Graduate Course Descriptions

M.S. in Digital Imaging and Design: Y35

Y35.1000/Art, Technology, and Design

This course is intended to serve as an introduction to a number of the fundamental issues concerning practitioners working contemporary art, technology, and design. The subjects covered form a decidedly multimedia curriculum: at various points in the semester, students will discuss painting, sculpture, graphic design, dance, photochemical film, analog video, video games, and medical imaging, to name a few. The degree of diversity in the course should allow for various points of engagement, depending upon each student’s personal and professional interests. Discussions take an issues-based approach to the material while also subjecting a variety of visual artifacts to different forms of aesthetic analysis. Accordingly, the assignments for the course will ask students to discuss important topics (usually regarding the role of technology in art and design) and to continue to hone their skills of visual analysis.

Y35.1010/Visual Literacy and the Moving Image

From the startling innovations of the 1890s to contemporary digital video, the world of moving images has had a tumultuous and spectacular evolution. In this course, students undertake a close reading of the development of the visual language of motion pictures. Students study the first attempts at storytelling on film, including the discovery of the semantic value of the shot and the subsequent elaboration of montage as the central meaning that generates the force of film, the advent of sound, the modern film and deep focus, and finally, the detailed analysis of the place of computer-generated in the contemporary context.

Y35.1040/Digital Production Process

The course is designed to introduce the student to the basic operations of a digital production environment. The entire digital production process will be examined, from concept development, and pre-visualization, through production, post-production and final presentation. As each phase of the digital production process is discussed, the various roles and job responsibilities in the industry will be examined, from Production Assistant to Executive Producer. As the student studies the different job descriptions, they will also learn about the tools and applications that are being used by professionals in the industry today. By working with Windows NT, Macintosh, and IRIX operating systems, the student will learn how to transfer files, backup data, convert between file formats and output to digital media such as DVcam and DVD. The student will also gain a working knowledge of the hardware and software used in the various studio courses at CADA by studying theories of digital production as they apply to practical tasks performed in the class.

Y35.1050/Thesis: Previsualization

In this course, students execute the pre-production process of their thesis concept. Taken one semester before their final thesis, students develop their concept, research material, create storyboards and style frames and all supporting elements. The final product produced will be a complete 2D/3D animatic with sound that will serve as the foundation for polishing a
quality thesis visual.

**Y35.2020/Designing for Previsualization**

*Prerequisite: Maya 1 and Post 1*

In this course, students learn to design the look of a film or digital project before it becomes a major financial production. Starting with concepts, students develop storyboards, visuals for 3-D scenes, motion design, animatics and spatial layout. Students resolve set-design issues, rough out lighting, add 2-D and 3-D elements, and plan moving perspective and effects. The course teaches the importance of a clear vision of the completed picture at the start of the process. Using traditional and digital tools students visually plan to compose all the elements within a timeline into a cohesive project.

**Y35.2110/3-D Modeling and Animation for Digital Applications**

*Prerequisite: Digital Production Process (can take during the same semester as 3-D Modeling)*

Working with the leading state-of-the-art 3D visual effects software, this production course provides a complete introduction to various forms of geometry and modeling techniques within Maya Unlimited. The course places the student in a real world post-production experience, stressing the fundamentals of professional tools and workflow. Students learn Maya’s interface, editors, tools options, and hierarchy setup. Starting with the geometry of NURBS, then Polygons, and increasing complexity to Subdivision Surfaces, students will focus on the creation of high-level object building. Animation will be introduced to allow the models to be viewed dimensionally using the turntable technique.

**Y35.2000/History of Special Effects in Cinema**

Creating special effects, fantasy and plausible reality are essential to cinema. This survey spans from pioneering magician Georges Méliès to today’s digital artists. Although covering many films, we emphasize techniques in adventure, horror, and fantasy. Effects studied range from staged disasters to monsters to seemingly mundane realities. We learn all the major techniques and interpret effects vis-à-vis storytelling, style and meaning. We adopt practical approaches to film history, giving students a database of influential images while examining contexts of how effects work in films. This course will be of interest to general students of film but since it covers all the major effects techniques the course also serves to complement lab-oriented courses specializing in digital design.

