VIA University College, The Animation Workshop

Creative Simulation Technologies 2022

5th September to 25th November 2022

Learn how to create beautiful simulations! Dive into Houdini, TouchDesigner, the Unreal Engine, and coding in this exciting and innovative course, taught by specialists from the film and games industries!

Course program

Week 1	5 - 9 September	**Introduction, Overview, Software Introductions**
Week 2	12 - 16 September	**Brainstorming, Planning, Drafting, Research**
Week 3	19 - 23 September	**Houdini: Proceduralism and Geometry**
Week 4	26 - 30 September	**Houdini: Solvers and Simulation**
Week 5	3 - 7 October	**TouchDesigner: Motion Graphics**
Week 6	10 - 14 October	**Coding: Python and Tool Building**
Week 7	17 - 21 October	**Coding: Vector Scripting and Rendering**
Week 8	24 - 28 October	**Unreal Engine: Environments**
Week 9	31 Oct - 4 Nov	**Unreal Engine: User Interaction**
Week 10	7 - 11 November	**Project Work**
Week 11	14 - 18 November	**Project Work, Case Study**
Week 12	21 - 25 November	**Project Rendering & Finalization**

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Creative Simulation Technologies 2022 – detailed program

Course description

This course taps into creative, artistic, scientific, technological applications for simulation. The methods and technology surrounding simulation are a rapidly evolving area of art and science and will touch every aspect of design, animation, media, and communication. To focus on this area, students will study and apply physics-based simulations such as water, gasses, fire, breaking, cloth, granular, growth, crowds, or other natural phenomena that are generally, no longer traditionally animated. The software and technology inherent in the course is highly node-based visual programming and 3d solutions, as well as some traditional coding where necessary. Real time technologies are also explored such as game engines. The final results from a participant should showcase a well-executed and visually presented simulation as well as a case study to highlight the technical methods which were studied and used. The successful completion of this course will ideally situate the learner to work in Europe's diverse art and technology markets such as film, games, animation, sciences and visualization, and emerging technologies.

Course assignments:
– Final rendered simulation
– Case study

Course materials:
– Dedicated computer workstation per student
– Physics simulation software with graphical outputs (Houdini)
– A real time graphics package (TouchDesigner)
– An industry standard game engine (Unreal Engine)
– A coding environment and installed language (Python)
– Drafting software (Photoshop or similar)
– Finishing software (Nuke, Photoshop, Premiere, or similar)
– Waterproof, high speed camera such as the GoPro to record natural phenomena
– Project-based external stimuli or devices (approved per project), such as a joystick.

Participant projects

Participants will work on an individual simulation project throughout the course. The participants choose a specific natural phenomenon that they must research. They will then have to recreate the phenomenon, or combine elements from different natural phenomena, as computer simulations. They can choose to render the end-product, the animated film sequence, in different ways, for instance realistically, graphically, or based on a game aesthetic, but the actual simulations in the scene will behave realistically based on the laws of physics. As a result, the participants' final projects are short animated clips consisting of well-executed computer simulations combined with detailed case studies documenting their workflow and considerations throughout the process. Case studies are important for the participants' own creative process, but equally important for knowledge sharing and further development of the field.

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Modules

Week 1 - Introduction, Overview, Software Introductions

Teacher: Andrew Lowell, US. Houdini FX Trainer / Technical Director. For many years Andrew has been recognized by industry as an FX TD and trainer. Movie credits/studios include *Mummy 3*, *Aliens in the Attic*, *Invictus*, *Thor*, *Sucker Punch*, *Transformers 3*, *Jack the Giant Slayer*, and *Ender's Game* at studios such as Digital Domain, Rhythm and Hues, and Animal Logic. He's conducted many seminars around the world and written articles, authored a Houdini book, and also conducts formal training at dedicated institutions such as The Animation Workshop, VIA UC and FXPHD.

This week should impart introductions and outline the curriculum and goals. The lectures are focused on introducing the main applications and software that will be used in order to promote idea generation.

Week 2 – Brainstorming, Planning, Drafting, Research

Teacher: Andrew Lowell, US. Houdini FX Trainer / Technical Director.

This week involves the students formulating project ideas and drafts, finding available assets and reference photos, video footage, and gathered reference. Stand in footage and assets can be used to represent the final result for timing and placement. Students will research past precedent. Introductory lectures are given on the fundamentals of simulation using Houdini and exploring various solvers.

Week 3 – Houdini: Proceduralism and Geometry

Teacher: Andrew Lowell, US. Houdini FX Trainer / Technical Director.

This week focuses on Houdini geometric proceduralism. Attributes and geometry types. Geometric flow. Basic expressions. Vector and transform operations. Volume operations. Generative copy and formation.

Week 4 – Houdini: Solvers and Simulation

Teacher: Andrew Lowell, US. Houdini FX Trainer / Technical Director.

