Fall 2018 Topics Courses

ENVE 4961 Photobiology

This senior level course explores the fundamentals of light and its effects on living systems. Students will explore how light contains and distributes information as well as energy. Perception, photodamage, acclimation, the dynamics of plant physiological systems and the use of photobiological responses to produce nutrient rich foods through the engineering of lighting systems are discussed.

3 credit hours
Instructor: Tessa Pocock

ITWS-6962 – Big Data Policies

Learn about: what data policies really are, and how buzz words muddy the waters; the ‘hot topics’ in data policy right now (hint – they include privacy, security, and sharing); how to critically analyze and evaluate the effectiveness of data policies; what other countries are thinking about with respect to data policies; who makes these policies anyway, and why; what technologies have to do with all of this; what roles politics, culture, economics, and other seemingly unrelated disciplines have to do with data policies; and how specific implementation of some data policies may help address current societal issues. Who should enroll: Students who are interested in how data policies are made and evaluated; anyone who will be working in the data analytic, informatics, business analytics, or other data-related field; anyone who likes to critique an argument, or who wants to learn how; anyone who has wondered what happens to all of that collected data; anyone who wants to understand the broader connections inherent in policy formulation. You will work in teams to analyze and evaluate specific aspects of current data policies, and present your analysis to the class.

3 credits
Instr. – Fontaine

ITWS-4960/6960 – Database Systems

Discussion of the state of practice in modern database systems, with an emphasis on relational systems. Topics include database design, database system architecture, SQL, normalization techniques, storage structures, query processing, concurrency control, recovery, security, and new directions such as object-oriented and distributed database systems. Students gain hands-on experience with commercial database systems and interface building tools. Programming projects are required.

Prerequisites/Corequisites: Prerequisite: CSCI 2300 or permission of instructor.

3 credits
Restricted to ITWS/ITEC majors
CIVL 4961 Bedford Digital Tools Development

Digital application instruction and related explorations are integral to the studio, designed to provide a critical forum and to facilitate both the development of the design and its systematic documentation. While the end results will be representational including diagrams, renderings, and graphic instructions for construction, explorations will target how digital tools can become procedurally integral with design and how they can open up greater opportunity for creative design study. Digital techniques will be investigated as developmental tools rather than an assistant representational technology. Parametric modeling will also be utilized to help manage and clarify complex relationships between systems and environments. We will be working with a master model / Building Information Modeling (BIM) logic, in which a single application software will be the predominant digital resource, and workflow becomes essential to the successful development of the project. The computer, like any other design tool, has its place. There are more and less appropriate applications for any method, and the various computational techniques will be used together with analog modes of working.

1 Credit hour

Instructor: TBA

ARCH4960 Seminar in Sensory Culture

The Seminar builds an understanding of the role of senses in a broad range of cultural productions through readings, writing, discussion, and projects. Source material will be drawn from neuro- and cognitive science, philosophy, art, medicine, psychiatry, perceptual psychology, performance and epistemology. First person experiences by means of field trips to art, music, performances and/or installations will be required in lieu of textbooks.

2 credits

Instructor: Ted Krueger

ARCH4961 Veil and Beam: Architectures of Espionage in Cinema

Emerging from the literature of James Fenimore Cooper's "The Spy" (1821) and Robert Erskine Childers' "The Riddle of the Sands" (1903) came a lively and secretive cinema - of espionage. From "Spies" (Lang, 1928) to much of Hitchcock's oeuvre, the genre has made for an inexhaustible set of spaces, plot devices and syntactic layers that restrict viewers, thrill them and construct the visual forms of our greatest personal phobias, social anxieties and conspiracy theories. "Veil and Beam" will examine the architectural and technical aspects of spy cinema, the (often) political agendas of the filmmakers, and provide a close-viewing of the observer 'observing' (and being observed). The films studied have a specific relationship to architecture and include The Man Who Knew Too Much (1934 and 1956, Hitchcock); The Third Man (1949, Reed); 5 Fingers (1952, Mankiewicz); North by Northwest (1959, Hitchcock); Dr. No (1962, Young); The Conversation (1974, Coppola); Tinker, Tailor, Soldier, Spy (1980, BBC; and 2011, Alfredson); and a recent masterpiece, The Lives of Others (2006, von Donnersmarck).

2 credits

Instructor: Michael Oatman
ARCH4963 Contemporary Ceramic Assemblies

This course provides a platform, in the form of ceramics, to execute and deploy digital design, material and engineering principles at full scale using the SOA clay printer, and kiln. Instruction will be conducted as a seminar and workshop and will introduce design methodologies that are unique to ceramic processes through the process of designing a ceramic assembly.

