IDeATe Courses
Fall 2016

For more information on these courses and IDeATe, please contact Kelly Delaney at kellydel@andrew.cmu.edu or 412-268-6440
http://ideate.cmu.edu
This document is for informational purposes only. For schedule planning, please consult the HUB's Schedule of Classes: http://www.cmu.edu/hub/courses/index.html

Portal Courses

These are the cross-training courses that serve as prerequisites for many of the IDeATe collaborative courses. Students should take a portal course in the fall semester of the sophomore or junior year.

15-104	**Introduction to Computing for Creative Practice**
Instructors:	**R. Dannenberg**
Meetings:	**MWF 9:30 – 10:20 a.m. Labs on Tuesdays, 9:00 – 10:20 a.m., 10:30 – 11:50 a.m., 1:30 – 2:50 p.m. and 3:00 – 4:20 p.m.**
Units:	**10**
Prerequisites:	**None**
Primary IDeATe Areas:	**Game Design, Animation & Special Effects, Media Design, Learning Media, Sound Design, Innovation & Entrepreneurship**
Location:	**MWF: DH A302, T: GHC 5210**
Note:	**Intended for students from DC, CFA, TSB**

An introduction to fundamental computing principles and programming techniques for creative cultural practices, with special consideration to applications in music, design and the visual arts. Intended for students with little to no prior programming experience, the course develops skills and understanding of text-based programming in a procedural style, including idioms of sequencing, selection, iteration, and recursion. Topics include data organization (arrays, files, trees), interfaces and abstraction (modular software design, using sensor data and software libraries), basic algorithms (searching and sorting), and computational principles (randomness, concurrency, complexity). Intended for students following an IDeATe concentration or minor who have not taken 15-112.

16-223	**Introduction to Physical Computing**
Instructor:	**G. Zeglin**
Meetings:	**MW 9:30 – 11:20 a.m.**
Units:	**10**
Prerequisites:	**None**
Primary IDeATe Area:	**Intelligent Environments, Physical Computing**
Location:	**HL A10 (IDeATe@Hunt Physical Computing Lab)**
Notes:	• **Intended for students from DC, CFA, TSB** • **There will be materials fees associated with this course**

Physical computing refers to the design and construction of physical systems that use a mix of software and hardware to sense and respond to the surrounding world. Such systems blend digital and physical processes into toys and gadgets, kinetic sculpture, functional sensing and assessment tools, mobile instruments, interactive wearables, and more. This is a project-based course that deals with all aspects of conceiving, designing and developing projects with physical computing: the application, the artifact, the computer-aided design environment, and the physical prototyping facilities. The course is organized around a series of practical hands-on exercises which introduce the fundamentals of circuits, embedded programming, sensor signal processing, simple mechanisms, actuation, and time-based behavior. The key objective is gaining an intuitive understanding of how information and energy move between the physical, electronic, and computational domains to create a desired behavior. The exercises provide building blocks for collaborative projects which utilize the essential skills and challenge students to not only consider how to make things, but also for whom we design, and why the making is worthwhile.

This course is an IDeATe Portal Course for entry into either of the IDeATe Intelligent Environments or Physical Computing programs. CFA/DC/TSB students can enroll under 16-223; CIT/MCS/SCS students can enroll in the 60-223 version of the course. Please note that there will be a materials fee associated with this course.

Upon completion of this course the students will be able to:

- work in a mixed physical-digital environment and laboratory
- make effective use of standard hardware and software tools for physical computing
- approach complex physical computing problems with a systematic overview that integrates iterative research and design steps
- generate systems specifications from a perceived need
- partition functionality between hardware and software
- produce interface specifications for a system composed of numerous subsystems
- use computer-aided development tools for design, fabrication and testing and debugging evaluate the system in the context of an end user application or experience.

18-090	**Digital Media Interactions: Signal Processing for the Arts**
Instructor:	**J. Stiles**
Meetings:	**MW 9:30 – 11:20 a.m.**
Units:	**10**
Prerequisites:	**None**
Primary IDeATe Area:	**Sound Design, Intelligent Environments**
Location:	**HL 106B (IDeATe@Hunt Studio A)**
Notes:	**Intended for students from DC, CFA, TSB**

This course presents an overview on manipulating and synthesizing sound, video, and control signals. Signals are the raw materials used in many forms of electronic art and design - electronic music, interactive art, video art, kinetic sculpture, and more. In these fields, signals are used to represent information about sound, images, sensors, and movement. By transforming and manipulating these types of signals, we are able to create powerful new tools for digital art, multimedia applications, music, responsive environments, video and sound installation, smart products, and beyond. In this course we will study Signal Processing from a practical point-of-view, developing tools that can be easily integrated into art-making using the graphical programming environment Max (a.k.a. Max/MSP/Jitter). We will present a survey of Signal Processing techniques used in the sonic and visual arts, and will discuss the mathematical theories underlying these techniques. Students will be encouraged to combine, modify, and extend working examples of software to create original digital artworks.

