

Visual Computing and Game Design

Curriculum overview

4

semesters

120

ECTS total

27

courses in the overview

COURSE CATEGORIES

P

Programme core

S

Specialization core

RE

Required electives

E

Recommended electives

01 · WINTER SEMESTER Foundations of images and systems	02 · SUMMER SEMESTER Graphics, data and design	03 · WINTER SEMESTER Perception and specialization	04 · SUMMER SEMESTER Master's thesis
P ANI-KOP Combinatorial Optimization 6 ECTS	P ANI-MLM Machine Learning Methods 5 ECTS	P ANI-TPB Team Project B 7 ECTS	P ANI-DIP Master's Thesis 30 ECTS
P ANI-ARC Advanced Computer Architecture 5 ECTS	P ANI-SAI Statistics for Applied Informatics 5 ECTS	S ANI-ROZ Pattern Recognition 5 ECTS	
S ANI-DZO Digital Image Processing 6 ECTS	P ANI-TPA Team Project A 4 ECTS	S ANI-PIV Computer Vision 5 ECTS	
S ANI-DVG Introduction to Discrete and Computational Geometry 5 ECTS	S ANI-PG1 Computer Graphics 1 5 ECTS	E ANI-NUR User Interface Design 5 ECTS	
S ANI-EGG Engines for Games and Graphics 4 ECTS	S ANI-VIZ Visualization 6 ECTS	E ANI-DID Digital Drawing 2 ECTS	
RE ANI-VGA Video Games Architecture 5 ECTS	RE ANI-SSD Storytelling and Game Design 5 ECTS	E ANI-DVD Board Game Design 4 ECTS	
RE ANI-PVR Advanced Virtual Reality 5 ECTS	RE ANI-BSO Biosignals and Biomedical Image Processing 5 ECTS	E UEE Environment Design in Unreal Engine 2 ECTS	
RE NI-GPU GPU Programming and Architectures 5 ECTS	RE ANI-IRT Internet and Real-time Transmission 5 ECTS		
E ANI-CCC Creative Coding and Computational Art 4 ECTS	E NI-ESC Experimental Project Course 8 ECTS		
	E ANI-TVR Virtual Reality Technology 3 ECTS		

Course syllabi

Complete syllabi follow the semester order used in the curriculum. The information is based on the FIT CTU catalogue and the source materials for the proposed specialization.

VCGD · FIT ČVUT

SYLLABUS 1 / 27

ANI-KOP

Combinatorial Optimization

P

Programme core

6 ECTS

Semester 1 · winter

Teaching extent: 2P+2C

Completion: Z,ZK

Discrete optimization problems, exact algorithms, heuristics and their experimental evaluation.

ANNOTATION

The students will gain the knowledge and understanding necessary to judge combinatorial problems by their complexity and deployment target (on-line, multicriterial, etc.). They will be able not only to select and implement but also to apply and evaluate heuristics for practical problems.

LECTURE SYLLABUS

SEMINAR SYLLABUS

LITERATURE

REQUIREMENTS

Algorithm, computational complexity, asymptotic complexity. Formal languages. Basic graph theory. Random variable. Boolean logic. Branch and bound algorithm. Basic dynamic programming. Practical programming in any imperative language.

Source: Official FIT CTU course catalogue

Course catalogue: <https://bk.fit.cvut.cz/en/predmety/00/00/00/00/00/00/08/56/92/p8569206.html>

Advanced Computer Architecture

P

Programme core

5 ECTS

Semester 1 · winter

Teaching extent: 2P+1C

Completion: Z,ZK

Modern computer systems, parallelism, real-time requirements, reliability and the selection of appropriate technologies.

ANNOTATION

The aim of the course is to provide students with a theoretical foundation for understanding modern computer systems that run real-world applications, which is necessary for all specializations in the program. Students will learn to understand current technical challenges, typical for example of the automotive industry, with regard to fast system response to external stimuli in real time, fast and secure processing of large volumes of data, integration of artificial intelligence, ensuring the required level of reliability according to the application, and at the same time rapid development and bringing results to market. Emphasis is placed not only on choosing suitable (parallel) algorithms, but also on selecting the most appropriate technological means for their implementation.

LECTURE SYLLABUS

SEMINAR SYLLABUS

To be added.

LITERATURE

REQUIREMENTS

Credit is awarded for assignments and tests of theoretical and practical knowledge during the semester. The examination emphasizes connecting the acquired theoretical and practical knowledge and applying it in an implementation.