2 credits
Instructor: Rhett Russo

ARCH4964 Projecting Light

"The relationship between light, projective geometry and drawing existed since antiquity. Different aspects of light are examined in mini-labs through their literary origins parallel to physical and optical explorations with light. The concluding project is a light construction that explores a thesis about projection in physical form."

Yael Erel.

Credits 2.

ARCH4965 Sculpting the Intangible: The Phenomenological experience in Arch

Light and materiality, intrinsically attached to the spatial experience, is able to affect, transform and stimulate not only our visual, but our mental and even bodily perception of things. This seminar intends to refine our ways of seeing by examining different artifacts, buildings, and expressions that engage with the phenomenological.

Elena Perez-Guembe.

Credits 2.

ARCH4966 Portfolio Development

The portfolio is a critical document standing on its own as both a representation of an architect's (or graduating architect's) body of work as well as a projection of the depth and breadth of it's authors imagination. More often than not you will depend on the impact and clarity of your portfolio as the primary vehicle for gaining future opportunities, whether in a top tier design office, an academic institution or when applying for commissions. Many of these opportunities are evaluated on the portfolio alone with no space for leveraging the public presentation skills of a seasoned graduating architecture student. More than a mere collection of projects, the portfolio demands a finely crafted set of editorial strategies that encompasses an array of visual representation skills, editorial skills, graphic design, book design and the subtle art of persuasion through non-verbal communication.
This seminar requires you to reassess your work and develop a global editorial strategy where you position your entire body of work in the framework of an architectural thesis. Drawings will be remade, renderings will be reworked and regenerated, layouts scrutinized and the conceptual underpinnings of any given project will be interrogated for its value and contribution to the larger narrative you will create around your work. The course will not seek to develop a complete portfolio, rather to identify a top level editorial approach and layout in connection with an in depth reassessment and re-presentation of a number of projects. This process will allow you to develop the editorial approach of your portfolio and to clarify the expectations of each page, each project, through the in-depth reassessment of individual projects.

Lonn Combs.

Credits 2.

ARCH4968 Nature and Arch in the times of Digital Reality Consequences and Hopes

"Transformation of information, not energy, is the fundamental building block of the universe." (Norbert Wiener, Cybernetics 1949) "Life is just bytes and bytes and bytes of digital information" (Richard Dawkins, River out of Eden 1995) We are walking already "in the digital age of biology in which the once distinct domains of computer codes and those that program life are beginning to merge, where new synergies are emerging that will drive evolution in radical directions." (Craig Venter, Life with Speed of Light 2013)

In the seminar we will study the new frontiers of architecture of the future.

Zbigniew Oksiuta.

Credits 2

MATH-6790 Wave Motion

Waves underlie a multitude of phenomena in nature and technology. This course is concerned with the mathematical analysis of systems of equations with wavelike solutions. Analytical and asymptotic methods are emphasized. Both linear and nonlinear waves are examined with examples chosen from a variety of application areas including acoustics, solids and fluids, compressible gas dynamics and reactive media.

Prerequisites: MATH 4600 and MATH 4500 respectively. Acquaintance with elementary mechanics of solids and fluids, and with asymptotic and perturbation methods, will be helpful but is not essential.

Credit Hours: 4

Instructor: Ashwani Kapila (660000644)
MATP-6960 Geometric Methods for Data Processing

Processing and analyzing data in 3D and higher are crucial topics in many fields such as computer vision, 3D modeling, medical image analysis etc. Topics of this course includes fundamental concepts of differential manifolds, computation of basic geometric quantities, numerical methods for solving PDEs on Riemannian manifolds and applications to data analysis.

Prerequisites: Multivariable calculus, Numerical linear algebra, Numerical differential equations.

Credit Hours: 4

Instructor: Rongjie Lai (661411085)

ISYE-6961 Stochastic Models-Optimization

Prerequisites: Courses that demonstrate a solid mathematical background and knowledge about optimization. Please talk to the instructor should you be concerned about your background.

Description: This graduate level course will focus on prescriptive analytics for decision-making environments characterized by high degrees of uncertainty. A variety of modeling approaches will be discussed including Markov Decision Processes (MDPs), partially observable MDPs, stochastic programming, and robust optimization. The course will not only present these modeling approaches but also on examining effective algorithms to solve the problems at scale. These algorithms include large-scale linear programming methods, approximate dynamic programming/reinforcement learning, and sample average approximation. Students will be expected to complete a course project relevant to their research area in the hopes that it could lead to results for inclusion in their thesis.

