

Course Structure

Course Code : SM7303

Course Title : Intelligent Systems

Credit Hours : 3

Course Description

This course presents fundamentals of the emerging of multidiscipline engineering fields of intelligent systems. Modules of intelligent systems architecture are described. This course presents theoretical fundamentals and practical techniques of the most important part of intelligent systems learning

Course Objectives

This course presents fundamentals of the emerging of multidiscipline engineering fields of intelligent systems. Modules of intelligent systems architecture are described. This course presents theoretical fundamentals and practical techniques of the most important part of intelligent systems learning. Strategies of learning are compared with software packages and a case study for autonomous intelligent system such as smart building.

Course Topics

- Introduction: Definition, Theoretical fundamental, System functions and requirements for intelligent Systems: This lecture will give overview and the foundation required for the course
Tutorial: Fundamentals, Basic equipment and health and safety for the lab
- Sensory for Intelligent system's : Sensors, Smart Sensors, data acquisition: this lecture will focus on the sensors types and their applications in intelligent systems. Also, the hardware for data acquisition for the intelligent system including the instrumentation circuits, amplifiers, analogue filters and introduction for Analogue to digital converters
Tutorial: Sheet(1) Sensors: pressure sensors temperature sensor, Bridge circuit, OP-AMP, analogue filter design
- Analogue frontend for Intelligent system: Analogue and Digital signals, Communication techniques between data acquisition and processing unit: This lecture highlights on advanced ADC design and requirements and the communication techniques challenges and requirements to connect the sensors to the analogue frontend then from the analogue frontend to the processor
Tutorial: Sheet 2:, sampling, quantizing and coding
- Processing and Control for Intelligent Systems(1): Advanced Digital signal processing,: This lecture revise the basic of DSP like FFT and IFT, then show the advanced techniques in DSP like multirate digital signal processing and Spectrum Estimation
Tutorial: Sheet 3: digital filter design
- Processing and Control for Intelligent Systems(2): Principles and Techniques for Sensors and Data fusion: This lecture focus on extracting information from several sensors or data using fusion algorithms like Kalman Filter
Tutorial: Sheet 3: Kalman filter design
- Processing and Control for Intelligent Systems(3): Control unit requirements for Intelligent systems (hardware and software): This lecture describes the hardware requirements for the intelligent systems and the open source hardware like Arduino and Raspberry Pi to be used in industrial intelligent systems
Tutorial : Sheet 4: Microcontroller Arduino Basics
- Exam

M.Sc. in Smart Control Systems for Energy Management

Course Structure

- Communication for Intelligent systems(1): Different Communication techniques and requirements, privacy and security: This Lecture focuses on the communication techniques used by the intelligent systems and compare with these techniques base on the application requirements
Lab :Arduino with wireless modules (Zigbee)
- Communication for Intelligent systems(2): Networks and IoT: This lecture shows the ability of constructing network from several numbers of the intelligent systems. Also it will show the challenges and the requirements to connect these networks on the internet cloud.
Lab: Arduino with wireless modules (WIFI)
- Intelligent Systems Power: requirements, resources, utilizations: This lecture shows the main types of power resources and the using of the renewable energy for the intelligent systems based on the application required
Tutorial sheet 6: Intelligent System Power tutorial including integration of renewable energy
- Intelligent systems feedback: actuators, action: This lecture describes how the intelligent systems can control output actuators like in industries and robotics.
Tutorial : Sheet 7: DC and AC motors with intelligent systems
- Exam
- Autonomous Intelligent Systems: Principles and techniques for autonomous intelligent systems: This lecture shows one of the main branches of the intelligent systems which is the Autonomous intelligent system and its applications in Smart Cities applications
- Case Study for Intelligent systems: Smart Building: This lecture gives a complete application of autonomous intelligent systems and discusses the hardware and software requirements for this application
Lab: Design Plan using Arduino and the sensors required
- Applications and case study for Intelligent systems: This lecture shows the importance of the intelligent system in our day life and the road map for the intelligent systems in the future.
Lab: Smart Building system design and evaluation
- Final Exam

References

- Intelligent Systems: Architecture, Design, and Control By: Alexander M. Meystel, James S. Albus
- SMART SENSOR SYSTEMS By: Gerard C.M. Meijer
- Smart Systems Integration and Simulation By: Nicola Bombieri, Massimo Poncino,
- Advances in Intelligent Autonomous Systems By: S.G. Tzafestas
- Mechatronics with Experiments, 2nd Edition By Sabri Cetinkunt