T.C.

DUMLUPINAR UNIVERSITY

FACULTY of ENGINEERING

ELECTRICAL-ELECTRONICS ENGINEERING DEPARTMENT

COURSE SYLLABUSES

Fall Session Courses

Photonics: Introduction to theories related to the light (beam optic, wave optic, electromagnetic optic, resonator optic, and photon optic), light and matter interaction theory, resonators, laser amplifiers, lasers, semiconductor photon sources, semiconductor photon detectors, electrooptics materials.

Microwave Techniques: TEM transmission lines, field and circuit models, frequency and time domain analyses, wave guides, impedance matching techniques, scattering matrices, passive microwave components, electromagnetic resonators, periodic structures, microwave filters, micro strip lines, semiconductor microwave components.

Hybrid Vehicle Technologies: Introduction to hybrid vehicles, hybrid vehicle mechanics, drive gear mechanism, hybrid vehicle control strategies, DC/AC motors, permanent magnet electrical machines, DC drivers, AC drivers, accumulator/batteries, alternative energy sources, liquid fuel types, hydrogen energy technologies, hydrogen internal combustible engines, system integration, control algorithms, hybrid vehicle system modeling and simulation.

Electrical-Electronics Engineering Numerical Methods: Focus on finite difference and finite element methods, computer code generation and their specific applications.

Power Quality: Energy system power quality problems and their sources, power quality, power quality standards, effects of power quality.

System Modeling and Simulation: System mathematical modeling and simulation, and recent simulation technologies.

Advanced Programming: How to create executable code step by step, hands-on experience on code generation, and improvement on programming and graphical user interface (GUI) generation.

Microsensors: Fundamentals of sensors, application steps, measurement criteria, sensor signal improvement, wireless sensor networks, speed, pulse, and vibration sensors, biosensors, chemical sensors,

capacitive and inductive distance sensors, flow rate and level sensors, load cell, force gauge, humidity sensor, thermal, heat, and temperature sensors, heat sensor.optical sensors, ionizing radiation sensors, motions detector, accelerometer.

Fuzzy Logic and Computer Applications: Classical and fuzzy sets, classical and fuzzy relations, membership function properties, fuzzification and defuzzification, logic, fuzzy systems, development of membership functions, automation methods for fuzzy systems, fuzzy system simulation, fuzzy rule reduction methods, fuzzy decision making, fuzzy classification and pattern recognition, fuzzy operations, fuzzy control systems, fuzzy logic applications, and fuzzy logic computer applications.

Optimization Techniques: Introduction to optimization, optimization problem definition, types of optimization algorithms, Differential Evolution algorithm (DE), Partial Swarm Optimization algorithm, Harmony Search algorithm (HS), Genetic Algorithm (GA), Gravitational Search algorithm (GSA), Charged System Search algorithm (CSS), Artificial Bee Colony algorithm (ABC).

Finite Element Method Modeling of Electrical Machines: Understanding of the basics the finite element method and to learn the information required for finite element method (FEM) modeling of electrical machines.

Optimal Operation of Energy Systems: Energy power systems, their optimal operation, mathematical optimization methods, important characteristics, circuit structures analyses and economic analysis of thermal and hydroelectricity systems.

Advanced Microcontrollers: General overview of microcontrollers, system architectures, comparison of different microcontroller families, basic architectural differences, C2000 family overview, system functions, hardware and software aspects, basic units and functions, hardware and software interfacing, application examples, ARM processors.

Information Retrieval Systems: Information Retrieval Systems, Vector Space Models, Probabilistic IR.

Special Topics: In the framework of research interests of the faculty member, the goal of this course is to further specialize on a desired specific subject in the area of electrical and electronics engineering.

Spring Session Courses

Advanced Fiber Optic Systems: Modal dispersion, chromatic dispersion, polarization mode dispersion, scattering and absorption loss in fiber optic, optic receiver and transmitter, fiber optic link characterization: Optic Pass Modulation (OPM), Optical Time Domain Reflection (OTDR), Optic Spectrum Analyzer (OSA), fiber optic systems design, fiber optic system performance advanced optical components, dispersion management techniques, Optical Time Domain Modulation (OTDM) and Wave Division Frequency Modulation (WDFM) systems, optic amplifiers, Erbium Doped Fiber Optic Amplifiers (EDFA) and soliton communication system understanding, modeling, and mathematical analysis, lab assignments to compare theoretical concepts.

Antennas and Propagation: Fundamentals of antenna theory and pole antenna simulations.

Renewable Energy Sources: Clean and renewable energy sources, and utilization of wind and solar energies.

Biomedical Systems: Structures and operation of fundamental measurement and evaluation systems in medicine.

Adjustable Speed Drivers: Power electronics circuit experiments and its applications, AC Drives, DC Drives, Synchronous Machine Drives.

Microsensors Applications: Systems design with a sensor and microcontroller.

High Voltage Direct Current Energy Transmission (HVDC): High Voltage Direct Current (HVDC) energy transmission.

Breakdown Analysis in Energy Systems: Relays in energy protection systems and breakdown analysis.

Design of Electric Machines: Understanding how to design an electrical machine and proper material choice.

Power Converters Design and Applications: Power electronics, industrial, commercial, and military aviation has a widespread use. Power semiconductors are key devices in modern power electronics. A power electronics engineer, effective, convenient and low cost of these devices to design converter needs to be better understood. The content of this course; Heat transfer and switching losses, Gate drive (gate driver) circuits, ASD dc line converters, harmonics in power systems, PWM rectifiers, active power filters, Space Vector Modulation, Hysteresis and current controllers, the modeling of the rectifier and inverter by using rotating reference frame method, Field oriented control.

Swarm Intelligence: Swarm intelligence is the discipline that deals with natural and artificial systems composed of many individuals that coordinate using decentralized control and self-organization. In particular, the discipline focuses on the collective behaviors that result from the local interactions of the individuals with each other and with their environment. Examples of systems studied by swarm intelligence are colonies of ants and termites, schools of fish, flocks of birds, herds of land animals. Some human artifacts also fall into the domain of swarm intelligence, notably some multi-robot systems, and also certain computer programs that are written to tackle optimization and data analysis problems. The course will present a number of swarm intelligence systems and will give the opportunity to experiment with them.

Bioinformatik Algoritmalar: Probability and Algorithms, Alignment Methods, Hidden Markov Models, Phylogenetic Algorithms.

Data and Network Security: Data and network security concepts, requirements, and methods.

Seminar: In the framework of research interests of the faculty member, the goal of this course is to make the student do the preparatory work and plan a project which will be developed by the student and the faculty and make him/her report it.

Thesis Study: In the framework of research interests of the faculty member, the goal of this course is to further specialize on a desired specific subject in the area of electrical and electronics engineering.

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