<table>
<thead>
<tr>
<th>Dept.</th>
<th>Course #</th>
<th>Title</th>
<th>Description</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>BME</td>
<td>595</td>
<td>ST: COMMERCIAL ANALYSIS BME</td>
<td>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.</td>
<td>Fall 2020</td>
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</tbody>
</table>
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.
ECE 579B ST: Blockchain and Cryptocurrencies. Cryptocurrencies changed the way we look at money. It created significant impact on finance, socioeconomic and technology. The course will introduce the technical aspects of blockchain technologies, consensus protocols and cryptocurrencies. Students will learn the basics of the blockchain systems and how to engineer blockchain systems to create cryptocurrencies. They will learn the bottlenecks of the blockchain systems and study new blockchain design proposals to see if these bottlenecks are overcome. Further, the course will also cover the basics of Ethereum and smart contracts. Students will have the chance to learn programming smart contracts. In some occasions, the course might include class discussions and paper reading. Also, students are expected to give a presentation on a topic related to blockchain.

ECE 579N ST: Optimal Control This course provides an introduction to the theory and practice of optimal control. The main emphasis of the course will be on linear quadratic methods. Topics covered will include static optimization, principles of MIMO systems and feedback control, calculus of variations, LQR/LQG control, and dynamic programming. Additional topics such as nonlinear and H-infinity control may be explored as time permits. Theoretical foundations will be reinforced with applications to state-of-the-art research areas such as autonomous vehicles and power systems.
Machine Learning has proven immensely effective in a diverse set of applications. This trend has reached a new high with the application of Deep Learning virtually in any application domain. This course studies the applications of Machine Learning in the sub domain of Cybersecurity by introducing a plethora of case studies including anomaly detection in networks and computing, side-channel analysis, user authentication and biometrics etc. These case studies are discussed in detail in class, and further examples of potential applications of Machine Learning techniques including Deep Learning are outlined. The course has a strong hands-on component, i.e. students are given datasets of specific security applications and are required to perform simulations.

Prerequisites: Basic understanding of principles of cybersecurity, familiarity with Machine Learning techniques and tools (Matlab or python, numpy, scikit-learn) will be useful but not required.

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.
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.
This course samples major developments in the global history of medicine, as manifestations of the human endeavor to understand disease and health. Under the circumstances or remote learning imposed by the current coronavirus epidemic, it seems most appropriate to turn our attention in this iteration of the course toward the history of social and medical responses to epidemic disease outbreaks. We will read a selection of research articles and two scholarly books. One book presents Western medical perceptions and responses to plague and pestilence over 2,000 years. In this historical survey, “disease” involves biological conditions of pathology, politics, culture, medicine, attitudes, and social relations. The second book examines the transitions that disease-fearing Americans have followed from 19th century fears of miasmas and faith in wilderness cures to the more recent era of chemical pollution and cancer clusters, noting how Americans have often associated disease threats with notions of race and place as well as dirt and germs. By analyzing the examples, concepts, and arguments offered by these authors through class discussions and short writing assignments, we may come to better understand why the world is reacting to the Covid-19 outbreak in the ways that we have witnessed, and how this new disease itself is contributing to the history of medicine.
This Inquiry Seminar explores questions of how, why and to what degree modern life is dependent on fossil fuel use and what paths exist through which humanity can moderate its dependence on fossil fuels. Students may pursue different approaches to these questions from the demand and supply sides of energy markets, through politics and culture, through an examination of alternative energy sources and demand efficiency technologies, or some combination of these. Students might, for example, examine a refined petroleum product of their choice and investigate its history, uses and future position in consumer markets relative to alternatives; they might choose a fossil fuel resource, in particular places and at specific periods of time, and study the history of its exploitation, current status and future amid changes in the global energy matrix; or they might foreground an alternative energy source or efficiency technology in their research, and address its likely impact on the production and consumption of energy.
Technology has long maintained a seductive power over the western imagination and many see it as the propulsive force driving human history. In this course, we will critically interrogate the idea – usually identified as “technological determinism” – that technology exists “outside” society and drives social, cultural and political change. Moving beyond simplistic determinist arguments, we work to understand how society, culture and politics simultaneously shaped and were reshaped by technology. To accomplish this, the course is organized around a series of questions, including: Where did the idea of “technological determinism” come from and why does it hold such seductive explanatory power? What are the alternatives to deterministic models in history? How has technology’s influence over society changed with the development of ever more complicated and seemingly inescapable technological systems? These questions will be (1) explored through a series of case studies drawn from existing scholarship and (2) further pursued as students develop an independent research project and paper on a technology of their choice.
J. R. R. Tolkien’s Middle Earth was the culmination of his love of Saxon and Nordic sagas, his ambivalence concerning industrialization, his fear of the great wars, and his joy in storytelling. Scholars have attended to his forms, his religious and philosophical explorations, his engagement with a particular historical moment, his linguistic inventions (Tolkien was a philologist and studied language in historical sources), and much more. Further, Tolkien has seen a resurgence in contemporary culture with the movie and game adaptations of his material. This inquiry seminar takes a cultural studies approach to the Lord of the Rings trilogy, building from student backgrounds in HUA disciplines, to analyze the original trilogy. Combining close reading of the books with external research to answer humanities-based questions, students will complete a seminar project that explores different aspects of The Lord of the Rings in cultural contexts. Cultural studies are often grounded in history, literature, rhetoric, and philosophy, so students with depth in these areas will be better prepared to succeed.
This course examines relationships between different aspects of our global systems and the emergence, dispersion, and reactions to the spread of the 2019 novel coronavirus (Covid-19). Students will explore underlying circumstances that have contributed to the recurrence of coronaviruses and their transmission through systems of interaction and exchange, with particular focus on the Covid-19 epidemic that has expanded dramatically during the first part of 2020. The course will also engage with the range of initial responses that the epidemic has generated within and among government agencies and intergovernmental institutions. It will review and analyze preliminary implications of the crisis on global economic system. It will also explore the ways these health and economic crises, and political reactions to them, have alternatively disrupted and/or mobilized social and cultural networks that extend across boundaries and around the world. The objectives of this course are to review, interrogate, and begin to understand the ways our global systems have facilitated the gestation of Covid-19-related crises, how economic, political, social, and cultural systems have responded so far, and how we can approach the study of these phenomena from different perspectives and disciplines.
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. Prerequisite: Introduction to Materials
This course is intended to provide students with understanding the intra- and inter-organizational implications of environmental practices and policies. The role of organizational operational and supply chain management functions, activities, tools and methods and their relationship to the natural environment will be introduced and discussed. At the end of the course a successful student should be able to: grasp the scope of general operations and supply chain management and environmental sustainability as they relate to the firm, be able to relate to the manners in which management may respond and collaborate/cooperate with suppliers, customers, and various other stakeholders influencing and influenced by operational and supply chain activities from practical and theoretical case studies and able to evaluate various factors and understand tradeoffs in management decisions as they pertain to environmental operations and supply chain management.
Positive psychology is the scientific study of positive experiences, character strengths and the practices that enable individuals and communities alike to thrive. This course explores the question, “what is happiness?” and will examine how meaning, compassion, fulfillment, well-being and resilience relate to happiness. Special attention will be given to experiential learning, including mindfulness practice and other evidence-based strategies that elicit positive emotion and increase stress coping, optimism, and resilience. Course content and discussion will be based on research findings from positive psychology, neuroscience, sociology, and applied practice. Suggested background: PSY 1400

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.