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:

Autonomy

DESCRIPTION:

The Autonomy concentration within the Interdisciplinary Engineering master's program (IDE) focuses on the area of analysis, control and design of autonomous systems spanning a variety of application domains. The courses in this concentration will establish fundamental theories and tools for modeling, analyzing, and developing algorithms to achieve autonomy of both individual systems and a network of interconnected systems. It spans core topics such as control theory, machine learning, artificial intelligence, networks, as well as advanced courses in emerging topics.

RATIONALE:

Autonomous systems are playing a significant role in modern society including self-driving cars, unmanned aerial/ground/underwater vehicles, and so on. Current and future engineers will be faced with significant challenges in designing, analyzing, and controlling autonomous systems in many engineering applications including exploration of unknown areas (such as Mars), search and rescue, package delivery, and so on. 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 advances in learning and AI. Students can greatly benefit from this accessible online option within the IDE program, as this area of interest is naturally interdisciplinary.

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Academic Leads from the Institute for Control, Optimization and Networks (ICON)

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Target Audience

Practicing professional engineers wishing to return to school for specialized autonomous systems 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 autonomy 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 57000 Artificial Intelligence Select 1 of the following: ECE 60200 Lumped System Theory AAE 56400 Systems Analysis and Synthesis ME 57500 Theory and Design of Control Systems
Other Required Courses (select 3)	ECE 59500 Introduction to Deep Learning AAE 59000 Multi-Agent Systems and Control ECE 50024 Machine Learning ME 57800 Digital Control AAE 56800 Applied Optimal Control and Estimation ECE 59500 Game Theory CE 59700 Data Science for Smart Cities CE 59700 Network models for Connected and Autonomous Vehicles ECE56900 Introduction to Robotics AAE 56100 Introduction to Convex Optimization ECE 68000 Modern Automatic Control ECE 59500: Reinforcement Learning - Theory and Algorithms

	The following 4 courses will be developed for online soon and be added to this list of options: CE 59700 Transportation Systems Evaluation in the Context of Vehicle Automation and Robotics IE 69000 Reinforcement Learning and Control CE 59700 Intelligent Transportation Systems ME 59700 Autonomous Systems
Electives (12 credits)	Mix of engineering and some non-engineering <u>courses available here</u>

Curriculog link to come shortly.