ISYE 4960/6960: Introduction to Cyberphysical Systems

Cyber-Physical Systems (CPS) are a mechanism that is controlled or monitored by computer-based algorithms, tightly integrated with the physical environment or a biological system. In CPS, physical and software components are deeply intertwined, each operating on different spatial and temporal scales, and exhibiting multiple and distinct behavioral modalities, and interacting with each other in a myriad of ways that change with context. Examples of CPS include smart grid, autonomous automobile systems, medical monitoring, process control systems, robotics systems, and automatic pilot avionics.

Introduction to CPS provides students with the opportunity to learn the different principles entailed in the analysis and design of CPS. In the context of this year’s class, the application technology chosen was brain interfaces, motivated by the multitude of initiatives released by Silicon Valley companies that will likely shape the job market landscape. Examples include, for instance, the NeuraLink by Elon Musk, and typing-by-brain from Facebook. Consequently, the interplay between brain (i.e., the physical system) and its interface (i.e., the hardware and software components) will be explored from a practical and formal perspective. Due to the high interdisciplinarity of the topic, the course is structured in four parts: (i) the organization of the brain, and dynamics at different time-scales; (ii) determine the main features and their neurophysiological translation; (iii) classification of the features using statistical analysis and machine learning; and (iv) executing a task in open and closed-loop fashion.
In summary, the students will generally gain an understanding of the fundamental aspects required for the design and analysis of computational systems that are integrated with physical processes. In particular, the students will be equipped with skills and understanding regarding brain interfaces that will uniquely position them in the new market landscape and get a transversal (i.e., interdisciplinary) educational experience.


ECSE 4962 Introduction to Machine Learning

Course Description (Catalog Course Description)


ECSE 4961/6961 - Modeling & Simulation for Cyber-Physical Systems

Course description:
This course develops a solid basis for students to model and simulate cyber-physical systems using computer-based object-oriented equation-based modeling languages and tools with the goal of building models with high reusability. The course covers both theoretical and practical issues related to numerical simulation methods for CPS, including continuous time, discontinuous/discrete and timed clocked systems. Aspects of code-generation and real-time simulation for embedded systems are introduced. These foundations allow for the modeling and simulation of embedded systems which will be carried out “virtually” (by simulation) and physically using the Arduino and Raspberry Pi.

ECSE 6963 Advanced Topics in Large Power Systems

Course description: This is a course team-taught by thrust/subthrust leaders and other key faculty of the NSF Engineering Research Center, CURENT (Center for Ultra-wide-area Resilient Electrical Energy Transmission Networks). The goal is to present the latest development in the CURENT research areas and other related areas to the graduate students and to have them well prepared for research tasks in CURENT. The course is open to all graduate students.

BIOL 6960 Current Topics in Cytoskeletal Research

This course approaches the function of the nervous system from a cell biological perspective. Neurons have a unique organization that facilitates their role in signal transmission and information processing. This course will explore the mechanisms that develop and maintain neurons and the unusual cell-biological problems these cells solve. Students will learn about modern experimental tools and how they are applied in neuroscience research. Students engage with current scientific literature, learn to evaluate it critically, and develop a research project.

Pre-Requisites: BIOL 4260 or BIOL 6260 and BIOL 4100 or permission of the instructor
PHYS-4963 Condensed Matter Theory Seminar

Course description

The weekly condensed matter theory seminar will bring together graduate students, postdocs, researchers, and faculty to discuss current topics in the physics of condensed matter theory. The students will earn one credit for their participation. Advanced topics such as many-body quantum physics, use of modern computational techniques to solve new solid state physics problems, and other contemporary subjects will be treated.

Prerequisites: none

Notes: students need to manually register to get into this course. It is limited to students actively involved in CMT research.

Credit Hours: 1

Instructor: Vincent Meunier (660985977)

CSCI 4964/6964 01 Cognitive Computing

Credits: 4

Prerequisite: CSCI 2300 or permission of instructor

Cognitive Computing is a term being used for a new generation of artificially intelligence computers that interact with humans in new and important ways. Rather than human-machine interaction, cognitive computing is said to be leading to a new generation of human-machine collaboration, where computers help humans gain new insights into problems via a suite of technologies ranging from natural language to machine learning. The "coming of age" of cognitive computing was demonstrated when IBM's Watson program beat the world's experts at the TV gameshow Jeopardy! The 2015 announcement of the Cognitive and Immersive Systems Lab (CISL), a collaboration between the IBM Research and RPI, explores new research in human-scale situations rooms for human-machine partnership. In this course, we will explore several types of cognitive computing architectures, including Watson, neuromorphic computing, and agent-based modeling, and try to discover, via team projects motivated by the students in the class, what, if anything, is truly new and exciting in this technology space. Students should be willing to work in small teams on research-related projects requiring the teams to define, plan and implement their approaches. (Note that some of the classes will be held in CISL research spaces).