60-212	**Electronic Media Studio: Interactivity and Computation for Creative Practice**
Instructor:	**G. Levin**
Meetings:	**F 8:30 – 11:20 a.m., 1:30 – 4:20 p.m.**
Units:	**12**
Prerequisites:	**Some prior programming experience**
Primary IDeATe Area:	**Game Design, Animation & Special Effects, Media Design, Learning Media, Sound Design, Innovation & Entrepreneurship**
Location:	**CFA 111 (STUDIO for Creative Inquiry)**
Notes:	**Intended for students from School of Art**

This is an intermediate level course in "creative coding," interactive new-media art, and computational design. Ideal as a second course for students who have already had one semester of elementary programming (in any language), this course is for you if you'd like to use code to make art, design, architecture, and/or games -- AND you're already familiar with the basics of programming, such as for() loops, if() statements, and arrays.

This course satisfies the EMS-2 (60-210: Interactivity) requirement for BFA and BXA-Art majors. As with EMS-2, students in this course will develop an understanding of the contexts, tools, and idioms of software programming in the arts. Unlike EMS-2, this course additionally satisfies the computing portal requirement for CFA students pursuing IDeATe minors and concentrations. (Students with no prior programming experience should register instead for 15-104, 15-110, or 15-112.)

This is a "studio art course in computer science," in which the objective is art and design, but the medium is student-written software. The course develops skills and understanding of text-based, imperative programming techniques in a variety of popular open-source arts-engineering toolkits, including p5.js (JavaScript), Processing (Java), and openFrameworks (C++), with the aim of applying such skills to interactive art and design, information visualization, generative media, and other creative cultural practices.

Rigorous programming exercises will develop the basic vocabulary of constructs that govern static, dynamic, and interactive form. Topics include the computational manipulation of: point, line and shape; texture, value and color; time, change and motion; reactivity, connectivity and feedback; interactive graphics, sound, and simulation; and the incorporation of various modes of input (sensors, cameras) and multimedia output.

60-223	**Introduction to Physical Computing**
Instructors:	**A. Momeni**
Meetings:	**TR 6:30 – 8:20 p.m.**
Units:	**10**
Prerequisites:	**None**
Primary IDeATe Area:	**Intelligent Environments, Physical Computing**
Location:	**HL A10 (IDeATe@Hunt Physical Computing Lab)**
Note:	• **Intended for students from CIT, SCS, MCS** • **There will be materials fees associated with this course**

Physical computing refers to the design and construction of physical systems that use a mix of software and hardware in order to sense and respond to the surrounding world. Such systems include digital+physical toys and gadgets, kinetic sculpture, functional sensing and assessment tools, mobile instruments, interactive wearables, etc. This is a project-based course that deals with all aspects of conceiving, designing and developing projects with physical computing: the application, the artifact, the computer-aided design environment, and the physical prototyping facilities. The class consists of students from different disciplines who collaboratively synthesize and implement several systems in a short period of time. The course is organized around a large set of essential skills that students must gain in order to effectively tackle physical computing problems. It is then deployed through a series of quick group projects that utilize the essential skills and challenge students to not only consider HOW to make things, but also for WHOM we design, WHEN the time is ripe, and WHY the making is worthwhile/necessary. Upon completion of this course the students will be able to: work in a mixed physical-digital environment and laboratory make effective use of standard hardware and software tools for physical computing approach complex physical computing problems with a systematic overview that integrates iterative research and design steps generate systems specifications from a perceived need partition functionality between hardware and software produce interface specifications for a system composed of numerous subsystems use computer-aided development tools for design, fabrication and testing and debugging evaluate the system in the context of an end user application or experience.

62-150	**Introduction to Media Synthesis & Analysis**
Instructors:	**D. Byrne**
Meetings:	**TR 9:00 – 10:20 a.m.** **F 9:30 – 10:20 a.m. or F 10:30 – 11:20 a.m.**
Units:	**10**
Prerequisites:	**None**
Primary IDeATe Area:	**Game Design, Animation & Special Effects, Media Design, Learning Media, Sound Design**
Location:	**HL 106B (IDeATe@Hunt Studio A)**
Notes:	**Intended for students from CIT, SCS, MCS**

New creative industries are empowering new modes of collaborative consumption, creation and reuse of media. This often relies on successful collaborations between cross-trained artists, designers and technologists as well as critical reflection on distribution, participation, interaction and audience. This course is designed to prepare engineers and scientists to work in these contexts. By the end of the course, students will be able to think critically across several media theory paradigms; formulate the intent of their creative work; articulate relationships to art/design practice and theory; and respond insightfully to creative outcomes. The goal is not just to make creative media rich outcomes but also to think critically about their production.

