Sisteme avansate si algoritmi de comanda	Advanced Systems and Control Algorithms
Obiectiv principal	**Course Objective**
Sisteme complexe in tehnica, natura si societate; structuri de control cu microcontrolere, procesoare numerice de semnal, structuri digitale programabile (CPLD, PFGA); algoritmi de reglare numerică specifici sistemelor cu esantionare; aplicatii in domeniul servo si controlul unor parametri de mediu; sisteme cu inteligenta artificiala: controlere fuzzy, retele neuronale artificiale, sisteme neuro-fuzzy, algoritmi genetici; microsisteme de control integrate in aplicatii.	Complex systems in technics, nature and society; control structures with microcontrollers, digital signal processors, programmable digital arrays (CPLD, PFGA); numerical control algorithms specific to digital systems; servo applications and control of some environmental parameters; systems with artificial intelligence: fuzzy controllers, artificial neural networks, neuro-fuzzy systems, genetic algorithms;embedded systems.
Curs	**Course**
2 ore/săptămână, total 28 ore	2 hours weekly, 28 hours total
- Sisteme complexe, performante, avansate, hibride. Caracteristicile si evaluarea algoritmilor. Algoritmi specifici sistemelor cu eşantionare (Dead-Beat, Dahlin, Kalman, Lead-Lag). Sinteza algoritmilor numerici. - Proiectarea unui algoritm de control performant a pozitiei intr-un servosistem. Modele, conditionare multicriteriala a problemelor, hardware, timing, programare, evaluare performante. - Procesoare de comandă: microcontrolere, DSP, retele logice programabile. Hardware si software, comparatii. - Inteligenta artificiala. Logica si controlere fuzzy. Aplicatie cu controlul temperaturii. - Retele neuronale artificiale. Sisteme neuro-fuzzy. Aplicaţii de control neuro-fuzzy: pentru un sistem de poziţionare cu m.c.c., pentru un sistem de acţionare cu motor asincron si control vectorial, pentru o buclă de temperatură. - Algoritmi genetici. - Microsisteme integrate in aplicatii. Dezvoltare pentru automobil.	- Complex, advanced, high performance, hybrid systems. Characteristics and evaluation of algorithms. Numerical control algorithms specific to digital systems (Dead-Beat, Dahlin, Kalman, Lead-Lag). Synthesis of digital control algorithms. - Designing a high performance control algorithm for the position in a servodrive. Models, multicriteria problem conditioning, hardware, timing, programming, performance evaluation. - Processors: microcontrollers, DSP, programmable logic arrays. Hardware and software, comparisons. - Artificial intelligence. Fuzzy logic and fuzzy controllers. Application for temperature control. - Artificial neural networks. Neuro-fuzzy systems. Neuro-fuzzy control applications: for a DC positioning system, for an asynchronous motor drive with vector control, for a temperature loop. - Genetic algorithms. - Embedded systems. Development for automotive.
Laborator	**Laboratory**
2 ore/la 2 săptămân1, total 14 ore	2 hours to 2 weeks, 14 hours total
- Platforma cu module Eblocks programata in Flowcode pentru comanda unui motor pas cu pas in multi-regim. - Controlul temperaturii dintr-o incinta. Platforme cu procesoare CISC si RISC, algoritmi cvasicontinui tipizati si fuzzy. - Studiul unui sistem de control vectorial cu DSP TMS 320 pentru un servosistem cu motor fara perii. - Studiul unei retele CAN cu 4 noduri pentru automobil. - Studiul unui sistem de actionare cu motor asincron si control vectorial cu procesor dsPIC30. - Platforma cu 4 motoare diferite comandate de un singur procesor in sistem cu intreruperi. - Aplicatii de control fuzzy in fuzzyTech si Inform Software pentru pendul inversat, deplasare optimala containere, automobil fara pilot.	- Platform with Eblocks modules programmed in Flowcode to control a stepper motor in multi-mode. - Temperature control in an enclosure. Platforms with CISC and RISC processors, quasi-continuous and fuzzy algorithms. - Study of a vector control system with DSP TMS 320 for a brushless servodrive. - Study of a 4-nodes CAN network for a car. - Study of an asynchronous motor drive system with vector control by a dsPIC30 processor. - Platform with four different motors controlled by a single processor operating in interruption mode. - Fuzzy control applications in fuzzyTech and Inform Software programs for inverse pendulum, optimal displacement of containers, unmanned car.