CSCI 4965 01 RCOS

Credits: 0

Prerequisite: CSCI 1200 and a 2000-level course in CSCI, ECSE, or ITWS

This 0-credit non-graded course offering is an administrative means to obtaining a full roster of students participating in RCOS. RCOS (Rensselaer Center for Open Source) is an eclectic group of undergraduate students that embark on individual and team-based open source projects, primarily software, but also open hardware projects. Many new projects are introduced each semester, though many ongoing and higher-profile projects are undertaken, as well. Students are required to work on and contribute to open
source projects, maintain a blog, and present to the group during the semester. Students may earn independent study credit hours, a limited stipend, or do RCOS for the experience only.

**CSCI 4963/6963 Large-Scale Programming and Testing**

This course focuses on software development techniques in support of large-scale software projects and maintenance. Specific topics include various programming paradigms and techniques, approaches to testing and automation, debugging, refactoring, and inheriting code. Individual and team assignments are required, including programming assignments. Project topics include text processing, building a search engine, and the like.

Prerequisites/Corequisites: Prerequisites: CSCI 2300

(4) **CSCI 4969/6966: prereq is CSCI 2300; description:**

"A project-oriented coding course in which we will examine Linux kernel code and make modifications to the operating system. Part of the course will be a survey of the kernel and organization of subsystems, but the primary focus will be in the networking code. Students should have a good grasp of operating systems concepts and C programming before taking this course, and be willing to run a virtual machine on their computer. Projects may be open-ended and will likely involve group work."

(5) **CSCI 4977/6962: prereq is CSCI 2300; description:**

"This course is an interdisciplinary introduction to network resilience and its applications in both science and engineering. Classes will interchangeably present the chapters from these textbooks with emphasis on the current active research related to network resilience, robustness, stability, and control. Topics to be covered include the network theory, dynamical systems, data analysis, and applications to biology, ecology, sociology, technology, and other fields. Students will learn about the ongoing research in the field, and ultimately apply their knowledge to conduct their own analysis of a real network data set of their choosing as part of the final project."

(6) **CSCI 6969: description:**

"This course provides graduate students with invaluable information and guidance for succeeding as a graduate student in computer science. Specific topics covered by faculty and guest speakers each week include writing papers and proposals, giving talks, finding and reading research papers, fellowship applications, career paths after graduate school, and so on."

**MGMT 4960: Student Managed Investment Fund**

The Student Managed Fund course actively invests real capital using financial market principles. The goal of the fund is to produce excess returns consistent with the performance of long/short hedge funds through the use of fundamental, technical, and quantitative strategies driven by economic fundamentals. The goal of the course is to directly apply, in a real world environment, the analytical financial skills developed within other Lally courses and to provide students with both instructor and peer real-time feedback for their work. Students will be actively engaged in discussion of economic events, market developments, investment strategies, and portfolio risk in every class session."
MTLE 4960/6960 Material Informatics and Data Science  Credit Hours: 3

Introduction to machine learning and data science, with case studies in discovery of structure-property relationships and new materials from experimental and computational data. Brief review of required background in linear algebra and statistics with hands-on exercises in Python. Data science topics: model fitting, clustering, dimensionality reduction, ontologies, Bayesian inference and design of experiments.

Prerequisites: CSCI 1100 and MATH 2010, or permission of instructor.

MANE-2960-Thermodynamics

Introduction to the First and Second Laws of Thermodynamics for open and closed systems. Thermodynamic properties of solids, liquids, and gases. Elementary power and refrigeration cycles.

NOTE: this course is only for Class of 2021 Mechanical Engineering and Nuclear Engineering students who opt in to the Class of 2022 curriculum.

MANE-4946-Control Systems Engineering

Cross-listing of ECSE-4440 Control Systems Engineering. Prerequisite: ECSE-2410 Signals and Systems, or MANE-4050 Modeling and Control of Dynamic Systems and ENGR-2300 Electronic Instrumentation. Students may not get credit for both ECSE-4440 and this course.

MANE-6960-Experimental Methods in Macro/Micro Fluid Dynamics

Theory and practice of experimental fluid mechanics at macro and micro length scales will be studied primarily through lectures and augmented with a few laboratory demonstrations.

Topics will include:

1. Necessary tools (fundamentals of optics, including geometric optics and Gaussian optics, microscopy, lasers; also signal processing);
2. Flow visualization (topics ranging from Schlieren imaging to laser-induced fluorescence);
3. Velocity measurements (including the theory and practice of laser-Doppler velocimetry; particle image velocimetry, including cross-correlation and auto-correlation techniques; hot-wire anemometry, etc.); and
4. Interfacial measurements (including nonlinear optics and Brewster angle microscopy).