The class will introduce core concepts through foundational texts, in-class exercises, collaborative projects, and group critique. Students will ground concepts such as critical design, computational performance, embodiment, emergence, composition, participatory interfaces, and media editing through hands-on, applied exploration. Weekly lab sessions will also support the development of new skills and practical development of digitally mediated content.

Collaborative Courses

These courses are the new collaborative courses and studios that were created specifically for IDeATe.

18-099	**Mobile App Design and Development**
Instructors:	**P. Narasimhan**
Meetings:	**MW 11:30 a.m. – 12:50 p.m.**
Units:	**12**
Prerequisites:	**15-104 or 18-090 or 62-150**
Primary IDeATe Area:	**Media Design**
Location:	**HL 106B (IDeATe@Hunt Studio A)**

IDeATe is partnering with YinzCam to develop and offer a studio course on mobile app design and development. The course will leverage the extensive expertise of YinzCam on mobile-app development in the sports and entertainment space, both for real-time and asynchronous enrichment of the fan experience and the stadium experience. However, the lessons learned will apply to mobile-app development broadly. Issues covered will include cross-platform development, mobile video, streaming media, real-time content delivery, along with best practices in server-side cloud management for large-scale mobile-app deployment. Please note that this course is for students to take as one of their IDeATe concentration/minor options and will NOT fulfill a CIT/ECE requirement. Open to juniors and seniors. DC and MCS students should take the course after completing another IDeATe collaborative course.

05-291	**Learning Media Design**
Instructors:	**M. Louw**
Meetings:	**TR 10:30 – 11:50 a.m.**
Units:	**12**
Prerequisites:	**05-292**
Primary IDeATe Area:	**Learning Media**
Location:	**HL 106C (IDeATe@Hunt Studio B)**

Learning is a complex human phenomenon with cognitive, social and personal dimensions that need to be accounted for in the design of technology enhanced learning experiences. In this studio course students will apply learning science concepts to critique existing forms of learning media, establish a set of design precedents to guide project work and produce a series of design concepts that support learning interactions in a real-world context. Collaborating in small interdisciplinary teams, students will partner with a local informal learning organization (e.g. museum, after school program provider, maker space) to conduct learning design research studies, synthesize findings, establish learning goals and iteratively prototype and assess design concepts. As final deliverables, students will present their design research findings, design concepts, and prototypes to stakeholders, and draft a media-rich proposal for their learning media concept to pitch to a local funder.

16-375/54-375	**Robotics for Creative Practice**
Instructors:	**G. Zeglin**
Meetings:	**MW 1:30 – 3:20 p.m.**
Units:	**10**
Prerequisites:	**15-104 or 15-112 or 15-122 or 16-223 or 60-223**
Primary IDeATe Area:	**Intelligent Environments, Physical Computing**
Location:	**HL A10 (IDeATe@Hunt Physical Computing Lab)**

This project-oriented course brings art and engineering together into making machines which are surprisingly animate. Students will iterate their concepts through several prototypes focused on using embodied behavior as a creative medium for storytelling, performance, and human interaction. This year we will work with human-scale machines constructed using CNC-cut plywood and pneumatic actuation, culminating in a group performance. Students will learn skills for developing and programming performance behaviors, designing expressive kinetic systems, and rapidly prototyping simple robots. Technical topics include systems thinking, dynamic physical and computational behavior, autonomy, and embedded programming. Discussion topics include both contemporary kinetic sculpture and robotics research. Interested students without the specific prerequisites should contact the instructor.

16-456/48-558	**Reality Computing**
Instructors:	**P. Matikainen, J. Folan**
Meetings:	**TR 1:30 – 3:20 p.m.**
Units:	**12**
Prerequisites:	**Permission of instructors**
Primary IDeATe Area:	**Intelligent Environments**
Location:	**HL A10 (IDeATe@Hunt Physical Computing Lab)**
Note:	**There will be materials fees associated with this course**

The Adaptive House is the focus of an advanced design studio based around the collaborative development of reality computing applications within a residential prototype. Reality computing encompasses a constellation of technologies focused around capturing reality (laser scanning, photogrammetry), working with spatial data (CAD, physical modeling, simulation), and using data to interact with and influence the physical world (augmented/virtual reality, projector systems, 3d printing, robotics). This studio will use reality computing to understand existing homes, define modes of augmentation, and influence the design of houses yet to be built through full scale prototyping. The objective of the course will be the production of a house that moves beyond the notion of being "smart," but is actively adapted towards its inhabitants' needs and capabilities. Topics of special focus within the course are residential design (John Folan), augmented reality and robotics (Pyry Matikainen), and indoor flying robots (Manuela Veloso and Nina Barbuto). This course is presented with the support and cooperation of Autodesk, Inc.