Source: Official FIT CTU course catalogue

Course catalogue: <https://bk.fit.cvut.cz/en/predmety/00/00/00/01/25/40/88/91/14/p1254088911405.html>

ANI-DZO

Digital Image Processing

S

Specialization core

6 ECTS

Semester 1 · winter

Teaching extent: 2P+2C

Completion: Z,ZK

Modern methods for interactive editing of digital images and video, with an emphasis on algorithms and their theoretical foundations.

ANNOTATION

This course presents a comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical algorithms that are both easy to implement and have an interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is also valuable outside the domain of digital image processing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDR compression, de-blurring in frequency domain, abstraction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray conversion, context enhancement, interactive as-rigid-as-possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, adding depth, alpha matting.

LECTURE SYLLABUS

SEMINAR SYLLABUS

LITERATURE

REQUIREMENTS

Elements of Calculus (BIE-ZMA) Linear Algebra (BIE-LIN) Probability and Statistics (BIE-PST) Programming and Algorithmics 2 (BIE-PA2) Graph Algorithms and Complexity Theory (BIE-GRA) English language.

Source: Official FIT CTU course catalogue

Course catalogue: <https://bk.fit.cvut.cz/en/predmety/00/00/00/00/00/08/56/71/p8567106.html>

ANI-DVG

Introduction to Discrete and Computational Geometry

S

Specialization core

5 ECTS

Semester 1 · winter

Teaching extent: 2P+1C

Completion: Z,ZK

Geometric data structures and algorithms for practical problems in discrete and computational geometry.

ANNOTATION

The aim of the course is to introduce students to the key principles of discrete and computational geometry, which plays an important role in computer science, robotics, computer graphics and geographic information systems. The course focuses on understanding basic geometric objects, algorithms and their applications in the field of computational geometry. Fundamental concepts and used structures are gradually introduced in lectures. Students will become familiar with the theoretical foundations and effective algorithms for solving problems in these areas. Exercises are focused on practical applications of the discussed concepts, implementation of algorithms and solving computationally demanding problems.

LECTURE SYLLABUS

SEMINAR SYLLABUS

To be added.

LITERATURE

REQUIREMENTS

The students are expected to be familiar with the basic notions of combinatorics, graph theory and analysis of algorithms.

Source: Official FIT CTU course catalogue

Course catalogue: <https://bk.fit.cvut.cz/en/predmety/00/00/00/00/00/00/08/56/70/p8567006.html>

ANI-EGG

Engines for Games and Graphics

S

Specialization core

4 ECTS

Semester 1 · winter

Teaching extent: 1P+2C

Completion: Z,ZK

A practical introduction to game engines, their architecture and their use in interactive graphics projects.

PEOPLE**Guarantor**

Petr Pauš

Lecturers

Petr Pauš, Jan Matoušek

Instructors

Jan Matoušek, Petr Pauš

ANNOTATION

This practice-oriented course introduces game engines, their underlying principles and their use in game development. Teaching focuses on general concepts of development in graphics engines and their application in tools such as Unity or Godot. Seminars emphasize hands-on work with engines and independent projects. Students learn to use editors, create scenes, implement animations, interact with objects, design dialogue and apply advanced graphics techniques. The acquired knowledge is put into practice in semester projects. The course is intended for students interested in game development who want a solid foundation in modern graphics engines and an understanding of how game applications are created.

LECTURE SYLLABUS**SEMINAR SYLLABUS**

To be added.

LITERATURE**REQUIREMENTS**

Source: Official FIT CTU course catalogue

Course catalogue: <https://bk.fit.cvut.cz/en/predmety/00/00/00/01/25/40/88/92/04/p1254088920405.html>

ANI-VGA

Video Games Architecture

RE

Required electives

5 ECTS

Semester 1 · winter

Teaching extent: 2P+1C

Completion: Z,ZK

Technical and design principles of game development: engines, physics, graphics, AI, multiplayer and the implementation of game mechanics.

PEOPLE

Guarantor	Radek Richtr
Lecturers	Jan Matoušek
Instructors	Jan Matoušek

ANNOTATION

The course covers a wide range of topics, procedures and methodologies related to the development of computer games - from a technical point of view, but also from a design and philosophical point of view. In the lectures, students will be guided through the history of development, the structure of game engines, component and functional architecture typical of game development, physics, graphics, artificial intelligence and multiplayer. The exercises will then cover selected technological topics in greater detail, including ways of implementing some game mechanics, in the form of practical demonstrations.

