ITWS-6960/ITWS 4960 Data and Society

The ubiquitous availability of digital information has transformed the world as we know it. This has created a paradigm shift from information-poor to information-rich, and impacts virtually every part of society. This course is a data topics course that provides an overview of the ways in which society is leveraging and responding to social, organizational, policy, and technical opportunities and challenges of a digitally-enabled world. Course topics and readings will sample a broad spectrum of areas of a data-enabled society and are described below. The prerequisite is Data Science (CSCI/ERTH/ITWS 4350/6350) or permission from the instructor.

Cross listed with CSCI 6370/CSCI 44370

3/4 credits

Instr. – Berman

COMM 296X: Language in Real Time

Sarah Seeley

This course offers an introduction to theories and methods used to study language in its real time contexts. We will begin by exploring the structure of sounds, words, and phrases. We will move on to investigate how language variation at those structural levels bleeds into social life – including the cultural and socio-historical production of identities, ideologies, and inequalities. A series of writing assignments will allow students to participate in both public and academic debates about language. Students will learn to conceptualize critical thinking and composing as processes – including the creation, development, organization, and revision of ideas and arguments.

ARTS/GSAS 496x/696x: AR Design for Cultural Heritage

Rebecca Rouse

Wednesdays, Noon - 3:50pm

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-1978: History of Jazz and Improvised Music
Matthew Goodheart
Meeting times
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
Meeting times
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
Meeting times
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
Meeting times
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

Meeting times

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.

**ARTS 496X/696X: Interdisciplinary Research Seminar: Experimental Music & Sound Art**

Justin Yang

Meeting times

This is a history and analysis course that surveys 20th and 21st century experimental music and sound art. The last hundred years of music has been marked by continuous change, a proliferation of different styles and approaches, and challenges to what music is and can be. This course investigates experimentalism in a broad sense from the breakdown of tonality and early experiments in Expressionism and Serialism, to the rise of Modernism and Experimental Music, through post war developments of Minimalism, improvised music, computer music, and Postmodernism.

**IHSS 196X: The Future of AI and HCI**

Ralph Noble & Mei Si

In this course, we'll jointly explore the central ideas and anticipated societal impacts of Artificial Intelligence. What is Artificial Intelligence (AI) and how will it shape the world in the decades to come? What ideas enable machines to see, use language, and reason, and how will these machines affect the world? This course intends to introduce students to the state of art development in AI, and open the discussion of how the growth of AI impacts individuals and society, and ultimately how we can make AI better serve people’s needs. With the rapid development of technologies, AI is playing an increasingly important role in our society. They can not only facilitate people in their everyday lives (e.g. smart home, Siri and other chatbots that provide directions and other useful information, Amazon’s drones for making deliveries), but also have the power of monitoring and manipulating people’s interaction. The study of AI therefore should come not only from the technological perspective, but also social and psychological perspectives. This course could provide an excellent gateway course for an HCI concentration where human computer interactions are construed in the broadest possible terms. This course could provide an excellent foundation for the informed and responsible use of computer-based technology.
IHSS 196X: Contemporary Africa

Cynthia Cook

This course will introduce students to the sociology of Africa via film, literature, and ethnography. Through the print and visual media, students will be exposed to the culture, health, demography, and the politics of the continent. We will study pre-colonial, colonial, and post-colonial Africa as well as contemporary economic, social, and political issues for a select group of African countries. By the end of the course you should have a better understanding of the people and culture of Africa.

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.

ECON 496X: Law & Economics

Bob Jones

Market-based economies depend upon legal systems that establish and protect property rights. In this and many other instances the law is designed to encourage and support economic activity; in others it is designed to restrain certain types of otherwise rational economic behavior. This course will apply fundamental economic concepts, such as supply and demand, competition, monopoly, externalities, and Pareto efficiency to a range of legal topics, including contracts, torts, criminal, and intellectual property law to explain the economic motivation and consequences of the legal framework. For those students considering law school, this course offers an exposure to many of the legal concepts found in the first year law school curriculum.

IHSS 196X: Principles of Economics

Sarah Parrales

Every society faces the question of choosing how to use its natural and human resources to produce goods and services and how to distribute these resources among its people. This course studies how these choices are made in markets. It also explains the determinants of total output, employment, and inflation. Attention may also be given to special topics such as the environment, trade, and population.
MANE 696X: Constitutive laws and statistical mechanics of materials

SIS: CONSTIT LAWS & STAT MECH

Course covers the mathematical foundations of constitutive equations describing the mechanical behavior of materials, physical aspects governing this behavior, and statistical mechanics and multiscale tools used to derive constitutive equations based on the underlying physical processes. Topics include: elements of continuum mechanics, thermodynamics concepts relevant for constitutive laws, linear and non-linear elasticity, classical plasticity formulation, mechanism-based plasticity formulations, multiscale aspects of plastic deformation and statistics of crystal defects, elements of rheology and time-dependent behavior, statistical mechanics of macromolecular systems, constitutive laws for polymeric melts and solids, statistical mechanics of network-based materials.