49-300	**Integrative Product Conceptualization**
Instructors:	**McComb**
Meetings:	**TR 10:30 a.m. – 12:20 p.m.**
Units:	**12**
Prerequisites:	**None**
Primary IDeATe Area:	**Innovation & Entrepreneurship**
Location:	**HL A5 (IDeATe@Hunt Fabrication Lab)**

The Integrated Product Conceptualization course focuses on introducing students to some of the thinking, basic skills and methods used by industrial design, engineering, and business to generate new consumer product proposals within integrated teams. Teams will progress through three phases 1) identifying opportunities for new products or services, 2) understanding those opportunities through stakeholder research, value opportunity analysis, and competitive landscape assessment, then selecting one of which to focus, 3) conceptualizing the opportunity with the goal of meeting the value proposition. This course will combine lecture and studio activities including the generation of 2D visual representation skills and 3D low-fidelity physical modeling in support of course work.

An important part of this course is a design project that is carried out by interdisciplinary teams. In order to effectively contribute to their team, each student should have experience or coursework in at least one of the following: design, the arts, engineering/technology, or business.

This course is reserved for junior and senior level students. Freshmen and sophomores will be admitted as space allows and with instructor permission.

53-451	**Research Issues in Game Development**
Instructors:	**T. Corbett**
Meetings:	**MWF 10:30 – 11:50 a.m.**
Units:	**10**
Prerequisites:	**15-104 or 16-223 or 18-090 or 60-223 or 62-150**
Primary IDeATe Area:	**Game Design**
Location:	**HL 106C (IDeATe@Hunt Studio B)**

This course covers evolving trends in technology and how they can apply to game design. Recent advancements in virtual reality, augmented reality, cloud computing, 4K video streaming, and alternative input devices are changing the way that we create, deliver, and experience games. Students will form collaborative teams to explore these platforms and address design challenges by creating games for them and testing their designs.

54-498/60-446	**Expanded Theater Fusion Studio**
Instructors:	**A. Momeni, L. Shea**
Meetings:	**TR 3:00 – 4:20 p.m.** **F 10:00 a.m. – 1:50 p.m.**
Units:	**10**
Prerequisites:	**Permission of instructors**
Primary IDeATe Areas:	**Intelligent Environments, Media Design**
Location:	**HL A10A (IDeATe@Hunt Integrative Media Lab)**

As the boundaries between theater, art, entertainment and everyday life continue to expand through engagement with new technologies, it is critical that emerging artists and technologists be provided with the tools, language, and vision to thrive in the new millennium. Expanded Theater will reanimate classical modes of performance with media, networks, robotics, locative applications, and mobile systems.

Considering theater as an ancient technology of mass participation and social cohesion, this fusion studio explores how emerging technologies can expand upon the basic theatrical relationships in new and culturally relevant ways. Collaboration and integration of design, media and storytelling is critical to this approach. Experimentation with new forms can reanimate the basic values of theater; the essential nature of a live event, the possibility of visionary spectacle, and the creation of meaning in dialogue with an audience.

Expanded Theater is an opportunity to explore avenues outside of traditional theatrical production modes and beyond each student's individual discipline. The curriculum combines resources from Carnegie Mellon's Schools of Art and Drama, Integrative Design, Arts, and Technology (IDeATe), the Emerging Media Masters (EM2), Computer Science, the Robotics Institute, and their collaborators across the university in a new configuration. Expanded Theater will explore domains ranging from site specific and networked-based performance and interventionist practices, to pervasive social media technologies and their influence on interpersonal communication. The goal is to investigate contemporary languages that allow authors, actors and technologists to collaborate in ways that push beyond our present understanding of theatrical production and reception.

60-333	**Character Rigging for Production**
Instructors:	**S. Diaz**
Meetings:	**MW 3:00 – 4:20 p.m.**
Units:	**10**
Prerequisites:	**None**
Primary IDeATe Area:	**Animation & Special Effects, Game Design**
Location:	**CFA 317**

In computer animation, rigging is the art of building a digital skeleton and control system to drive the animation of a character or object. This particular course will focus on the process needed to create fully articulated characters that are strong enough for film and/or video game production. We will start with rigging fundamentals to learn proper joint orientation for skeleton creation, focus on skinning techniques for attaching the skeleton to the character afterwards, and then work on building a system of controls to move the character in compelling ways. Certain topics will include kinematics, set driven keys, direct connections, space switching, corrective blendshapes, custom attributes, and deformation. Students interested in the artistic and technical sides of computer animation are encouraged to enroll. Previous experience with Autodesk Maya/3D animation is preferred.