LECTURE SYLLABUS

SEMINAR SYLLABUS

LITERATURE

Recommended literature:

REQUIREMENTS

Basic knowledge of algorithms, linear algebra, graph theory and data structures on bachelor's level.

Source: Official FIT CTU course catalogue

Course catalogue: <https://bk.fit.cvut.cz/en/predmety/00/00/00/00/00/08/57/62/p8576206.html>

ANI-PVR

Advanced Virtual Reality

RE

Required electives

5 ECTS

Semester 1 · winter

Teaching extent: 2P+1C

Completion: KZ

VR technologies and the practical development of immersive applications in accessible 3D engines, particularly Unity.

PEOPLE

Guarantor	Petr Pauš
Lecturers	Petr Pauš
Instructors	Petr Pauš

ANNOTATION

The course introduces advanced parts of the virtual reality. It is a continuation of the already running graphic objects, especially the creation of 3D models in Blender, and among other things, it introduces students to their application in virtual reality. Lectures will focus on virtual reality technology, its use in various applications and will also deal with creating applications in available 3D engines (mainly Unity3D). The course is freely connected with the subject VHS (virtual game worlds), students will be able to apply the knowledge gained in this subject in virtual reality, or directly create a complex game for VR.

LECTURE SYLLABUS

SEMINAR SYLLABUS

1Assignment of term projects. 2Introduction to the headset installation, room setup, and controllers. 3Unity3D, new project, 3D object import, VR plugins import, application compilation. 4Modelling in Blender, textures, export to Unity3D. 5Object interaction, teleportation, basic interactive application. 6Term project check point. 7User interface (menu, buttons, textboxes), scripting in Unity3D. 8Complex scene (surfaces, trees). 9Object animation. 10Advanced scripting in Unity3D. 11Augmented reality application. 12Project presentation.

LITERATURE

The course lectures are based on the current available literature on VR. The practical lectures use Unity3D, currently one of the most widely used 3D engines, which is fully multiplatform, free for non-commercial or low-budget use.

REQUIREMENTS

None.

Source: Official FIT CTU course catalogue

Course catalogue: <https://bk.fit.cvut.cz/en/predmety/00/00/00/00/00/00/08/57/54/p8575406.html>

NI-GPU

GPU Programming and Architectures

RE

Required electives

5 ECTS

Semester 1 · winter

Teaching extent: 2P+1C

Completion: Z,ZK

Modern GPU architecture, massive parallelism, CUDA and program optimization for multiprocessor graphics systems.

PEOPLE

Guarantor	Ivan Šimeček
Lecturers	Ivan Šimeček
Instructors	Ivan Šimeček

ANNOTATION

Students will gain knowledge of the internal architecture of modern massively parallel GPU processors. They will learn to program them mainly in the CUDA programming environment, which is already a widespread programming technology of GPU processors. As an integral part of the effective computational use of these hierarchical computational structures, students will also learn optimization programming techniques and methods of programming multiprocessor GPU systems.

LECTURE SYLLABUS**SEMINAR SYLLABUS****LITERATURE**

Brian Tuomanen "Hands-On GPU Programming with Python and CUDA: Explore high-performance parallel computing with CUDA" , Packt Publishing, 2018 Sudhakar Yalamanchili "GPU Architectures"
<https://ece8823-sy.ece.gatech.edu/>

REQUIREMENTS

Basics of programming in C and C ++ (at the level of subjects BI-PA1 and BI-PA2), it is recommended to complete the subject Parallel and Distributed Programming (MI-PDP).

Source: Official FIT CTU course catalogue

Course catalogue: <https://bk.fit.cvut.cz/en/predmety/00/00/00/00/00/06/07/20/p6072006.html>

ANI-CCC

Creative Coding and Computational Art

E

Recommended electives

4 ECTS

Semester 1 · winter

Teaching extent: 1P+2C

Completion: KZ

Creative coding, data visualization and the combination of proven technical approaches with artistic methods.

