Sensors and Transducers

Learning Outcomes

At the end of this module, the student should be able to

1. Identify the specifications of various types of sensors.
2. Select the sensors required for an automated system design.
3. Select actuators required for an industrial automation project.

Outline Syllabus

1. Different types Sensors and their characteristics
2. Different types of Actuators
3. Data sampling, A/D, D/A
4. Interfacing and systems development using sensors and actuators.

6. Computer Aided Design in Automation

Learning Outcomes

At the end of this module, the student should be able to

1. Design and manufacture simple products based on engineering drawing specifications
2. Employ CAD techniques and software to design/create solid models of robotic components

Outline Syllabus

1. Introduction to Computer aided drafting
2. Introduction to Computer Aided Manufacturing
3. Prototyping and Manufacturing for Automation
4. CNC Machining

7. Microcontroller based Systems

Learning Outcomes

At the end of this module, the student should be able to

1. Design and implement a microcontroller based system with relevant hardware and Software

Outline Syllabus

1. Introduction to microcontrollers
2. Microcontroller hardware architectures
3. On-chip software resources
4. Commercial microcontrollers and their applications
5. Microcontroller programming

8. Industrial Electronics

Learning Outcomes

At the end of this module, the student should be able to

1. Design simple analog/digital electronics circuits for industrial applications
2. Select the most appropriate power switching devise for a given design.
3. Assemble single and three phase ac to dc converters and test them.
4. Construct different types of dc to ac inverters and apply them selectively to solve practical problems.
5. Understand the principles of generation of harmonics, their impacts and mitigation

Outline Syllabus

1. Analog Electronics and industrial applications
2. Digital Electronics and industrial applications
3. Power semiconductor switching devices
4. AC to DC converters
5. DC to AC inverters
6. Harmonics in industrial circuits

9. Project

Learning Outcomes

At the end of this module, the student should be able to

1. Design and implement Automation based Engineering Project.
2. Present technical ideas in written and oral form effectively.

Outline Syllabus

1. Design and develop a complete Automation based engineering project on a topic assigned by the department.
2. Demonstrate and present the result.