Full time training
English – Mechatronics engineers – (MSc)
Mechatronics of Intelligent Robot Systems Specialization
E curriculum

State exam's questions
Multi-agent mobile robot systems + Fuzzy systems

Subject code: BGK-MEI-2023-AMM-E-MRS+FS

Multi-agent mobile robot systems

MRS 01 What is the agent, and Architecture of the agent, Sensor systems, control system, and navigation of the agents.

MRS 02 Path planning of Agents :

- Graph-based method.
- Search-Based Methos.
- FireFly Algorithm
- Gradient Descent algorithm
- Probabilistic Road Map Algorithm.
- Generalized Voronoi diagrams.

MRS 03 Intelligent Agent Characteristics.

MRS 04 Cooperative Control Theory, Communication Graph method for data exchange between agents in the environment, Algebraic Graph theory for designing the agent controller.

MRS 05 Distributed Artificial intelligence, Behavioral Based Robotic approach. (Pick up the trash Robot App.)

MRS 06 Genetic algorithm, (Structure, Mathematical Model, Application in multi-agent robotic system)

MRS 07 Fuzzy logic controller (theory, structure, Application in multi-agent robotic system)

MRS 08 Evolutionary Robotics;

MRS 09 Machine Learning app. In multi-agent:

- Supervised ML
- Unsupervised ML
- Reinforcement learning
- Q-Learning, Strategy Policy
- Temporal Difference (Montecarlo Algorithm, Dynamic Programming).

MRS 10 Bellman Equation (Application of Bellman in Robot decsion making).Classification of signals according to various points of view (deterministic, stochastic, real-value, complex-value, final duration, infinite duration, periodic, aperiodic, continous, quantized, analog, digital, parameters in time domain and in frequency domain)

Fuzzy systems

FS 01 Classic set theory

FS 02 Fuzzy set theory in basics, geometric properties of Fuzzy sets (support, core, height, alphacut, etc.)

FS 03 Properties of Fuzzy sets I. (convexity, symmetry, normality, cross over point, etc.)

FS 04 Properties of Fuzzy sets II. (equivalency, (proper) subset, cardinality, etc.)

FS 05 Operations on Fuzzy sets (complement, union, intersection; law of contradiction, law of excluded middle, etc.)

FS 06 Fuzzy union (axiomatic skeleton, properties, etc.)

FS 07 Fuzzy intersection (axiomatic skeleton, properties, etc.)

FS 08 Fuzzy complement (axiomatic skeleton, properties, etc.)

FS 09 Binary operators: t-norm, t-conorm

FS 10 Difference of Fuzzy sets

FS 11 Fuzzy relations, composition of relation

FS 12 Extension principle

FS 13 Structure of Fuzzy rule based systems

FS 14 Fuzzy rule base

FS 15 Mamdani type Fuzzy inference system

FS 16 Sugeno type Fuzzy inference system

FS 17 Defuzzification methods