PEOPLE

Guarantor	Radek Richtr
Lecturers	Radek Richtr
Instructors	Josef Kortan, Radek Richtr, Jiří Šebele

ANNOTATION

Students work on practical tasks, get acquainted with creative and yet proven methods of visualizing various types of data. The course freely follows the basic graphics courses (MGA, BLE,?) and introduces students to suitable visualization methods for traditional as well as for open data. It combines well-known visualization techniques with artistic methods using modern technologies. The aim is to create an interesting visualization project. It is planned to work closely with IPR CAMP (Center of Architecture and Metropolitan Planning) and IIM (Institute of Intermedia FEL).

LECTURE SYLLABUS

SEMINAR SYLLABUS

LITERATURE

Shiffman, Daniel: Learning Processing: a beginner's guide to programming images, animation, and interaction Lauren McCarthy, Ben Fry, and Casey Reas: Getting Started with p5.js: Making Interactive Graphics in JavaScript and Processing, by.

REQUIREMENTS

Requirements are strongly individual due to the choice of semester work.

Source: Official FIT CTU course catalogue

Course catalogue: <https://bk.fit.cvut.cz/en/predmety/00/00/00/00/00/00/06/28/35/p6283506.html>

Machine Learning Methods

P

Programme core

5 ECTS

Semester 2 · summer

Teaching extent: 2P+1C

Completion: Z,ZK

Supervised and unsupervised learning, regression and classification models, neural networks and model evaluation.

ANNOTATION

The course introduces students to machine learning methods applicable within their specializations in the follow-up Applied Informatics program. These principles and competencies are not part of the common undergraduate curriculum and are typically taught only in specializations focused on artificial intelligence. The aim is to understand the theoretical foundations and to gain practical experience in applying models suitable for regression and classification tasks within supervised learning, including kernel methods and neural networks. In unsupervised learning, students will become familiar primarily with clustering models and principal component analysis. The course also covers model evaluation techniques and fundamental methods for data preprocessing. Practical exercises involve data analysis and model implementation using the Python libraries pandas, scikit-learn, and PyTorch.

LECTURE SYLLABUS

SEMINAR SYLLABUS

LITERATURE

REQUIREMENTS

Basic knowledge of programming (Python).

Source: Official FIT CTU course catalogue

Course catalogue: <https://bk.fit.cvut.cz/en/predmety/00/00/00/01/25/40/88/91/04/p1254088910405.html>

Statistics for Applied Informatics

P

Programme core

5 ECTS

Semester 2 · summer

Teaching extent: 2P+2C

Completion: Z,ZK

Applied statistics, regression and correlation analysis, analysis of variance and the interpretation of data analysis results.

ANNOTATION

Students become familiar with applied statistical methods and their theoretical foundations. They learn to work with different types of data, carry out analyses and choose a model appropriate to the data. The course covers regression and correlation analysis, analysis of variance and an introduction to non-parametric methods. Students also learn to use the R statistical environment and apply the methods to real-world data.

LECTURE SYLLABUS

SEMINAR SYLLABUS

LITERATURE

REQUIREMENTS

Semestral work + exam.

Source: Official FIT CTU course catalogue

Course catalogue: <https://bk.fit.cvut.cz/en/predmety/00/00/00/01/25/40/88/89/04/p1254088890405.html>

Team Project A

4 ECTS

Semester 2 · summer

Teaching extent: 3C

Completion: Z

The first half of a two-semester project: ideation, planning, risk management and interdisciplinary teamwork.

ANNOTATION

Team project. The graduate will gain experience in the following areas: project planning, management, and monitoring; ideation; risk analysis; and software support for teamwork. Teams are formed across specializations, so each group will also include students who will learn more details about project leadership, risk analysis, ideation, user interface design, and related topics in other courses of the program (for example, Software Product Development (ANI-TSW) or User Interface Design (ANI-NUR)). Students work on the projects independently with the support of collaboration tools. In particular, they will use GitLab Premium, which the faculty provides, and which supports a wide range of tools for managing and implementing team projects.

LECTURE SYLLABUS

The course has no lectures.

SEMINAR SYLLABUS

Before or at the beginning of the semester, all students meet with the leaders of the individual projects, who may be faculty members or external partners. Students are assigned to final teams and receive an introductory briefing on project planning, management and monitoring, ideation, risk analysis and software support for teamwork. The briefing is intentionally concise because the teams are interdisciplinary and students develop the relevant specialist knowledge in other programme courses, such as Software Product Development (ANI-TSW) or User Interface Design (ANI-NUR). Teams then meet regularly with their project leader and, where appropriate, other domain experts to discuss interim results and define the next tasks and milestones. Students work independently between meetings using collaboration tools, especially the GitLab Premium environment provided by the faculty for project management and implementation.