**Y35.2010/Digital Post-Production I (Combustion I)**

*Prerequisite: Digital Production Process (can take during the same semester as Post 1)*

In this course, students learn to seamlessly integrate multiple visual components for dazzling effects to be used in feature films, commercials, and television along with some basic fundamentals of Broadcast Design. Students will use Adobe After Effects in a real post-production environment in which they will use feature-rich modules to solve design challenges and create special effects and motion graphics. All the key elements that make up the concept of compositing and motion design are covered, including keying, creation of mattes, color correction, stabilizing, and tracking. Also explored: animation of text, animation, and logo replacement.

**Y35.2100/3-D Modeling and Product Design I**

*Prerequisite: 3-D Modeling*

In this course, students use Alias'Wavefront Studio Tools to create visually stunning designs that utilize Studio’s CAD export capabilities for precision and accuracy. While implementing Studio’s advanced surface modeling tools, students experience immediate feedback with real time diagnostics. Topics covered include photorealistic rendering, NURBS modeling, and advanced freeform surfacing. Design principles, aesthetics, fabrication and the relationship of high-end modeling software to the design process are
discussed. Students are required to complete several projects, one of which will relate to the student’s field of interest. This course is suited to a wide range of design applications, including jewelry, furniture, point of purchase, product, and automotive design.

**Y35.2210/MAYA Visual Effects I**

*Prerequisite: 3-D Modeling*

Working with the leading state-of-the art 3-D visual effects software, this production course provides a complete introduction to the powerful rendering architecture and animation of Maya Unlimited. Students use Maya to create complex scenes and animated visual effects similar to the ones used for broadcast, commercial and film. Through lectures, class assignments and weekly projects each aspect of image creation and keyframe animation will be explored as it applies to the production world. A concentration on using cameras in dimensional space, realistic lighting, texture mapping and material building will be the main goal of the course. Students will also learn how to break out render passes and use them individually for high level composite effects.

**Y35.2220/XSI Visual Effects I**

*Prerequisite: 3-D Modeling*

The XSI software from Softimage is one of the most comprehensive tools used today in both films FX and 3-D elements for commercials. Students will use XSI to learn the basic concepts of texture mapping, lighting, animation and rendering techniques. Lectures will focus on dissecting visual effects in film, 3-D elements in commercials, important people in the industry, and historical groundbreaking animation that students should know about in order to give a competitive edge.

**Y35.2230/Editing for Visual Effects**

*Prerequisite: Digital Post-Production I*

The effects editor uses primarily rhythm to create the climax of a special effects shot within the context of the overall production. Using Final Cut Pro as an editing tool, students will examine the editor’s storytelling methodology through the craft of cutting. Students will analyze classic films to see why specific cuts were made. The usage of types of shots and transitions for storytelling purposes will also be examined. The focus of the course will be to make the student aware of the sequence and timing in order to make the visual effects shot dynamic. Students will learn to enhance the narrative through the use of timing, context and rhythm. Students will also focus on supporting techniques involved in editing sequences for visual effects, as well as commercials and trailers. The student will learn to analyze the challenge presented by such diverse factors as the story, the camera angle, the drama, and characters. Ultimately, the final result of the shot within the sequence should be visually captivating. Timing, shots, color, light, shadow placement, and audio syncing are covered in depth.

**Y35.3010/Digital Post-Production II (Combustion II)**

*Prerequisite: Digital Post-Production I*

This course is an introduction to Discreet Combustion, a desktop solution integrating multi-formats, paint, text, particles, animation and 3-D compositing used for the creation of motion graphics and visual effects. This course covers high level compositing and visual effects for production of film and video. Sophisticated problem solving and advanced tool understanding are taught to enable the student to address topics in compositing and motion design. Some of these visual issues will include stabilizing, color correction, painting, and keying. Importing graphics for advanced special effects work and image processing with an emphasis on aesthetics and design is the core of this course. Students learn new features such as displacement mapping, advanced spline-based stabilization and tracking, complex morphs, and advanced matting techniques.

**Y35.3080/Shake VFX Compositing**
This course is an advanced studio lab using Apple’s Shake, a high-level film compositor. Students focus on effects compositing, network rendering, multi-resolution inputs, and working with non-linear workspace. Sophisticated problem solving techniques are taught by organizing the building blocks of complex visual effects in a tree structure. Students will also explore Shake’s powerful warping and shape based morphing with spline tools. This course covers high level compositing and visual effects for production of film and video.