62-478 A1/A2	**digiTOOL**
Instructors:	**Z. Ali**
Meetings:	**MW 10:30 a.m. – 12:20 p.m.**
Units:	**6**
Prerequisites:	**None**
Primary IDeATe Area:	**Media Design, Physical Computing**
Location:	**HL A5 (IDeATe@Hunt Experimental Fabrication Lab)**

This IDeATe-affiliated course serves as an introduction to the fundamental concepts, processes, and procedures to utilize digital and traditional equipment within the IDeATe@Hunt Library facilities. After completion, participating students should leave with a thorough understanding of laser cutting/engraving, 3D printing, CNC routing, and traditional woodworking equipment/processes; and how to operate in a safe, responsible, and efficient manner. This comprehension and experience proves useful for all creative disciplines, and participants are certified for future fabrication equipment access.

Supportive Courses

These courses are existing courses and studios that are options for IDeATe. Students participating in the IDeATe concentrations and minors will not have priority access to these courses.

05-823	**E-Learning Design Principles**
Instructors:	**K. Koedinger**
Meetings:	**TR 9:00 -10:20 a.m.**
Units:	**12**
Prerequisites:	**None**
Primary IDeATe Area:	**Learning Media**
Location:	**GHC 4301**

This course is about e-learning design principles, the evidence and theory behind them, and how to apply these principles to develop effective educational technologies. It is organized around the book "e-Learning and the Science of Instruction: Proven Guidelines for Consumers and Designers of Multimedia Learning" by Clark & Mayer with further readings drawn from cognitive science, educational psychology, and human-computer interaction. You will learn design principles 1) for combining words, audio, and graphics in multimedia instruction, 2) for combining examples, explanations, practice and feedback in online support for learning by doing, and 3) for balancing learner versus system control and supporting student metacognition. You will read about the experiments that support these design principles, see examples of how to design such experiments, and practice applying the principles in educational technology development.

15-294 A1/A2	**Rapid Prototyping Technologies**
Instructors:	**D. Touretzky**
Meetings:	**MW 6:30 – 7:50 p.m.**
Units:	**5**
Prerequisites:	**15-112 or 15-104**
Primary IDeATe Area:	**Media Design, Physical Computing**
Location:	**HL A10 (IDeATe@Hunt Physical Computing Lab)**

This mini-course introduces students to rapid prototyping technologies with a focus on laser cutting and 3D printing. The course has three components: 1) A survey of rapid prototyping and additive manufacturing technologies, the maker and open source movements, and societal impacts of these technologies; 2) An introduction to the computer science behind these technologies: CAD tools, file formats, slicing algorithms; 3) Hands-on experience with SolidWorks, laser cutting, and 3D printing, culminating in student projects (e.g. artistic creations, functional objects, replicas of famous calculating machines, etc.). Please note that there will be a usage/materials fee for this course.

15-322	**Introduction to Computer Music**
Instructor:	**J. Stiles**
Meetings:	**MW 12:00 – 1:20 p.m.**
Units:	**9**
Prerequisites:	**15-112**
Primary IDeATe Area:	**Sound Design**
Location:	**HH B103**

Computers are used to synthesize sound, process signals, and compose music. Personal computers have replaced studios full of sound recording and processing equipment, completing a revolution that began with recording and electronics. In this course, students will learn the fundamentals of digital audio, basic sound synthesis algorithms, and techniques for digital audio effects and processing. Students will apply their knowledge in programming assignments using a very high-level programming language for sound synthesis and composition. In a final project, students will demonstrate their mastery of tools and techniques through music composition or by the implementation of a significant sound-processing technique.

15-390	**Entrepreneurship for Computer Science**
Instructor:	**W. Kaigler**
Meetings:	**TR 3:00 – 4:20 p.m.**
Units:	**9**
Prerequisites:	**15-221 or 76-270**
Primary IDeATe Area:	**Innovation & Entrepreneurship**
Location:	**WEH 5421**

This course is designed to develop skills related to entrepreneurship and innovation for non-business undergraduate and graduate students in the School of Computer Science. The course assumes no background courses in business and is appropriate for those who are interested in bringing innovations to market either through new companies or existing companies. The course provides an overview of entrepreneurship and innovation, develops an entrepreneurial frame of mind, and provides a framework for learning the rudiments of how to generate ideas. Students come up with or are presented with potential ideas and learn how to develop these ideas into opportunities, and to explore their potential for becoming viable businesses. They learn how to do market research, to develop go-to-market strategies, value propositions and to differentiate their products or services from potential competitors. The focus is on understanding and developing strategies for approaching the key elements of the entrepreneurial process...opportunity, resources and team. The course consists of a balance of lectures, case studies and encounters with entrepreneurs, investors and business professionals. The students are exposed to financial and intellectual property issues, and encounter a real world perspective on entrepreneurship, innovation and leadership. The output of the course is a mini-business plan or venture opportunity screening document that can be developed into a business plan in a subsequent course entitled New Venture Creation or through independent study.