LITERATURE

To be added.

REQUIREMENTS

Final presentation of the first phase of the project (analysis, design, first prototype or proof of concept) including a defense before a committee of project leaders and the opportunity to discuss the design with other teams.

ANI-PG1

Computer Graphics 1

S

Specialization core

5 ECTS

Semester 2 · summer

Teaching extent: 2P+2C

Completion: ZK

Advanced computer graphics: realistic texturing, ray tracing, research papers and the implementation of selected methods.

PEOPLE

Guarantor	Radek Richtr
Lecturers	Radek Richtr
Instructors	Radek Richtr

ANNOTATION

The course builds on graphic courses (mainly BI-PGA and BI-PGR) and the knowledge from these courses is deepened by state-of-the-art knowledge. The course is designed for those interested in advanced computer graphics. Students will gain practical knowledge with realistic texturing and raytracing methods. An integral part of the course is the study of scientific articles and their subsequent implementation. The course will be followed by a course PG2 supplementing the knowledge of PG1 on other areas and topics of computer graphics.

LECTURE SYLLABUS

SEMINAR SYLLABUS

LITERATURE

REQUIREMENTS

A highly recommended prerequisite is completion of the courses BI-PGA and BI-PGR.

Source: Official FIT CTU course catalogue

Course catalogue: <https://bk.fit.cvut.cz/en/predmety/00/00/00/00/00/08/57/52/p8575206.html>

Visualization

S

Specialization core

6 ECTS

Semester 2 · summer

Teaching extent: 2P+2C

Completion: Z,ZK

Theoretical foundations and practical methods of data visualization with respect to computing capabilities and human perception.

ANNOTATION

In this course, you will get the knowledge of theoretical background for visualization and the application of visualization in real-world examples. The visualization methods are aimed at exploiting both the full power of computer technologies and the characteristics (and limits) of human perception. Well-chosen visualization method serves as an external representation, with which it is possible to quickly obtain data values ??or compare data. This frees up the memory and cognitive capabilities of the analyst to solve the problem that the data represents.

LECTURE SYLLABUS

SEMINAR SYLLABUS

LITERATURE

REQUIREMENTS

Source: Official FIT CTU course catalogue

Course catalogue: <https://bk.fit.cvut.cz/en/predmety/00/00/00/01/25/40/88/90/44/p1254088904405.html>

ANI-SSD

Storytelling and Game Design

RE

Required electives

5 ECTS

Semester 2 · summer

Teaching extent: 1P+2C

Completion: Z,ZK

The design of mechanics, systems, narrative structures, levels, game economies and UX, supported by iterative playtesting.

PEOPLE

Guarantor	Radek Richtr
Lecturers	Radek Richtr
Instructors	Radek Richtr

ANNOTATION

The course gives students a comprehensive understanding of game-design principles and teaches them to apply theoretical concepts in practice. It focuses on the design of game mechanics, systems and interactions, with an emphasis on balanced and engaging player experiences. Students encounter key areas of game design including level design, narrative structures, game economies, UX, multiplayer systems and testing. The course emphasizes player-behaviour analysis, iterative development and the creative design process.

LECTURE SYLLABUS

SEMINAR SYLLABUS

LITERATURE

REQUIREMENTS

Semester projects are a key and major part of the course and determine the final grade. In these projects, students create a game design and quickly develop a prototype to verify the validity of their idea. The prototype will be presented and defended before a committee, which will include representatives from companies in the gaming industry. Another part of the assessment is a written exam.

Source: Official FIT CTU course catalogue

Course catalogue: <https://bk.fit.cvut.cz/en/predmety/00/00/00/01/25/40/88/90/04/p1254088900405.html>

ANI-BSO

Biosignals and Biomedical Image Processing

RE

Required electives

5 ECTS

Semester 2 · summer

Teaching extent: 2P+2C

Completion: Z,ZK

Principles, techniques and practical tasks in the processing of biological signals, medical images and biomedical data.

PEOPLE

Guarantor Vanda Benešová

Lecturers Vanda Benešová

Instructors Vanda Benešová

ANNOTATION

The aim of the course is to provide students with theoretical principles, techniques, and applications related to the processing and analysis of biological signals and medical images. During the course, students will work in MATLAB exercises on examples involving the processing of various biosignals. After completing the course, students should be able to design and implement solutions to complex tasks for biosignals and biomedical images, interpret the results, and apply their knowledge to real medical challenges.