Y35.3020/Compositing and Painting for Visual Effects

Prerequisite: Digital Post-Production, MAYA - Visual Effects I

Digital painting techniques are the fundamentals for a variety of jobs in 3-D texturing, compositing and the creation of digital matte paintings. Matte paintings have been used since the beginning of film production to create environments that are too expensive or simply impossible to build as real sets. Based on traditional painting techniques, today’s digital matte paintings use a wide range of digital tools thus offering a lot of additional options. This course focuses on digital painting techniques to enhance, replace or extend background as well as foreground sections of existing images. Digital matte paintings can also incorporate 3-D elements to allow for camera movement. Therefore, texture mappings have to be created like “three dimensional paintings” in order to achieve a believable look. The course will explore several texture mapping techniques and apply painted surface details onto 3-D geometry. Students will be asked to apply their knowledge of 2-D and 3-D applications to create interesting images and elements of professional quality.

Y35.3030/Lighting and Rendering I

Prerequisite: MAYA - Visual Effects I

Beautiful rendered images can be achieved using advanced software making real, all natural visual phenomena. Illumination, color, shadows, darkness and light come alive in the truest sense during this course. The difference between a dull sphere and a flaming comet traveling through space lies in its surface textures, glow, lighting, and color. This course introduces the student to the concepts of light, shadow and surface properties as they apply to creating environments and visual effects within the Maya 3-D graphics application. Several areas of study will be included such as camera lens properties, depth of field, surface texturing, caustics and radiosity. The study of the natural properties of light and human perception will be the basis of discussion for research into simulating such effects with computer graphics.

Y35.3035/Lighting and Rendering II

In this course, students explore advanced techniques in realistic lighting and rendering of images. The course will focus on Mel scripting, advanced shader networks, shader writing, caustics, global illumination, mental ray rendering techniques. The course will also incorporate a workflow for fluid dynamics such as smoke creation and liquid and water. Practice lighting set up, camera control, and green screen balancing will be a constant theme throughout the course.

Y35.3050/Digital Audio Production with Pro Tools

Prerequisite: Digital Production Process

Sound design is a critical element to all productions and is just as important as the impact of moving images. Using Pro Tools/24, the industry’s leading digital audio system featuring 24-bit integrated digital recording, students learn the complete editing and creative process for sound design. This course covers the fundamental techniques needed for producing soundtracks, sound effects and music. Topics include: non-destructive recording and editing, processing, digital mixing, fade-ins and -outs, play lists and customization. In this course, students advance through every phase of production—from input to final master.

Y35.3060/Sound Design for Visual Effects
Prerequisite: Digital Audio Production with Pro Tools

Sound designers are the creative minds who are essential to the audio production machine. The study of convincing sound effects and soundtracks employing hard and soft techniques will be explored. Through the study of effects and foley, the student will learn how to create sounds to match moving images. A powerful soundtrack supports and enhances the look, tone, and feel of a picture. The direction of the course is to help the student develop a strong understanding of sound’s influence on the visualization and film process.

Y35.3100/3-D Modeling and Product Design II

Prerequisite: 3-D Modeling and Product Design I

This course focuses on the successful creation of high-level models and accurate machinable surfaces for both fabrication and presentation. Within this high level modeling, students learn to edit and evaluate surfaces, so that the model not only considers aesthetics but functionality as well. Topics include: construction with free-form curves and surfaces, animating a model for presentation, and rendering for presentation. The importance of using textures and lighting to create effects is explored for rendering realistic models. Students use color mapping, bump mapping, environmental mapping and raytracing to create exciting and realistic images. Rapid prototyping/development as well as bottlenecks and workflow in the digital design process are explored. Students are expected to complete projects, all of which will be presentation/portfolio quality.

Y35.3210/MAYA Visual Effects II

Prerequisite: MAYA - Visual Effects I

This advanced level course will cover the high-end tool set of Maya. The primary subjects are polygonal and subdivision (sub D) modeling of characters, heads, hands, and other complex forms; keyframe and Set Driven Key animation, expressions, and rigging/binding. Other topics include Mel, clusters, deformer, hypershade, connection editor, polygonal mapping, and Maya paint Effects. One of the core themes of this class will be to take various traditional assignments and translate them into digital projects.