15-463	**Computational Photography**
Instructor:	**K. Kitani**
Meetings:	**MW 12:00 – 1:20 p.m.**
Units:	**12**
Prerequisites:	**15-213 AND 18-202 or 21-241**
Primary IDeATe Area:	**Animation & Special Effects**
Location:	**GHC 5222**

Computational Photography is an emerging new field created by the convergence of computer graphics, computer vision and photography. Its role is to overcome the limitations of the traditional camera by using computational techniques to produce a richer, more vivid, perhaps more perceptually meaningful representation of our visual world. The aim of this advanced undergraduate course is to study ways in which samples from the real world (images and video) can be used to generate compelling computer graphics imagery. We will learn how to acquire, represent, and render scenes from digitized photographs. Several popular image-based algorithms will be presented, with an emphasis on using these techniques to build practical systems. This hands-on emphasis will be reflected in the programming assignments, in which students will have the opportunity to acquire their own images of indoor and outdoor scenes and develop the image analysis and synthesis tools needed to render and view the scenes on the computer.

53-371	**Role-Playing Games Writing Workshop**
Instructors:	**G. Klug**
Meetings:	**TR 10:30 a.m. – 12:20 p.m.**
Units:	**12**
Prerequisites:	**15-104 or 62-150**
Primary IDeATe Area:	**Game Design**
Location:	**HL 106B (IDeATe@Hunt Studio A)**

Role playing games, mainly traditional pencil-and-paper, but recently to an extent, video RPGs as well, have matured over the last 40 years into a viable medium for modern storytelling. There is now a generation of novelists, screenwriters, playwrights and TV writers who first felt capable of telling a good story while they were an RPG games master. The course instructor is one of those writers, having won three Game of the Year awards for his RPG writing. Primarily for writers looking to work in games, this class also serves anyone interested in creating interactive stories. Additionally, more traditional linear writers who want to try their hand at "new media" will find a home in this class. The class will first examine and dissect existing RPGs (mainly using pencil and paper examples) seeking guidance for both design of RPGs as well as storytelling "best practices." Once the groundwork has been laid, the class will take an original draft story for an existing RPG world -- one from a game that was actually built -- and, having been given only the treatment document, form writing teams and 'flesh out' the story, transforming a hazy idea into form and substance, beats, missions, dialogue, Acts. Each student will be part of a three-person writing team which will first pitch a story idea for their own expanded version of the original story. Once their idea is approved, the team then design out a complete structure for that idea, followed by beat sheets, supporting characters, mission arcs, scene breakdowns, dialogue for some interactive scenes and also scripts for a single cut scene. By the end of the semester the students are delivering the backbone of their own story.

54-267	**Conceptual Sound Design**
Instructors:	**J. Pino**
Meetings:	**MW 3:00 – 4:20 p.m.**
Units:	**9**
Prerequisites:	**54-166 or permission of instructor**
Primary IDeATe Area:	**Sound Design**
Location:	**PCA 210**

Students explore the unique qualities of audio as a design element and the development of a design process through script analysis. Emphasis on the creative application and utilization of the studio in sound shaping and soundscape design. PREREQUISITE: 54-166 Introduction to Sound Design for Theater, 54-231 Design For The Stage. Drama majors have priority, however this course is also open to Music Technology majors and minors, or with permission of instructor.

54-509	**Theatrical Sound System Design**
Instructors:	**C. Evans, J. Pino**
Meetings:	**F 9:00 – 11:20 a.m.**
Units:	**9**
Prerequisites:	**54-666 and 54-166 or permission of instructor**
Primary IDeATe Area:	**Sound Design**
Location:	**PCA 210**

Intensive course exploring the theory, art and technology of large scale sound system design for entertainment, specifically live theater productions. Prerequisites: Intro to Sound Design for Theatre and Production Audio, OR permission of instructor.