Prerequisite: At least one course dedicated to the fundamentals of fluid mechanics, such as MANE-4070 Aerodynamics 1, MANE-4800 Boundary Layers & Heat Transfer, or MANE-6520 Fluid Mechanics
MANE-6961-Advanced Heat Transfer
Graduate level cross-listing of MANE-4710 Heat Transfer. Students may not get credit for both courses.

MANE-6962-Experimental Mechanics
We will study the design and analysis of experiments in solid mechanics, including some applications in biomechanics. Methods for experimental stress analysis and the mechanical testing of materials will be discussed. Measurement techniques, instrumentation, and data acquisition for key mechanical parameters such as displacements and forces (point and full-field measurements). Mechanical behaviors include creep and relaxation, high strain rate, fracture, fatigue, and aspects of biological soft tissues.

MANE-6963-Advanced Design Optimization
Graduate level cross-listing of MANE-4280 Design Optimization. Students may not get credit for both courses.

MANE-6967-Rotorcraft Dynamics and Aeroelasticity
The course will cover rotor flap dynamics and related mathematical concepts in detail, coupled flap-lag-torsion dynamics, aeroelastic stability in hover and forward flight, aeromechanical instability (ground and air resonance), rotorcraft vibration, and vibration reduction concepts.

Prerequisites: MANE-4900 Aeroelasticity & Structural Vibrations and MANE-4200/-6060 Rotorcraft Performance, Stability, and Control, or equivalent.

ARTS 296X: Sound Recording & Production
Justin Yang
This course covers historical, theoretical, practical and creative aspects of sound recording and production. Topics include microphone theory and placement, acoustics, recording studio use, mixing desk use, digital audio workstation, mixing, editing, and mastering.
Term: Summer I
Day/Time: M/R 10:30-12:35
Space: DCC
Size: 18

ARTS/GSAS 496x/696x: AR Design for Cultural Heritage
Rebecca Rouse
Students work in interdisciplinary teams to design and develop functioning prototype mobile augmented reality (AR) applications for cultural heritage. This semester, students will collaborate with the City of Cohoes to develop a series of interactive murals to accompany new parks in the historic downtown district. Students with backgrounds in computer science, games, visual media, sound design, HCI, architecture and storytelling are welcome.
IHSS-196X: History of Jazz and Improvised Music  
Matthew Goodheart

In the century since the first commercial jazz recording, the energy, vitality, and challenging nature of jazz has had a major impact on music throughout the world. This course explores the emergence, evolution, and influence of jazz in America, Europe and beyond, and examines the many controversial musical, social, and philosophical questions it continues to provoke.

IHSS 196X: Music and Nature  
Justin Yang

Music and Nature is a course exploring the intersections between music and nature from a variety of disciplinary perspectives – artistic, scientific, spiritual/religious. Music will be approached as artistic expression, drawing on diverse world cultures, as well as a form of knowledge that can heighten our sensitivity and awareness of the environment and natural processes.

ARTS 196X: Fundamentals of Music and Sound  
Matthew Goodheart

This course is a hands-on introduction to the primary building blocks of music and musicianship in a 21st Century context. The course will explore acoustics and psychoacoustics, rhythm, pitch, harmony, melody, timbre, improvisation, composition, and music notation through engaged listening practices and creative projects. No formal musical background is expected. This course may be taken by those who wish go on to Music and Sound I and II.

ARTS 296X: Contemporary Improvisation Ensemble  
Matthew Goodheart

This ensemble explores a variety of contemporary group improvisational practices that draw upon the creativity of the performer to make spontaneous and original music. Among the techniques explored will be conduction, musical games, graphic and text scores, and cell-structure improvisation. No prior experience with improvisation is required, and participants from any musical background, including electronic and computer music, are encouraged to join.

ARTS 296X: Sound Recording & Production  
Justin Yang

This studio based course covers the theory, practice and creative use of sound recording and production techniques. Topics include sound basics, acoustics, microphone theory and placement, mixing, mastering, recording console use, and digital audio workstations. Emphasis will be placed on hands on experience with a professional recording studio and equipment.