Prerequisites: MANE 6250 Continuum mechanics or MANE6170 Mechanics of solids

When Offered: Spring term every third year

Credit Hours: 3

xxxxx – MANE-496x-01 (3 credit hours)

Analysis and Design of Thermal-Fluid Systems

This course extends basic concepts of thermodynamics, fluid mechanics, and heat transfer to a variety of thermal and fluid system components such as heat exchangers, pumps, fans, and piping networks. Modeling and simulation methods for design of integrated thermal-fluid and energy conversion systems, including second law analysis, will be introduced. Applications will be developed in refrigeration and air conditioning, air handling, and energy conversion systems.

Prerequisite: MANE-4010 Thermal and Fluids Engineering II.

55414 – MANE-4960-01(3 credit hours)

Multirotor UAV Design

This is a Capstone Design / Communication Intensive substitute for MANE-4860 Introduction to Helicopter Design for aeronautical engineering seniors. It concentrates on Multirotor Unmanned Arial Vehicle Design (e.g., drone design).

Prerequisite: MANE-4965 Multi-rotor Unmanned Ariel Vehicles, or permission of the instructor.
55417 – MANE-4961 (3 credit hours)

Introduction to Radiation Transport Methods

The broad goal of this course is to introduce students to basic methods that are used for simulating radiation transport processes, encountered in nuclear engineering. Radiation transport computation plays important roles in the design of new reactors, evaluation of radiation dose in medical physics, and the understanding of radiation interactions with materials. This introductory course will present the foundations of deterministic and Monte Carlo numerical methods that are widely used in the modeling and simulation of nuclear reactor design, radiation dosimetry, and radiation shielding. Some theoretical properties of the underlying transport and diffusion equations will also be developed, but only if they relate directly to computational methods. Emphasis will be placed on the three fundamental aspects of computation methods: (i) discretization methods for the transport and diffusion equations; (ii) iterative methods for solving the system of discretized equations; and (iii) Monte Carlo methods for solving general fixed-source and eigenvalue problems. A practical goal of the course is to provide students with a working knowledge of computational methods for deterministic and Monte Carlo simulations of 1-D transport problems. Students who wish to pursue this topic for more realistic (multidimensional) problems will receive the necessary background in this course.

Prerequisite: MANE-4480 Physics of Nuclear Reactors

54050 – MANE-4962 (3 credit hours)

Digital Control Systems

This is a MANE cross-listing of ECSE-4510 Digital Control Systems, taught by an Electrical, Computer, and Systems Engineering instructor. It is expected to be of special interest to Mechanical Engineers concentrating in Dynamics and Control.

Prerequisite: ECSE-2410 Signals and Systems is specified as a prerequisite, but MANE-4050 Modeling and Control of Dynamic Systems will be sufficient for students concentrating in Dynamics and Control.

55410 – MANE-6960-01 (3 credit hours)

Adjoints for Scientists and Engineers

Adjoints, also known as dual or costate variables, arise in a variety of science and engineering applications including inverse problems, design optimization, control, and uncertainty quantification. This course will introduce students to the theory and application of adjoints for partial differential equations (PDEs). Topics will include: derivation of adjoint PDEs; continuous versus discrete adjoints; adjoint consistency; sensitivity analysis; error estimation; algorithmic differentiation; and check-pointing for large unsteady problems. Students will be expected to implement algorithms as part of projects, so adequate experience with programming is highly recommended. Students must also have some knowledge of ODEs, PDEs, and suitable discretization methods.
53106 – MANE-6962-01(3 credit hours)

Spacecraft Navigation

Navigation is one of the key capabilities that enable spacecraft to explore our Solar System. In this course, we will study the methods used to determine the translational and rotational states of a typical spacecraft. We will review the most common sensors used for spacecraft navigation, including: radiometric data (focus on DSN), cameras, inertial measurement units, star trackers, and sun sensors. Detailed mathematical models will be developed for each of these. After reviewing the available sensors, we will study the most common methods for fusing asynchronous and dissimilar sensor data to create a statistically optimal estimate of the spacecraft six-degree-of-freedom (6-DOF) state. We will derive --- and students will implement --- both batch filters and sequential filters (e.g. extended Kalman filter). Students will learn when it is best to use different types of estimation algorithms for space missions. Students are expected to have a strong command of (or be willing to do a little extra learning on) the following topics: linear systems, basic probability/statistics, and state-space representation of dynamical systems.