LECTURE SYLLABUS

SEMINAR SYLLABUS

To be added.

LITERATURE

REQUIREMENTS

Source: Official FIT CTU course catalogue

Course catalogue: <https://bk.fit.cvut.cz/en/predmety/00/00/00/01/25/40/88/90/64/p1254088906405.html>

ANI-IRT

Internet and Real-time Transmission

RE

Required electives

5 ECTS

Semester 2 · summer

Teaching extent: 2P+1C

Completion: Z,ZK

Audiovisual signals, network protocols, codecs, stereoscopy and the design of low-latency transmission chains.

PEOPLE

Guarantor	Sven Ubik
Lecturers	Jiří Melnikov
Instructors	Jiří Melnikov

ANNOTATION

The course focuses on principles and current technologies for real-time network transmission. The syllabus covers the capture and presentation of audiovisual signals, network protocols used for transmission, device interfaces, codecs, data formats and stereoscopy. Attention is given to practical uses of real-time AV transmission. In seminars, students assemble a complete AV transmission chain using hardware and software components, examine how individual components affect quality and latency, and learn how to provide the network infrastructure required for high-quality AV transmission from scene capture to presentation to users.

LECTURE SYLLABUS**SEMINAR SYLLABUS**

To be added.

LITERATURE**REQUIREMENTS**

Source: Official FIT CTU course catalogue

Course catalogue: <https://bk.fit.cvut.cz/en/predmety/00/00/00/01/25/40/88/90/24/p1254088902405.html>

NI-ESC

Experimental Project Course

E

Recommended electives

8 ECTS

Semester 2 · summer

Teaching extent: 0P+30R+52C

Completion: KZ

A substantial practical project focused on designing, prototyping and evaluating a user-centred solution, such as a physical escape game.

PEOPLE

Guarantor

Ondřej Brém

Lecturers

Ondřej Brém, Jan Matoušek

Instructors

Ondřej Brém, Jan Matoušek

ANNOTATION

"The Design Project course offers a holistic exploration of the design process, providing students with a well-rounded understanding of the principles, methodologies, and tools used in designing technology-driven solutions that are user-centric and industry-relevant. Throughout the semester, students will work on real-world design projects, collaborate with industry experts, and learn to integrate theory with practical application. Through a hands-on, project-based learning approach, students will develop their skills in user-centered design and user experience evaluation, as well as gain experience working in a team to design and prototype a functional solution."

LECTURE SYLLABUS

This course does not have lectures

SEMINAR SYLLABUS

Design Thinking, Human centered design. Prototyping, Industry collaboration, Technical skills dependent on project scope and topic
Business development Testing, validation and iteration Pitch Presenting the results of the project to the public.

LITERATURE

Will be in portal <https://courses.fit.cvut.cz> according to the current project

REQUIREMENTS

Source: Official FIT CTU course catalogue

Course catalogue: <https://bk.fit.cvut.cz/en/predmety/00/00/00/00/00/07/82/48/p7824806.html>

ANI-TVVR

Virtual Reality Technology

E

Recommended electives

3 ECTS

Semester 2 · summer

Teaching extent: 1P+1C

Completion: Z,ZK

Fundamental VR concepts, CAVE and HMD systems, tracking, avatar control and the principles of mixed and augmented reality.

PEOPLE

Guarantor	Tomáš Nováček
Lecturers	Tomáš Nováček
Instructors	Tomáš Nováček

ANNOTATION

Students will be introduced to the basic concepts of virtual reality. Techniques for displaying virtual worlds (CAVE, HMD, ...) and the possibilities of controlling virtual avatars (position tracking, hand tracking, eye tracking) will be discussed. Furthermore, the concepts of mixed and augmented reality will be introduced. Finally, ways of using virtual and augmented reality will be presented.

LECTURE SYLLABUS

SEMINAR SYLLABUS

LITERATURE

REQUIREMENTS

None

Source: Official FIT CTU course catalogue

Course catalogue: <https://bk.fit.cvut.cz/en/predmety/00/00/00/00/00/07/02/09/p7020906.html>

Team Project B

P

Programme core

7 ECTS

Semester 3 · winter

Teaching extent: 4C

Completion: Z

Completion of the two-semester team project, with the option to develop its topic towards a future master's thesis.