ECON 496X/696X: Econometric Methods for Big Data  
Chad Stetcher

Examine advanced econometric and statistical methods for the analysis of high-dimensional data, otherwise known as “Big Data.” In this setting, detailed information for each unit of observation informs machine learning techniques such as decision trees; neural nets; deep learning; classification and regression trees; penalized regressions; boosting; and bagging.
Application of these techniques will include study of healthcare demand and supply modeling, and behavior of consumers and businesses. 
Prerequisites: ECON 1200 & MATH 2010

ECON 496X/696X: Health Economics
Jason Huh
Also cross-listed as 6000 level course Examine various facets of the healthcare industry. Application of microeconomic theory and tools will be used to: analyze healthcare demand and supply; examine the impact of public policies; study market segments such as health insurance and pharmaceuticals; explore economic choices of healthcare professionals; identify potential socioeconomic and demographic determinants of health status and healthcare; and gain insights into issues related to the ongoing healthcare policy reform. Prerequisites: ECON 1200 & MATH 1010

ECON 496X/696X: Behavioral Economics
Chad Stecher
Also cross-listed as 6000 level course Integrate theory from psychology, neuroscience, and other social sciences into traditional economic models of human behavior. By relaxing the standard assumptions of perfect rationality and selfishness, more realistic modelling features such as loss aversion, myopia, framing, mental accounting, information salience, and social norms can improve the accuracy of economic analyses. These techniques are used to analyze decision-making across a wide range of settings with an emphasis on health behaviors, health insurance markets, and healthcare policy. Prerequisites: ECON 1200 & MATH 1010

ECON 4150/6150: Economics of Government Regulation
Vivek Ghosal
Also cross-listed as 6000 level course [This course is already in the catalog, but will undergo description changes.] Examine regulations related to the environment, intellectual property rights, healthcare, and antitrust. Examine the interaction between regulatory policies and how businesses respond to them with respect to innovation, production, and pricing. Some of the industries and markets examined to highlight the regulatory policy issues include automobiles, information technology, telecommunications and media, healthcare services, pharmaceuticals, medical devices, retail sector, high-speed rail, and taxi and ridesharing. Prerequisites: ECON 1200 & MATH 1010.

ARTS 696X: Composition Seminar
Composition Seminar focuses on music composition designed to prepare students for the more extensive creative work involved in the Senior Thesis. The course asks students to model a variety of compositional types of as a means to exposing them to different systems of musical organization and to help them discover a musical linguistic practice that resonates with their own creative aims.

IHSS-196X: Philosophy, Technology and the Human Future
This course explores the philosophical and ethical implications of cutting edge technological developments that promise to shape – and perhaps to jeopardize – human life and society in the 21st Century: Prospects of a coming technological "Singularity," in which hyper-intelligent
machines may leave humanity in the dust. Killer robots. The cloning of human beings. Genetic modification for superhuman abilities. Students will improve their insight as well as their critical reasoning skills as we examine, analyze, and evaluate each of these controversial topics through the lens of philosophical reasoning. This is a communication intensive course.

**IHSS-196X: Great Ideas in Philosophy**

This course invites you into the world of philosophical ideas and reasoning -- to join a great conversation that has unfolded over the past 2,500 years. We will explore such issues as whether some ways of acting and living are morally better than others, as well as philosophical issues concerning the relationship between mind and body. This course will include both frequent discussion and written assignments, and will aim to help you develop your skills in each of these modes of communication. This is a communication intensive course.

**IHSS 6960: Research Methods**

*Michael Century*

This course provides a forum for interdisciplinary graduate discourse and community at Rensselaer. Students will curate a series of presentations by guest speakers, faculty, and graduate students. Related readings and writing assignments will be based on colloquium presentations.

**ECON 496X/696X: Applied Game Theory for Economics**

Provide set of tools to analyze strategic interactions among rational decision-makers. Introduce basic concepts in game theory: Nash Equilibrium, pure/mixed strategies, sequential games, subgame perfect equilibrium, backward induction, and games with incomplete information. The concepts will be illustrated by numerous business applications with an emphasis on the healthcare industry and markets, including quantity and price competition, entry and exit, bargaining, and issues of adverse selection. Prerequisites: ECON 1200 and MATH 2010. ECON 2010 is highly recommended.

**COGS 4964 Sensibilities: Writing X Discipline**

“Sensibilities”—a special ART_X@Rensselaer (Art Across the Curriculum) seminar—draws from the tremendous resource of EMPAC to inspire students to cultivate writing skills through the cross-disciplinary theme of the senses/perception. During the semester students will have opportunities to observe unique art/science presentations and performances in an intimate setting at EMPAC, providing rich experiences for discussions and writing. Classes include reading science and art texts, as well as writing workshops to develop authorial voice and experimentation. Prerequisites: PSYC1200, or PHIL/PSYC 2120, or permission of instructor This course is Communication Intensive.