Y35.3220/Dynamics and Particle

Prerequisite: MAYA - Visual Effects II

This course presents particle and dynamics animation using Alias Wavefront’s Maya. Particles and dynamics represent the computer simulation of natural phenomena including fire, snow, and rain. Using specific, production-related examples and weekly projects, students will use Maya to create complex effects animations and dynamic simulations. Procedural animation techniques using Maya’s built-in scripting language Maya Embedded Language (MEL) will be introduced. This course will discuss some basic properties of physics as they relate to animation production; prior physics experience is not required.

Y35.3230/Character Animation I

Prerequisite: MAYA Visual Effects I

In response to the growing interest in the art of character animation, this course focuses on the elusive task of creating a believable animated performance using Maya’s advanced character tools. Students study the basic elements of complex motion, performance structure, and their relationship to digital inverse kinematics. Digital characters with natural movement, emotion, and density are created and placed in interactive environments designed by the student. Although technical ability is a requirement, the primary focus of this course is building digital characters that act. Software will be used as a creative tool to convey a realistic performance to a modeled character or creature.

Y35.3235/Character Animation II
Prerequisite: Character Animation I, MAYA -Visual Effects II

The character animator's job is to bring a computer-generated character to life in a believable way within the space and the narrative. The key element of the course is for the student to give expression to an animated character. The course should serve as a link between the art of traditional animation and computer animation. The underlying principles that make a character work expressively will be covered. Students will further explore physical acting, observation, lip synchronization, and facial expressions. This course focuses on the fundamentals of creating characteristic movement and personality.

Y35.3245/Character Construction

Prerequisite: MAYA - Visual Effects II

Character setup is one of the most important steps in the character building process. A good character rig will allow you to get the most out of your characters, and save you from a number of possible problems you could encounter later on in your projects. This course will cover basic and advanced rigging solutions. Students will learn how to solve their own issues based on the tools they learn in class. Topics include modeling for animation/ skinning, character setup, forward / inverse kinematics, and UV texture layout. This course is designed to run in conjunction with the Character Animation course.

Y35.3260/Title Design

Prerequisite: Digital Post-Production I

The history of graphic design constitutes a mere blip in the entire history of mankind. With the recent increased acceptance of desktop computers in the film and design industries, the potential to create spectacular visual effects and design is given more to the individual. This class will explore the history and recent innovations of motion graphics. Students will focus on the conceptual aspects of film title design and develop the ability to think of innovative means of production on the computer and in the studio. Students will screen music videos, films and works by Saul Bass, Norman McLaren, and Jakob Trollback to learn about type in motion, transitioning and the theme of addition subtraction and multiplication.

Y35.3400/Digital Medical Imaging

Prerequisite: MAYA - Visual Effects I

This course is essential for students interested in high level organic modeling. Using Maya, Alias|Wavefront's most advanced animation application, students will explore and solve problems specific to biomedical visualization, and learn techniques for creating complex organic surfaces for human anatomy. Eyes, bones, skin, and muscle will be created and animated in dynamic surgical situations. Lighting attributes, shading, rendering, particles, and modeling techniques are covered.

Y35.3405/Advanced Digital Medical Imaging

Prerequisite: Digital Medical Imaging

In the first part of the course, students continue to learn the modeling, lighting, dynamics and animation techniques for medical illustration. The new modeling techniques will include soft bodies, textures, and the dynamic interaction between surgical instruments and bones with soft tissue. We will also address, by modeling, the concept of the varying densities between different types of anatomical parts. In the second part of the course, students work on an approved project. This may include the construction of a specific area of the human anatomy as it pertains virtual surgery and surgical education, i.e. the brain, heart or skull. Students also work on a dynamic simulation of human tissue according to a specified plan. Importing CT and MRI data to create anatomically correct images is covered.

Y35.3460/Broadcast Design I
Prerequisite: Digital Post-Production I

This course will cover the design, art and science of professional motion design. Students explore all aspects of creating a small network package from conception to completion. The areas of study will include; the basics of developing a brand from basic strategy, creating and selling an extensive presentation, producing and posting your work in a mix of mediums. Other topics include breakdown of the creative process, conceptual development, pitching your work, production basics, and motion design/filmmaking theory.