55415 – MANE-6963-01(3 credit hours)

Advanced Multirotor UAV Design

This is a cross-listing of MANE-4960 Multirotor UAV Design. The 4000-level course is an approved Communication Intensive Capstone Design course for aeronautical engineering seniors. This 6000 level course is for graduate students.

Prerequisite: MANE-4965 Multi-rotor Unmanned Ariel Vehicles, or permission of the instructor.
ENVE 4961
Advanced Oxidation Processes

Advanced Oxidation Processes (AOPs) are efficient methods to remove organic contamination from aqueous media. The application of basic principles and equations dealing with very reactive species mainly in aqueous media will be discussed. Topics include water quality and associated pollution, material and energy balances, reactive oxygen and other species for destruction of wide range of organic contaminants.

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.

This course has a co-requisite of CIVL 6340, Bedford Design Studio.
ARCH4020.01  Bedford Sem: Advanced Building Structures (Civil)  This interdisciplinary seminar consists of students from both the School of Architecture and Civil Engineering department. Presentation of a variety of structural typologies bears direct relation to practical experience and the necessity for constructive

ARCH4170.80  Environmental Parametrics taught w/6380  The work of this course sets out to describe the meaning, values, and methods of using parametric techniques as both an analytical tool and a generative device in comprehensive performance-based building design. The students learn techniques to set-up fe

ARCH4850.01  Architectural Acoustics 2  In the spring semester, students will have the opportunity to design their own performance hall. This process will include continued studies of acoustics measurements, simulated sound fields, community noise issues, and professional practice in acoustics

ARCH4880.01  Aural Architecture w/6890  In this course, design processes in architectural acoustics will be studied from a psychoacoustical perspective. Different concepts to create physical and virtual acoustic spaces will be discussed based on perceptual design goals. Topics include ecologica

ARCH4956.01  Contemporary Furniture Design  This course provides a platform, in the form of furniture, to execute and deploy digital design, material and engineering principles at full scale. It will be conducted as a seminar and workshop and will introduce design methodologies that are unique to p

ARCH4957.01  Structural Anatomy of Buildings (through case studies)  This course will offer students a foundation and familiarity with the use of structural systems through various case studies and examples. Each case study will be presented holistically and then deconstructed and analyzed to determine structural systems u

ARCH4958.01  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 i

ARCH4959.01  PIP Performance Planning Seminar  The Production Installation Performance (PIP) Studio is an interdisciplinary studio linking Architecture and Arts with an invited artist to produce a public performance. This seminar will do the initial groundwork and conceptualization in collaboration w

ARCH4960.01  Contemporary Enclosure Design  This course introduces students to the technical design of building enclosures. Students undertake an enclosure design project that evolves as the design intent is inflected by considerations of materiality, system typology, structural and environmental p

ARCH4961.01  Interfaces and Virtual Worlds  The seminar looks into theories of architecture and representation that relate to the creation of immersive spaces, interfaces, interactive spaces and virtual structures. Classes and final projects will take place at the CRAIVE lab. Students will produce

ARCH4963.01  Sculpting the Intangible  "Architecture mediates our body with the environment. It describes the way we understand our position in the world and how we perform within it. Light, intrinsically attached to the spatial experience, is able to affect, transform and stimulate not only o
ARCH4964.01  Hidden Figures  "Hidden Figures’ seminar explores the back and forth process where detailed three-dimensional form is used to generate figural two-dimensional geometry. We will look at objects with delineated volumes and transform these into flattened instruments through "

ARCH4965.01  Veiled Assemblages  “Veiled Assemblages,” will focus on machined parts, joinery and projective geometry. Studying and examining a series of projections of image/graphic in conjunction with wrapping/draping, this seminar will explore the ability to visually augment objects to

ARCH4966.01  The Man Next Door: A.Hitchcock  and the Arch of Fear  This seminar explores the cinema of Alfred Hitchcock via the urban condition. The narrative structures of Hitchcock’s films often move the characters from pastoral settings to urban contexts, and vice versa. These allegories track naive or innocent charac

ARCH4967.01  Emerging Material Systems in Architecture  This research seminar looks at the impact of emerging materials, fabrication systems and methods that are upending traditional notions about design, construction, economy and materiality in architecture. Materials such as Cross Laminated Timber, recycled

ARCH4968.01  Creativity versus Responsibility Discussions about Now and Future  “Based on the theory of Universal Darwinism we will analyze competition of main forces of our universe: biological, cultural and technological.

We will study possible scenarios:

Optimistic:

“Evolution moves toward greater complexity, greater elegance, gr”

ARCH4969.01  The Arch of the Screen: Relationships Betw Film/A  While architecture is one of the oldest forms of cultural expression, film, by comparison is one of the youngest. Although seemingly at odds with one another, due to the physicality of architecture, and the image based condition of film, architecture has