**ARTS 2963: DESIGNING MUSICAL GAMES**

Students will explore the artistic role of music and sound in gaming by building their own interactive sound and music-rich games and 2D/3D rendered environments. Within the context of their own creative game projects, students will learn the basics of designing sound and composing music for interactive game spaces. Using workflow programming languages and software tools, students will program basic gaming interactions, link them to interactive audio software, and create musical gaming experiences.
IHSS 196X: DESIGN AS GLOBAL CHALLENGE

This course explores the roles of design, technology, and engineering in addressing complex global challenges spanning environmental, economic, and cultural domains. Using a project-based learning approach, the class allows students to work in interdisciplinary teams to design, propose, and advocate their own creative solutions to enduring global challenges. In addition to project work, students will be expected to do weekly reading, to discuss readings in class, and to write reflection pieces based on their readings. This course is designed to help students draw connections between modes of inquiry commonly found in the humanities, arts, and social sciences and those of engineering and the sciences. The class will meet in a once-weekly lecture and twice-weekly breakout sessions that include hands-on project work.

STSS 296X: Society by Numbers

Study of global and national population trends with an emphasis on how population growth and decline affects migration, urbanization, economic development, sustainable development, environmental degradation, food scarcity, and political conflict.

IHSS 196X: Human Rights in History

Sohasky

This course explores the historical development of modern international human rights through the lens of American foreign policy. Through lecture and discussion, this course will guide students in critical analysis of the narratives and national myths surrounding human rights in the history of the United States and the world. Major themes include the origins of human rights, human rights abuses, the human rights regime, human rights institutions, and problems of enforcement. Freshmen only.

IHSS 196X: Open Source Art, Music and Culture

Malazita

The concept of “Open Source,” once exclusively linked to a certain kind of politically and economically engaged set of software production, has experienced a period of growth and transformation in the 21st Century. “Open Source” projects can now be found in disciplines and activities ranging as wide as computer science, hardware development, artistic practice, design, bio hacking, and social justice work, as well as in artistic and technological experimentations in LGBTQ and racially intersectional communities. Though “Open Source” practices across all these domains vary wildly, a common thread that runs through all these groups is the commitment to collaboration and to distributed “making” tools. Through a hybrid of readings, discussions, and collaborative papers and art projects, this class will explore the dynamics and politics of Open Source knowledge, collaboration, and distributed technical and artistic production. Freshmen only.

IHSS 196X: Religion in a Global World

Royer

This course explores the role of religion and ritual in the everyday lives of people around the world. It will introduce students to key concepts, themes, and debates in social science and their relevance to present-day issues. We will read classic texts and recent ethnographic reports relating to very different types of societies, from traditional non-western cultures to modern American culture. Freshmen only.
STSS/H: Medicine and Society
Cook
This course explores the social dimensions of health and medicine, examining factors shaping disease, access to health care, and therapeutic choices. It also explores the different stakeholders in health (doctors, nurses, patients, parents) and their interaction.

STSS 496X: STS Research Design
Kinchy
This is the first part of a two-semester senior project sequence for majors in STS Sustainability Studies and Science and Technology Studies. Students who successfully complete this course will be able to identify and investigate important research topics, construct theoretically-informed research questions, select research methods that are appropriate to their questions, review the relevant research literature, and compose compelling research proposals. Students will practice methods of locating, generating, managing, and analyzing diverse forms of data, as relevant to their senior projects. The course also addresses research ethics and the practical challenges of carrying out a research project.

IHSS 1968.01 BLENDED REALITY & INTERNET
Increasingly we live in a blended reality where life and the internet are intertwined. This course provides the students with an opportunity to develop a multidisciplinary perspective on the impact of blended reality; enhancing their capacity to critically evaluate the impact of technology on contemporary life. This class is a joint venture; students provide the content knowledge of technology while the professor provides human perspective.

IHSS 1969.01 ARE HUMANS RATIONAL?
This course is an introduction to the philosophy of mind and cognitive science. Students meet in small sections to have class discussions and debates about questions like: What are minds? Are minds physical or non-physical? If minds are purely physical, do we have free-will? If we don’t have free-will, do we have moral responsibilities or rights? How are we defined anyway? Does our reliance on technology turn us into cyborgs? How close are we to building an intelligent robot or machine? Do we want to? Students will learn how to make a philosophical argument, and how to express them in writing or thorough an oral presentation.