ANNOTATION

The course consists of regular and systematic work on the project selected in Team Project A. Students improve their collaboration skills in small interdisciplinary teams. Some students may use the project to identify and develop a topic for their future master's thesis, extending the project in the direction of their specialization.

LECTURE SYLLABUS

The course has no lectures.

SEMINAR SYLLABUS

The course has no seminars.

LITERATURE

To be added.

REQUIREMENTS

The course ends with a final public presentation and defense before a committee consisting of the project leaders or other domain specialists who consulted with the students.

Source: Official FIT CTU course catalogue

Course catalogue: <https://bk.fit.cvut.cz/en/predmety/00/00/00/01/25/40/88/90/34/p1254088903405.html>

Pattern Recognition

S

Specialization core

5 ECTS

Semester 3 · winter

Teaching extent: 2P+1C

Completion: Z,ZK

Statistical pattern recognition, probabilistic models, parameter estimation and the computational aspects of classification methods.

PEOPLE

Guarantor	Michal Haindl
Lecturers	Radek Richtr
Instructors	Radek Richtr

ANNOTATION

The aim of the module is to give a systematic account of the major topics in pattern recognition with emphasis on problems and applications of the statistical approach to pattern recognition. Students will learn the fundamental concepts and methods of pattern recognition, including probability models, parameter estimation, and their numerical aspects.

LECTURE SYLLABUS

SEMINAR SYLLABUS

LITERATURE

REQUIREMENTS

introductory probability, programming, English

Source: Official FIT CTU course catalogue

Course catalogue: <https://bk.fit.cvut.cz/en/predmety/00/00/00/00/00/00/08/57/55/p8575506.html>

Computer Vision

S

Specialization core

5 ECTS

Semester 3 · winter

Teaching extent: 2P+2C

Completion: Z,ZK

Classical and modern image analysis: filtering, segmentation, object detection, deep learning, CNNs, YOLO and vision transformers.

PEOPLE

Guarantor	Vanda Benešová
Lecturers	Vanda Benešová
Instructors	Vanda Benešová

ANNOTATION

The Computer Vision course focuses on the theoretical and practical mastery of modern methods and algorithms in the field of image data processing. Students will get acquainted with the basic principles of computer vision, gradually move to advanced computer vision techniques using deep learning. Emphasis is placed on theoretical knowledge as well as on practical applications and implementation of learned methods during exercises. Topics covered include morphological operations, image filtering, color representations, object detection and recognition and segmentation through classical and recent approaches based on deep learning, deep neural networks for computer vision (including CNN, RCNN, YOLO, ViT), motion detection, visual expressiveness (saliency).

LECTURE SYLLABUS

SEMINAR SYLLABUS

In the exercises, students will have to work out 5 tasks using the OpenCv library:

LITERATURE

Recommended literature:

REQUIREMENTS

Input knowledge of the subject will be supplemented by the subject guarantor.

ANI-NUR

User Interface Design

E

Recommended electives

5 ECTS

Semester 3 · winter

Teaching extent: 2P+1C

Completion: Z,ZK

The design, development and management of advanced user interfaces, with an emphasis on general principles and web technologies.

ANNOTATION

Students will understand the theoretical background of human-computer interaction and user interface (UI) design, will learn formal description of UIs, formal user models, the fundamental notions and procedures. They get acquainted with graphical, speech, and multimodal UIs. Thanks to the gained knowledge, the students will be able to design advanced UIs.

LECTURE SYLLABUS

SEMINAR SYLLABUS

LITERATURE

REQUIREMENTS

Students should know the fundamentals of software system design, creation, and maintenance. Active knowledge of any programming language.

Source: Official FIT CTU course catalogue

Course catalogue: <https://bk.fit.cvut.cz/en/predmety/00/00/00/00/00/00/08/56/96/p8569606.html>

ANI-DID

Digital Drawing

E

Recommended electives

2 ECTS

Semester 3 · winter

Teaching extent: 4C

Completion: Z

Composition, perspective, colour theory and practical digital drawing through thematic and creative exercises.

PEOPLE

Guarantor

Denisa Nováčková

ANNOTATION

The course will introduce students to the basic principals of digital drawing and graphical design. Students will gain understanding of composition, perspective and color theory, which they will practically apply in their own design works. Students will also gain experience in drawing and painting with digital and analog tools. The course is fit for anyone who wants to practice or learn drawing and painting. The course is organized as a thematic practices covering parts of theory and practical exercise to practice gained knowledge.