57-337	**Sound Recording**
Instructors:	**R. Schulz**
Meetings:	**Mini 1 and Mini 2: M 6:30 – 7:50 p.m., W 5:00 – 6:20 p.m., W 6:30 – 7:50 p.m.**
Units:	**6**
Prerequisites:	**None**
Primary IDeATe Area:	**Sound Design**
Location:	**CFA A6**

Sound Recording (57-337, 57-947) centers around the Vlahakis Recording Studio in the College of Fine Arts: how the studio works, and how to record various types of music. The method of instruction is to learn by doing, and the goal is to achieve professional-sounding results. Equipment includes a complete 24-track Pro-Tools system, professionally designed control room that can accommodate up to 24 people, outboard preamps and other gear, and an interesting array of microphones. All recording is direct to hard disc. Grading is based on recording projects, class attendance, mastering studio hardware and software, and several quizzes.

57-347	**Electronic and Computer Music**
Instructors:	**B. Opie**
Meetings:	**Section A: TR 8:30 – 9:20 a.m.** **Section B: TR 9:30 – 10:20 a.m.**
Units:	**6**
Prerequisites:	**57171 or 57101**
Primary IDeATe Area:	**Sound Design**
Location:	**MM 119A**

This course builds on the concepts learned in Introduction to Music Technology (57-101) and gives added knowledge in the areas of composition using digital and analog devices as well as various computer programs. Building computer models of both analog and digital synthesizers as well as drum machines, loop players and various other sound processing effects will be covered in detail. Students will be required to produce several projects throughout the course demonstrating their understanding of various concepts in electronic music. More emphasis is placed on the overall quality of the end musical product than in 57-101 in order to prepare students for music production in a professional setting.

57-458	**Business of Music**
Instructors:	**L. Laduke**
Meetings:	**TR 9:00 – 9:50 a.m.**
Units:	**6**
Prerequisites:	**None**
Primary IDeATe Area:	**Sound Design**
Location:	**CFA M160**

This class will teach you the fundamentals of how to survive in the music industry. A diverse set of speakers, hands-on projects tailored to your interests and needs and group activities will introduce you to the challenges you'll face during your career. How to manage your money, what you need to know about copyright, who do you need on your side? We'll cover all of these and more!

60-130 D1/D2	**3-D Media Studio I: Hey Robot, Let's Make Something**
Instructors:	**TBD**
Meetings:	**MW 1:30 – 4:20 p.m.**
Units:	**5**
Prerequisites:	**None**
Primary IDeATe Area:	**Physical Computing**
Location:	**Various**

An introduction to three-dimensional form. Various materials and methods are explored through projects covering a broad range of sculptural concerns. Art majors must complete one Mini-1 course and one Mini-2 course to satisfy the 3DI requirement. Students are required to select two of the following four sections: The Structural Imagination (Wood and Steel); Clay Sculpture; Wearables; and Hey Robot, Let's Make Something. Materials fee may be required. Open to freshmen in the School of Art, or by instructor permission.

60-210	**Electronic Media Studio: Introduction to Interactivity**
Instructors:	**Section A: TBA** **Section B: P. Pedercini**
Meetings:	**Section A: MW 8:30 – 11:20 a.m.** **Section B: MW 6:30 – 9:20 p.m.**
Units:	**10**
Prerequisites:	**None**
Primary IDeATe Area:	**Media Design**
Location:	**CFA 318**

Electronic Media Studio: Introduction to Interactivity is an introduction to software programming and physical computing within the context of the arts. In this course students develop the skills and confidence to produce interactive artworks using audiovisual, networked and tangible media.

60-415	**Advanced ETB: 3D Animation**
Instructors:	**J. Duesing**
Meetings:	**TR 8:30 – 11:20 a.m.**
Units:	**10**
Prerequisites:	**60-110**
Primary IDeATe Area:	**Animation & Special Effects**
Location:	**CFA 317**

This studio will introduce students to a variety of 3-D computer animation techniques. The class will look at and discuss examples of historic and contemporary animation. The students will explore animation through a variety of short experiments and develop individual projects that use animation as a means of self-expression.

60-419	**Advanced ETB: Experimental Game Design**
Instructors:	**P. Pedercini**
Meetings:	**MW 1:30 – 4:20 p.m.**
Units:	**10**
Prerequisites:	**60-210**
Primary IDeATe Area:	**Game Design**
Location:	**CFA 307**

Experimental Game Design: Playing Stories is a hands-on game design course focused on innovative and expressive forms of gameplay. The emphasis is on the complex relationship between storytelling and games: from point-and-click graphic adventure games to AI-driven interactive narratives. The class involves frontal lectures, design exercises and in-depth analysis of works from the digital arts and the independent gaming world. This installment of Experimental Game Design does not require any substantial coding experience but all students will be required to tackle some programming and produce visual content.