BRINGSJORD

STSS 6963 WRITING PRACTICUM
Set writing goals, complete a writing project, and exchange constructive feedback on works in progress. Students enrolled in this course are expected to make consistent progress toward their own writing goals and will receive peer review at various stages of their writing. Enrolled students are also expected to provide peer review for about two papers each month. Restricted to STS graduate students. (1 Credit)

NIEUSMA
ARTS 296X: Private Music Lessons:
- Violin
- Viola
- Cello
- Bass
- Flute
- Oboe
- Clarinet
- Bassoon
- Saxophone
- Trumpet
- French Horn
- Trombone
- Tuba
- Piano
- Harp
- Percussion
- Voice

Individual instruction in 15 1 hour private meetings. Provided on violin, viola, cello, bass, flute, oboe, clarinet, bassoon, saxophones, trumpet, French horn, trombone, tuba, piano, harp, percussion, voice. On registration students should contact Professor Nicholas De Maison (demain@rpi.edu) indicating their instrument. A lab fee applies: $990

ARTS 2961: BOARD GAME SCULPTURE
Jefferson Wille Kielwagen
A hands-on sculpture class focused on design and fabrication of board games. Students generate original game ideas and employ woodworking, mold-making, casting and other sculptural crafts to fabricate game boards and pieces.

GSAS 2961: Films Every Game Designer Should See
Michael Lynch
This course explores a number of cinematic concepts (using excerpts and entire films) that can be of use to game designers. The concepts range from the purely technical (camera, lenses, lighting, composition) to narrative (storytelling conventions, handling of time and space, etc.). The objective of the course is to allow game designers to gain insights into techniques for telling a broader range of stories than have traditionally been found in video games.

ARTS 4965/6065  Biopunk: Arts Lab Practices
Kathryn High (P)
"Biopunk: Arts Lab Practices" is both a studio, lab and lecture class encouraging student participants to become science literate and to investigate the complex microbiomes of our environment. We will use punk and biological laboratory techniques to creatively produce science, design and art works in a wet lab. Students will be required to complete readings, experiment, and create their own visions of a speculative biofuture.
BMED 4961/6961

Starting with the introduction of the probability distribution of one or two continuous random variables, basic concepts of mean, variance, covariance and correlation coefficient are covered. Description techniques discussed include stem-and-leaf plots, histograms, box plots, and probability plots. Confidence intervals for a single sample and for two samples are constructed on means and variances. The procedure of hypothesis testing is introduced conceptually followed by solving real-life biomedical problems. The design and performance of engineering experiments involving a single factor are discussed, where the analysis of variance is used to extract information from data. The course also shows how to determine situations where nonparametric procedures should be applied. Several nonparametric statistics are introduced.

ARTS 4962 IRS: SONIFICATION ART & SCI.

Interdisciplinary Research Seminar: Sonification, Art and Science

Prof Hamilton

Sonification, or the use of sound to represent data, is at the same time a science and an art form. This advanced research seminar focuses on tools and methodologies used in both artistic and scientific interest areas to sonify data, exploring topics such as auditory display, large-scale data sets, procedural audio, real-time data streams and musical sonification. Students will investigate prior research into sonification as well as design and develop creative sonification projects.

ARTS 2963 DESIGNING MUSICAL GAMES

Prof Hamilton

One of the most exciting areas of music technology development is happening in the realms of gaming and interactive virtual space. Students will explore the artistic role of music and sound in gaming by building their own interactive sound and music-rich games and 2D/3D rendered environments. Within the context of their own creative game projects, students will learn standard and extended techniques for sound design and musical composition for interactive game spaces.

Course title: Empathy & Emotions

COGS4962/PSYC4960

Course description: This course is an introduction to the emerging field of Social and Affective Neuroscience — a field focused on understanding the brain mechanisms of emotions within and between individuals. The course explores the neuroscience of empathy/emotions from a basic science approach (hormones, neurotransmitters, brain pathways) to a psychological one considering the entire organism (body+mind) within a developmental and sociocultural context. Special attention will be paid to considering emotion as a cognitive process and related to well-being.
COGS 4965/6965: Artificial Intelligent Agents

Sergei Nirenburg

This class will be devoted to investigating the ways of making machines that think, communicate and act by means of understanding how people think, communicate and act. Among the topics expected to be covered are: the basics of artificial intelligent agents and cognitive systems; issues related to content – knowledge, memory, human-like learning; a variety of topics in deep language understanding, including human-robotic interaction; decision-making, reasoning and mindreading; emotions; case studies of cognitive systems. We will also address methodological issues related to developing cognitive systems as well as some societal and philosophical issues related to this area of research and development. The class will combine lectures and seminar-style discussion of assigned literature. Reading will be an essential component of this class. Active participation in class discussion will be required and will constitute a significant part of the final grade. Exams will test the students’ understanding of basic concepts presented in lectures and in assigned literature. There will be no traditional programming projects. However, the instructor reserves the option of assigning tasks related to knowledge programming – acquisition of knowledge elements, such as ontological concepts and semantic lexicon entries – both in homework and on exams.