LECTURE SYLLABUS

The subject does not have separate lectures, they are part of exercises.

SEMINAR SYLLABUS

Each exercise contains theoretical intro to different subjects and time for practical exercise to practice the techniques of drawing and painting. Creative exercises focus more on the practice part of the learning and feedback.

LITERATURE

REQUIREMENTS

znalost AJ

Source: Official FIT CTU course catalogue

Course catalogue: <https://bk.fit.cvut.cz/en/predmety/00/00/00/00/00/00/07/18/58/p7185806.html>

ANI-DVD

Board Game Design

E

Recommended electives

4 ECTS

Semester 3 · winter

Teaching extent: 2P+1C

Completion: Z,ZK

The design of mechanics and a playable board-game prototype, including practical aspects of production, publishing and release.

ANNOTATION

The course builds loosely on the bachelor's course BI-VHS and applies the acquired knowledge in practice. It focuses on the design and mechanical aspects of game design and uses them to develop and prepare an original board game. Students also learn principles typical of modern board games and practical aspects of production, publishing and release from industry professionals.

LECTURE SYLLABUS

1. Introduction and modern board games
2. Design, prototyping, MVP and design sprints
3. Cooperative versus competitive games and zero-sum games
4. Party games: where does their appeal come from?
5. The 4Cs: creativity, critical thinking, communication and collaboration
6. Game-based learning versus gamification
7. Board games for ethical and social skills
8. Social board games, storytelling and logical deduction
9. Educational games versus education through play
10. Legacy games
11. Designing heavy economic and sandbox games
12. Presentation of the completed games

SEMINAR SYLLABUS

1. Hands-on prototyping and examples
2. Designing the first game and its prototype
3. Testing and evaluating the proposed prototypes
4. Further development of the first game and its prototype
5. Testing and evaluating the revised prototypes
6. Final presentation and assessment

STUDY OBJECTIVES

Students apply game-design knowledge to the design and preparation of an original board game. They become familiar with principles used in modern board games and with the practical production, publishing and release process.

STUDY MATERIALS

To be added.

NOTE

The course is taught in Czech.

UEE

Environment Design in Unreal Engine

E

Recommended electives

2 ECTS

Semester 3 · intensive block at the beginning of the examination period

Teaching extent: four-day intensive block

A four-day practical block combining Unreal Engine, basic work in Blender and 3D scanning, including the use of scanned objects in an interactive environment.

PEOPLE

Lecturers

Daniel Tripplet (Purdue University)

ANNOTATION

An intensive practice-oriented course focused on creating interactive 3D environments in Unreal Engine. It combines work in Unreal Engine with basic preparation of 3D content in Blender and with the capture and use of 3D scans of physical objects.

LEARNING OUTCOMES

- create and edit a simple interactive 3D environment in Unreal Engine
- prepare basic 3D content in Blender for use in Unreal Engine
- capture a 3D scan of an object and integrate the scanned object into an Unreal Engine environment

INTENSIVE-BLOCK SYLLABUS

- hands-on work in Unreal Engine to create an interactive environment
- a basic workflow between Blender and Unreal Engine
- a short practical course in 3D scanning objects
- processing and using scanned objects in Unreal Engine
- combining these techniques in the creation of a 3D environment

TEACHING FORMAT

The course was delivered as a four-day intensive block at the beginning of the examination period. It was taught by Daniel Tripplet from Purdue University and carries 2 ECTS credits.

NEXT COURSE RUN

A similar four-day intensive format is planned for the following academic year. The exact dates will be announced separately.

Master's Thesis

P

Programme core

30 ECTS

Semester 4 · summer

Teaching extent: 270ZP

Completion: Z

Individual work supervised by an advisor: theoretical and practical components, writing, defence preparation and the final defence.

ANNOTATION

Teaching is based on individual consultations with the thesis supervisor and, where appropriate, other consultants. The 30 ECTS workload (approximately 900 hours) includes consultations, preparation of the theoretical and practical parts, writing, defence preparation and the defence before a committee.

LECTURE SYLLABUS

The course has no lectures.

SEMINAR SYLLABUS

The course has no seminars.

LITERATURE

Study materials are provided by the thesis supervisor.

REQUIREMENTS

No additional requirements are specified in the source syllabus.

NOTE

Students must first have an approved master's thesis assignment. Further information and materials are available on the FIT Courses website.