

## WPI SPECIAL TOPICS 2019-2020

Dept.	Course #	Title	Description
BME	595	ST: COMMERCIAL ANALYSIS BME	This course partially fulfills the Clinical Competency requirement in Biomedical Engineering. The course will follow a seminar format, with faculty and industry experts serving as invited lecturers and case study presenters. The course is designed to introduce BME graduate students to the process and practices of evaluating the commercial potential of medical products and technologies.
CS	525	SP TOP: SWARM INTELLIGENCE	This course will cover a wide range of topics in swarm intelligence, including mathematical, computational, and biological aspects. The course is organized in three parts. In the first part, the students will learn about complex systems and the basic concepts of self-organization, such as positive and negative feedback, symmetry breaking, and emergence. The instructor will illustrate a diverse collection of self-organized systems in nature, finance, and technology that concretize these concepts. The second part covers optimization algorithms inspired by swarm intelligence, namely ant colony optimization and particle swarm optimization. The third and final part is dedicated to swarm robotics, and will cover common swarm algorithms for task allocation, collective motion, and collective decision-making. The course will blend theory and practice, challenging the students to learn by implementing the algorithms discussed in class. The final project will involve working on a research problem in swarm robotics, and the final deliverable will include a demo and a research paper.

ETR	598	ST: ENGINEERING & BUSINESS: POWER OF COLLABORATION	Technology-based project management and product designs benefit from collaboration between enabling technologies and the commercial opportunities they represent. The integration of the two disciplines can be utilized from inception to final delivery of the work products presented. This course is taught simultaneously with Engineering and Business School faculty. It features formal mid and final project reviews and collaborative teaching styles.
FP	580	ST: SPECIAL PROBLEMS	Individual or group studies on any topic relating to fire protection may be selected by the student and approved by the faculty member who supervises the work. Examples include: Individual or group studies on any topic relating to fire protection may be selected by the student and approved by the faculty member who supervises the work. Examples include: Business Practices, Combustion, People in Fires, Fire Dynamics II, Fire and Materials, Forensic Techniques, and Complex Decision Making.
MIS	598	ST: BUS APP MACHINE LEARNING	This course explores how Machine Learning (ML) and Artificial Intelligence (AI) is applied to solve business problems, to satisfy specific business needs, or to discover new opportunities for businesses. Applications of ML and AI are constantly evolving across many industries. This course utilizes existing ML solutions to address issues identified in business case studies.

MTE	594	ST: HEAT TREATING OF STEELS	<p>Most cast, forged or powder metallurgy steel parts require heat treatment to obtain the specified properties. In this seminar the fundamentals of the heat treatment of steels will be addressed (i.e. normalizing, annealing, austempering, austforming, marquenching and hardening/quenching/tempering). In addition, the important surface engineering processes (carburizing, carbonitriding, nitriding, ferritic nitrocarburizing, boronizing and aluminizing) will be analyzed. Each process will be fully developed in terms of the thermodynamics, transformation and diffusion kinetics.</p> <p>Prerequisite: Introduction to Materials</p>
MTE	594	ST: HEAT TREATMENT OF STEELS	<p>Most cast, forged or powder metallurgy steel parts require heat treatment to obtain the specified properties. In this seminar the fundamentals of the heat treatment of steels will be addressed (i.e. normalizing, annealing, austempering, austforming, marquenching and hardening/quenching/tempering). In addition, the important surface engineering processes (carburizing, carbonitriding, nitriding, ferritic nitrocarburizing, boronizing and aluminizing) will be analyzed. Each process will be fully developed in terms of the thermodynamics, transformation and diffusion kinetics.</p> <p>Prerequisite: Introduction to Materials</p>

RBE 595 ST: ROBOTIC MANIPULATION

This course covers both the fundamentals and recent advances of robotic manipulation research. Grasp taxonomies and stability measures will be examined, and grasp planning methods will be studied. Sensing strategies that are used for object manipulation will be covered along with various data processing methods. Soft manipulation techniques and the methods that exploits environmental constraints will be analyzed. In addition withIn-hand manipulation methods will be covered. Finally, learning-based manipulation strategies will be discussed.