PURDUE UNIVERSITY | College of Engineering

Engineering Faculty Document No.: 25-24
August 16, 2023

TO: The Engineering Faculty

FROM: The Faculty of the Interdisciplinary Engineering Program

RE: New Engineering Concentration within an Existing Graduate Program

The Faculty of the Interdisciplinary Engineering team has approved the following new graduate Concentration from the College of Engineering. This action is now submitted to the Engineering Faculty with a recommendation for approval.

TITLE:

Robotics

DESCRIPTION:

The Robotics concentration within the Interdisciplinary Engineering master's program (IDE) focuses on the area of analysis, control, and design of robots. This area spans a variety of application domains and is interdisciplinary in nature. The courses offered in this concentration will establish fundamental theories and tools for modeling, analyzing, and developing techniques in robotics. It spans core topics such as control theory, machine learning, artificial intelligence, networks, as well as advanced courses in emerging topics such as robotics, manipulators, and human-robot teaming.

RATIONALE:

Robots are playing a significant role in modern society including robotic arms for manufacturing, assistive co-robots in health care, etc. Current and future engineers will be faced with significant challenges in designing, analyzing, and controlling robotic systems in many engineering applications, especially in how to make robots intelligent co-workers for human. As such, there is a significant demand for students that have the core skills and knowledge in both classical theories in control, optimization, and networks and recent advanced in learning and AI, together with their applications in robotics, multi-robot coordination, and human-robot teaming. Students can greatly benefit from this accessible online option.

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Target Audience

Practicing professional engineers wishing to return to school for specialized robotics experience. Those looking to improve their career pathways and increase their employability in the promising emerging autonomous and connected systems industry.

Recently graduated Purdue B.S. students, and other domestic, and international students who intend to learn specialized skills in IoT along with core training in autonomous and connected systems to increase their employability.

Concentration Curriculum

Core Courses: 9 credits
Other Required Courses: 9 credits
Electives: 12 credits – mix of engineering and some non-engineering courses available here

Details

Core Courses (9 credits)	Math 51100 Linear Algebra ECE 56900 Introduction to Robotic Systems IE 57400 Industrial Robotics and Flexible Assembly
Other Required Courses (select 3)	Select 1 of the following: ME 57500 Theory and Design of Control Systems ECE 60200 Lumped System Theory AAE 56400 Systems Analysis and Synthesis Select 2 of the following: ME 57800 Digital Control AAE 56800 Applied Optimal Control and Estimation

	ECE 57000 Artificial Intelligence AAE 56100 Introduction to Convex Optimization ECE 59500 Introduction to Deep Learning AAE 59000 Multi-Agent Systems and Control ECE 58000 Optimization Methods for Systems and Control ECE 68000 Modern Automatic Control ECE 59500: Reinforcement Learning - Theory and Algorithms *The following 3 courses will be developed for online soon and be added to this list of options:* CE 597 Transportation Systems Evaluation in the Context of Vehicle Automation and Robotics IE 69000 Reinforcement Learning and Control ME 59700 Autonomous Systems
Electives (12 credits)	Mix of engineering and some non-engineering courses available here

Curriculog link to come shortly.