70-395	**Funding Entrepreneurial Ventures**
Instructors:	**S. Bollinger**
Meetings:	**W 6:30 – 9:20 p.m.**
Units:	**9**
Prerequisites:	**None**
Primary IDeATe Area:	**Innovation & Entrepreneurship**
Location:	**IA SIM AU**

So you want to do a startup and you know that you need funding. There are multiple ways to fund a new venture: bootstrapping, economic development, angels, venture capitalists. The question is what are these funders looking for in an early stage investment? What is important to them? How do they decide which companies to invest in and which not? This class looks at funding from the funder's point of view and provides the student with a framework of the investment process: investment criteria, sourcing, selection, due diligence, deal structure, valuation, post investment involvement. Real companies seeking funding are used for the final project in which students will be expected, as investment teams, to make investment decisions and convince their fellow investors (the class) to join them (or not). This is a highly interactive and project class. There will be multiple guest speakers. Prerequisites: Students are highly encouraged to take any of the introductory entrepreneurship classes offered in various schools and departments. While no financial background is required, this class will not cover the basics of entrepreneurship from the entrepreneur's perspective, but will be looking from the investor point of view.

70-414	**Entrepreneurship for Engineers**
Instructors:	**R. Daley, D. Mawhinney**
Meetings:	**M 6:30 – 9:20 p.m.**
Units:	**9**
Prerequisites:	**None**
Primary IDeATe Area:	**Innovation & Entrepreneurship**
Location:	**SH 125**

This introductory course in entrepreneurship primarily targets non-business students and assumes no background in business. Students majoring in science, computer science, engineering, the humanities or the arts are exposed to fundamental concepts and issues around innovation and entrepreneurship. The course provides a foundation for starting a new venture and innovating new technologies and products within existing organizations. Topics covered will include: identifying a business opportunity, building a team, finance, equity investment, managing risk, market understanding, and competitive advantage. Emphasis will be on team projects, including developing an investor pitch for an original idea.

70-415	**Introduction to Entrepreneurship**
Instructors:	**H. Jones**
Meetings:	**TR 1:30 – 2:50 p.m.**
Units:	**9**
Prerequisites:	**None**
Primary IDeATe Area:	**Innovation & Entrepreneurship**
Location:	**PH 125C**

This course is designed primarily to provide an overview of entrepreneurship, develop an entrepreneurial frame of mind and learn the rudiments of how to differentiate an idea from an opportunity. Students come up with a business idea and explore its potential for becoming a viable business. They learn to do market research and experience first-hand the rewards and difficulties in dealing with people in the real world. They will meet entrepreneurs and business professionals as part of the course and learn how to make effective presentations - both written and oral. Other important aspects of the course include self-assessment to determine one's strengths and weaknesses, understanding the "magic" of leadership and gaining an entrepreneurial perspective on life.

70-420	**Entrepreneurship for Scientists**
Instructors:	**R. Daley, D. Mawhinney**
Meetings:	**M 6:30 – 9:20 p.m.**
Units:	**9**
Prerequisites:	**None**
Primary IDeATe Area:	**Innovation & Entrepreneurship**
Location:	**SH 125**

Entrepreneurship for Scientists is an introductory course in entrepreneurship. The course primarily targets non-business students and assumes no background in business. Students majoring in science, computer science, engineering, the humanities or the arts are exposed to fundamental concepts and issues around innovation and entrepreneurship. The course provides a foundation for starting a new venture and innovating new technologies and products within existing organizations. Topics covered will include:

identifying a business opportunity, building a team, finance, equity investment, managing risk, market understanding, and competitive advantage. Emphasis will be on team projects, including developing an investor pitch for an original idea.

70-421	**Entrepreneurship for Computer Scientists**
Instructors:	**W. Kaigler**
Meetings:	**TR 3:00 – 4:20 p.m.**
Units:	**9**
Prerequisites:	**None**
Primary IDeATe Area:	**Innovation & Entrepreneurship**
Location:	**WEH 5421**

This course is primarily for non-business school students; it includes most of Introduction to Entrepreneurship (70-415), assumes no background courses in business and involves additional sessions for core business concepts. Students with majors in science, technology, engineering or computer science are exposed to fundamental concepts and issues in innovation, business and entrepreneurship. Students can expect to gain a basic understanding of functional areas such as finance, funding, marketing, sales and management. Student Status: Sophomore year or higher.

73-100	**Principles of Economics**
Instructors:	**Multiple**
Meetings:	**Multiple**
Units:	**9**
Prerequisites:	**None**
Primary IDeATe Area:	**Innovation & Entrepreneurship**
Location:	**Multiple**

Literally, an introduction to economic principles, the goal of this course is to give students an understanding as to what constitutes good "economic thinking." This thought process is grounded in the construction and use of economics models. Drawing on issues in both microeconomics and macroeconomics, fundamental principles are shown to transcend particular examples and allow the field to be seen as a coherent, unified whole. (Lecture, 2 hours; Recitation, 1 hour).