MSc in Automation Engineering _GlobalE3

I semestre

090912 COMPUTER AIDED MANUFACTURING – 10 cfu

088775 DYNAMICS OF MECHANICAL SYSTEMS – 10 cfu

096297 MODEL IDENTIFICATION AND DATA ANALYSIS – 10 cfu

II semestre

096129 ADVANCED AND MULTIVARIABLE CONTROL – 10 cfu

088860 DYNAMICS OF ELECTRICAL MACHINES AND DRIVES – 10 cfu

093062 AUTOMATION AND CONTROL IN VEHICLES – 5 cfu

090916 AUTOMATION OF ENERGY SYSTEMS – 5 cfu

Classes offered at Msc in Automation and Control Engineering

Prerequisites

Linear algebra

- Vectors, matrices, inverse and transpose
- Vector spaces and fundamental subspaces
- Linear transformations
- Orthogonality
- Determinants
- Eigenvalues and eigenvectors
- Similarity transformations

Other prerequisites

090912 COMPUTER AIDED MANUFACTURING

No further prerequisites.

088775 DYNAMICS OF MECHANICAL SYSTEMS

- Fundamentals of vector analysis: representation through scalar components and complex numbers, vector sum, scalar product, vector product.
- Taylor Series and Fourier Series.
- Constant coefficient linear ordinary differential equations.
- Planar kinematics: position, motion, velocity and acceleration of a particle/rigid body, instantaneous rigid motion of a rigid body and instantaneous centre of zero velocity, relative-motion analysis.
- Forces and moments. Active and constraint forces. External and internal forces.

- In-plane static equilibrium of a rigid body and of a system of rigid bodies: equilibrium equations.
- Mass properties of a rigid body: center of mass and moment of inertia about a given axis.
- In-plane kinetics of a particle, of a rigid body and of a system of rigid bodies: Newton's laws of motion.
- The principle of virtual work. Lagrange Equations for a system of rigid bodies

096297 MODEL IDENTIFICATION AND DATA ANALYSIS

- System modeling (modelling concepts, state space models);
- Dynamic behavior (differential equations, qualitative analysis, stability);
- Linear systems (matrix exponential, input/output response, linearisation);
- Transfer functions (frequency domain modelling, transfer function, block diagrams, Bode plots, Laplace transform);
- Frequency domain analysis (loop transfer function, Nyquist criterion, stability margins, Bode's relations, generalised gain and phase);
- Elementary notions of probability (expected value and variance of a random variable)

096129 ADVANCED AND MULTIVARIABLE CONTROL

- System modeling (modelling concepts, state space models);
- Dynamic behavior (differential equations, qualitative analysis, stability);
- Linear systems (matrix exponential, input/output response, linearisation);
- Transfer functions (frequency domain modelling, transfer function, block diagrams, Bode plots, Laplace transform);
- Frequency domain analysis (loop transfer function, Nyquist criterion, stability margins, Bode's relations, generalised gain and phase);

088860 DYNAMICS OF ELECTRICAL MACHINES AND DRIVES

Electric Circuit Analysis:

- Passive circuit elements R, L and C
- Ideal generators
- Electric power definition
- Kirchoff’s current and voltage laws
- First order transient circuit
- Fourier analysis
- Linear ordinary differential equations
- Sinusoidal steady-state analysis
- Phasor theory
- Three-phase circuits

Induction:

- Magnetic flux
- Faraday's law
- Flux linkage

Semiconductor circuit elements

- Main characteristics of diode, thyristor, MOSFET, BJT, IGBT

093062 AUTOMATION AND CONTROL IN VEHICLES

- System modeling (modelling concepts, state space models);
- Dynamic behavior (differential equations, qualitative analysis, stability);
- Linear systems (matrix exponential, input/output response, linearisation);
- Transfer functions (frequency domain modelling, transfer function, block diagrams, Bode plots, Laplace transform);
- Frequency domain analysis (loop transfer function, Nyquist criterion, stability margins, Bode's relations, generalised gain and phase);

090916 AUTOMATION OF ENERGY SYSTEMS

- System modeling (modelling concepts, state space models);
- Dynamic behavior (differential equations, qualitative analysis, stability);
- Linear systems (matrix exponential, input/output response, linearisation);
- Transfer functions (frequency domain modelling, transfer function, block diagrams, Bode plots, Laplace transform);
- Frequency domain analysis (loop transfer function, Nyquist criterion, stability margins, Bode's relations, generalised gain and phase);
- Fundamental notions of engineering thermodynamics