

AGRI 322 ADVANCED AUTOMATION AND SENSOR TECHNOLOGY 3 (2+1)

Objective(s)

After learning the course the students should understand the concept of Embedded Systems, interfacing of IO devices and other peripherals, learn OS functions and Real Time Operating System.

Unit I

Introduction to Embedded Systems:

Embedded Systems, Processor Embedded into a System, Embedded Hardware Units and Devices In a System, Embedded Software in a system, Examples of Embedded Systems, Embedded System-on-chip (SOC). Classification of Embedded Systems, Skills Required for an Embedded System Designer.

Unit II

Arduino Programming: Arduino introduction, I/O programming, Sensor Interfacing & data acquisition.

Unit III

Overview of Industrial automation using robots: Basic construction and configuration of robot, Pick and place robot, Welding robot.

Unit IV

Bridge Measurements: Wheatstone Bridge, Kelvin Bridge, AC Bridge and their Applications, Maxwell Bridge, Hay's Bridge, Unbalance Conditions, Wein Bridge. Anderson's Bridge, De Sauty's Bridge, Schering Bridge.

Unit V

Instrument for Generation and Analysis of Waveforms (Digital Storage Oscilloscope):

Introduction, The Sine Wave Generator, Frequency Synthesized Signal Generator, Frequency Divider Generator, Signal Generator Modulation, Sweep Frequency Generator, Pulse and Square Wave Generator, Function Generator, Wave Analyzers, Harmonic Distortion Analyzer, Spectrum Analyzer.

Reference Book(s):

1. Helfrick Albert D. and Cooper W. D., "Modern Electronic Instrumentation and Measurement Techniques", Prentice Hall India
2. Shawhney A.K. "A Course In Electrical and Electronics Measurements and Instrumentation", Dhanpat Rai & Sons
3. Kalsi H.S. "Electronic Instrumentation", Tata McGraw-Hill Education
4. Bell David A. "Electronic Instrumentation and Measurements", PHI/Pearson Education
5. Rangan C. S., Sarma G. R. and Mani V. S. V., "Instrumentation Devices And Systems", Tata McGraw-Hill.
6. A.J. Bouvens, "Digital Instrumentation", McGraw-Hill
7. Embedded System: Architecture, Programming and Design by Rajkamal, Tata McGraw Hill
8. MSP430 Microcontroller Basics by John H. Davies Elsevier
9. Computer as Components: Principles of Embedded Computing System Design, Wayne Wolf, Morgan Kaufmann Publication
10. Introduction to Embedded Systems, Shibu K.V., Tata McGraw Hill Publication.
11. Process Control Instrumentation Technology, C.D. Johnson, PHI
12. Industrial control handbook, Parr, Newnem
13. Programmable logic controller, Dunning, Delmar
14. Raspberry Pi Cook book, Simon Monk, O' Reilly Publication.

Practical(s)

1. To study the front panel controls of DSO.
2. Study of basic instruments used for measurement.
3. Study of solid state switches.
4. Various motors and their control using Arduino.
5. Study of programmable control systems.
6. Study of real time irrigation control system.
7. Study of various relay modes.
8. Study of wireless – communication system.
9. Introduction to Raspberry PI.
10. Small working project.