Y35.3465/Broadcast Design II

This course will cover advanced techniques in the art and science of professional motion design. Students will explore aspects of creating graphics for network and cable packages and their relationship to pop culture and traditional design approach. The class will take a look at the basic strategy for motion graphics for local broadcast as well as international design and implementation.

Y35.3500/Technical Directing

Prerequisite: MAYA - Visual Effects II

Technical directing is one of the most important roles in the digital production process for big budget Hollywood films, animation, and commercials. In the entertainment world, technical directors supervise the overall look and feel of a shot, focusing on lighting, perspective and match-movement. Students in this course will learn all aspects of a technical director's role in the digital pipeline including: design of motion, lighting, textures, rendering and scene design. Creating models, mattes, paintings and visual effects for this course will be taught using MAYA and Photoshop. Through hands-on projects students will learn to direct and produce dramatic scenes utilizing live action, lighting effects, motion blur, compositing, and rendering. Aspects of these projects will include digital camerawork, matching 2-D and 3-D perspective, producing several forms of mood lighting and integrating dynamic elements.

Y35.3070/Scripting for Visual Effects

In this course, students execute the pre-production process of their thesis concept. Taken one semester before their final thesis, students develop their concept, research material, create storyboards and style frames and all supporting elements. The final product produced will be a complete 2-D/3-D animatic with sound that will serve as the foundation for polishing a quality thesis visual.

Y35.3600/Video Game Development I

Prerequisite: MAYA - Visual Effects II

This course gives the student an introduction to the game industry within the context of a simple modification to a commercial game engine. The game industry production process will be explored through a series of demo presentations, weekly class exercises, assignments and a final project. Students will learn about creating and texturing spaces and objects in Maya, and the techniques and processes involved in exporting and importing these assets into a game editor. Lighting, animating objects and directing AI will be covered from within the editor. While the focus of the class is on creating a game environment, textures and character animation will be covered in brief.

Y35.3610/Video Game Development II

Prerequisite: Video Game Development I

This course expands on the material covered in the introductory class. Textures, lighting and scripting are all covered in greater depth along with the introduction of terrain creation. Different game types, weapon creation and simple environmental effects will also be addressed. The class is an opportunity for students to further develop their industry skills and potentially hone a specific area of expertise as part of the final project.
While the introductory class involved a general review and presentation of a selected game, this class will focus more directly on documenting game mechanics and structure.

Y35.4000/Thesis Project

Prerequisite: Core Courses

The thesis should result in a work of experimental digital image creation accompanied by a narrative describing the project. Proposals will be submitted for approval. Possible approaches for the thesis project can originate conceptually, philosophically, and experimentally. All areas can be acceptable if there is a certain degree of experimentation and intellectual challenge. Projects must show the students understanding of the material learned in the Master’s program. It is expected that the thesis project will be developed in close collaboration with an adviser working in the field of the student’s application.

Y35.0005/Thesis Workshop

The thesis workshop serves as an orientation to the thesis, the process, and what is expected as you plan, produce and execute the requirements of the thesis seminar. The Clinical Professors will instruct on how to write a treatment, show examples of previous thesis work (documentation and project work) and give you feedback on your proposal.

Y35.3420/Digital Bauhaus

This course allows students to gain hands-on production knowledge by applying skills used by professionals in a variety of industries such as fine arts, special effects, and 2-D motion graphics. One project that relates to the field is produced by the class as a production team.

Y35.4015/Special Projects—Digital Fine Arts

This course allows students to gain hands-on production knowledge by applying skills used by professionals of the Digital Fine Art industry. One project that relates to the field is produced by the class as a production team.

Y35.4020/Special Projects—Visualization

This course allows students to gain hands-on production knowledge by applying skills used by professionals of the Visualization industries such as architecture and medical imaging. One project that relates to the field is produced by the class as a production team.

Y35.4025/Special Projects—Entertainment

This course allows students to gain hands-on production knowledge by applying skills used by professionals of the Entertainment industries such as feature film effects and motion graphics for broadcast. One project that relates to the field is produced by the class as a production team.

Y35.4030/Special Projects—Gaming

This course allows students to gain hands-on production knowledge by applying skills used by professionals of the Gaming industry. One project that relates to the field is produced by the class as a production team.