A lecture week with a focus on dynamics simulation in Houdini. Specialized lectures in project relevant solver types such as rigid bodies, fluids, soft bodies, and crowd. Study of interaction, variables, catalysts, iterations and stability. Imparts the necessary knowledge to complete non-real time, highly accurate simulations for projects.

Week 5 – TouchDesigner: Motion Graphics

Teacher: Stefan Kraus, DE. Medie artist and educator. Berlin based media artist and educator, Stefan Kraus, is co-founder of the creative coding education hub, The NODE Institute, the projection mapping festival, Genius Loci Weimar, and the media art studio, MXZEHN. Trained as an architect at Bauhaus-University Weimar, Stefan explores the augmentation of physical structures using interactive and generative media and the narrative potential of abstract imagery. He holds a special interest in the art of live visual improvisation and creates augmented scenographies for theater, dance and

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music performances. Stefan enjoys sharing his knowledge and experience with the students of different universities and the creative coding community. His studio produces interactive installations, live media performances and augmented reality applications for commercial clients, festivals, institutions and exhibitions.

Students learn some of the basics of real time graphics software. This entails an exploration of the different hooks into video, audio, midi, and keyboard/mouse/joystick interaction. Low level feedback is explored. Lectures should be divided into introductory and in-depth categories by the instructor so that students notably without real-time/interactive components to their projects can optionally continue project work instead of undergoing the specialized lectures.

Week 6 – Coding: Python and Tool Building
Teacher: Kate Xagoraris, CAN. VFX Artist at MPC. VFX Professor/Mentor. VFX Scientist. VFX Consultant & Ally.

This week is dedicated to taking more manual control over a project via coding. This could take the form of a custom IO between a type of data and the simulation package, or a creative and optimized workflow within a program/engine. Python is used as the primary language because of its use in Houdini and TouchDesigner. Students who need a minimal amount of coding for their projects can opt out of the more advanced lectures to continue project work.

Week 7 – Coding: Vector Scripting and Rendering
Teacher: Kate Xagoraris, CAN. VFX Artist at MPC. VFX Professor/Mentor. VFX Scientist. VFX Consultant & Ally.

Low level vector expressions are studied and used to optimize existing projects. Python coding to streamline workflows. Projects needing coding should set milestones throughout the week complemented by lectures specific to project needs. Houdini Rendering and shading are also introduced.

Week 8 – Unreal Engine: Environments
Teacher: Adam Funari, US. Terrain and Technical Artist at Offworld Industries.

An industry standard game engine is introduced and explored. The focus is asset population and management. Lectures should be divided into introductory and in-depth categories by the instructor so that students notably without the needs of a game engine in their projects can optionally continue project work instead of lectures.

Week 9 - Unreal Engine: User Interaction
Teacher: Adam Funari, US. Terrain and Technical Artist at Offworld Industries.

User interaction, animation, and in-game simulation is learned and applied where necessary. Students without strong game-engine needs in their projects can optionally focus on project work while opting out of lectures.

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Week 10 – Project work
Teacher: Andrew Lowell, US. Houdini FX Trainer / Technical Director.

This week is solely dedicated to project work. Students will use their previously gained knowledge of simulation software to carry out their project objectives. Strict milestones for development will be adhered to with an emphasis on global completion.

Week 11 – Project work, Case Study
Teacher: Andrew Lowell, US. Houdini FX Trainer / Technical Director.

This week is solely dedicated to project work. Students will use their previously gained knowledge of simulation software to carry out their project objectives. Strict milestones for development will be adhered to with an emphasis on simulation tweaking and finalization, and rendering.

Week 12 – Project Rendering and Finalization
Teacher: Andrew Lowell, US. Houdini FX Trainer / Technical Director.

The final week of the course should focus on showcasing and marketing work as opposed to the creation of new versions or assets. The case study will be finalized as complementary and supporting explanations of the work undertaken for prospective employers. Final presentations given to a public audience of academics and professionals.

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Format of teaching

We have few permanent teaching staff at The Animation Workshop, VIA University College. Instead, we bring in professional artists from studios to teach for a limited number of weeks. In general, the teacher will do lectures/demos in the mornings followed by exercises and project work in the afternoons. Hands-on sessions are accompanied by 1-on-1 feedback or dailies and weeklies with the whole group. The classroom is set up with a computer for each of the (up to) 16 participants, and a teacher computer hooked up to a projector, making it easy to switch between demos/lectures and hands-on work.

Course instructional method

The instructional methods are interactive and hands-on. Students should feel a high degree of involvement with their goals and projects, and lectures should focus on the goals of the course as viewed through the lens of their project goals and efforts. Training and guidance from instructors/industry practitioners is performed in relevant areas. Mentorship is imparted through the notable stages of individualized projects. Weekly group critique and milestone review is conducted. Students may choose to review recorded lectures to grasp technical specifics. Often learners will be provided with Individualized lectures and help.

Class hours

Normal class hours are 9:00 to 16:00.

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