COURSE DESCRIPTION

1. Program Information

1.1 University	**“Alexandru Ioan Cuza” University of Iasi**
1.2 Faculty	**Faculty of Computer Science**
1.3 Department	**Department of Computer Science**
1.4 Study Domain	**Computer Science**
1.5 Study Cycle	**Undergaduate Studies**
1.6 Study Program / Qualification	**Computer Science/ Computer Science**

2. Course Information

2.1 Course Name	3D Computer Animation - Fundamental Algorithms and Techniques						
2.2 Course Teacher	Anca Vitcu, PhD (Associate Professor, Department of Technical Sciences, UAUIM, Bucharest)						
2.3 Seminary Teacher	Anca Vitcu, PhD (Associate Professor, Department of Technical Sciences, UAUIM, Bucharest)						
2.4 Study Year	**III**	**2.5** Semester	**1**	**2.6** Evaluation	**P**	**2.7** Course Status*	**OP**

** OB – Compulsory / OP – Optional*

3. Total estimated hours (hours per semester and didactic activities)

3.1 Hours per week		in which: **3.2** course		**3.3** seminary/laboratory	
(3 sessions; 4 weeks/session)					
1st session	**7**		**7**		**-**
2nd session	**4**		**-**		**4**
3rd session	**3**		**-**		**3**
3.4 Hours in curriculum	56	in which: **3.5** course	28	**3.6** seminary/laboratory	28

Time Distribution	hours
Manual study, Course support, Bibliography, and others	**25**
Supplementary Documentation in library, in electronic forums, and on the field	**10**
Seminaries/laboratories preparation, homeworks, reports, portfolios and essays	**20**
Tutoring	
Evaluation	**4**
Other activities: consultations for project implementation for each team (anytime is needed) – in lab or using e-comunication (e-mail, skype).	**20-30 min**

3.7 Total hours individual study	**55**
3.8 Total hours per semester	**115**
3.9 Credits	

4. Preconditions (if necessary)

4.1 Of Curriculum	----
4.2 Of Skills	----

5. Conditions (if necessary)

5.1 For Course Operation	**------**

5.2 For Seminary/Laboratory Operation	**Presence required**

6. Specific Skills Acquired

Professional Skills	**C1, C3**
Transversal Skills	**CT1, CT2, CT3**

7. Course Objectives (from the grid of specific skills acquired)

7.1 General Objectives	To put forward a background which catalysis and bring forward through experiment the creativeness and scientific association among mathematics & computer science on one side and, visual arts & architecture on another - relationship inspired by bioscience/natural sciences.
7.2 Specific Objectives	1) Model generation, simulation and visualization (2D, 3D) of complex processes from real world connected with random phenomena (ex. from fields like geography, geophysics, epidemiology); 2) Space configuration (ex. mathematical models in architecture); 3) Design characters involved in different scenarios. The outcome is an animation/short movie using concepts from AI, cellular automaton, fractals, algorithms, stochastic processes, knot theory, graphs/social networks, game theory, and programming. 4) Understand virtual and augmented reality technologies and applications

8. General Description

8.1	**Course***	**Teaching Methods**	**Observations** (hours and bibliographic references)
1.	Overview – Fundamental Autodesk Maya Concepts	Lecture & interactive presentation	2
2.	Polygon Modeling in Maya	Lecture & interactive presentation	2
3.	NURBS Modeling in Maya	Lecture & interactive presentation	2
4.	Working with Subdivision Surfaces	Lecture & interactive presentation	2

5.	MEL Programming Language: The Basics of MEL Commands, Using Expressions, Variables and Data Types, Procedures and Functions	Lecture & interactive presentation	2
6.	Problem Solving with MEL Scripting	Lecture & interactive presentation	2
7.	Controlling the Flow of Execution	Lecture & interactive presentation	2
8.	Shading and Texturing Basics, Redering Techniques	Lecture & interactive presentation	2
9.	Creating Character: Modeling Basics, Facial Expressions	Lecture & interactive presentation	2
10.	Creating Character: Skeleton Setup, Control Rig Setup, Muscle System	Lecture & interactive presentation	2
11.	Animation Techniques	Lecture & interactive presentation	2
12.	Animating Facial Features	Lecture & interactive presentation	2
13.	Animating Solid Spaces; Animating Biology	Lecture & interactive presentation	2
14.	Basic Concepts on Virtual and Augmented Reality	Lecture & interactive presentation	2

** Lecturers with invited professors, attendence of documentary presentations, videoconferences; senario presentation and brainstorming on study topics, discussions on scientific concepts and technology to be used.*

Bibliography

Main references:

Cabrera Cheryl (2008) – An Essential Introduction to Maya Character, Elsevier
Palamar Todd (2016) – Mastering Autodesk Maya, Wiley
Paret Rick (et. al.) (2010) – Computer Animation Complete (All-in-one: Learn Motion Capture, Characteristics, Point- Based, and Maya Winning Techniques), Elsevier
Gould D. A. David (2005) - Complete Maya Programming (Volume II), Elsevier
Stripinis David (2003)- The MEL Companion: Maya Scripting for 3D Artists, Charles River Media
Wilkins R. Mark, Kazmier Chris (2003) – MEL Scripting for Animators, Elsevier Science

Supplementary references:

Bertuglia Cristoforo Sergio, Vaio Franco (2005). Nonlinearity, Chaos, and Complexity: The Dynamics of Natural and Social Systems, Oxford University Press, NY.
Ching Wai-Ki, Ng Michael K., (2006). Markov Chains: Models, Algorithms and Applications, Springer, NY.
Ilachinski Andrew, (2001). Cellular Automata: A Discrete Universe, World Scientific, Singapore.
Kimmel Marek, Axelrod David E., (2002). Branching Processes in Biology, Springer, NY.
Koski T. (2001). Hidden Markov Models for Bioinformatics, Kluwer Academic Publisher, Dordrecht.
Mihelj Matjaz˘ (et. al.) (2014). Virtual Reality Technology and Applications, Springer, Dordrecht
Marsland Stephen, (2009). Machine Learning: An Algorithmic Perspective, Chapman & Hall/CRC Press.
Miller John H., Scott E. Page, (2007). Complex Adaptive Systems: An Introduction to Computational Models of Social Life (Princeton Studies in Complexity), Princeton University Press, NY.
Mitchell Melanie, (2009). Complexity: A Guided Tour, Oxford University Press, NJ.
Olive Joseph, Christianson Caitlin, McCary John (Ed.), (2011) – Handbook of Natural Language Processing and Machine Translation, Springer. Wasserman S., Faust K., (1994). Social Network Analysis: Methods and Applications, Cambridge University Press, Cambridge.
Waterman M., (1995). Introduction to Computational Biology, Chapman & Hall, Cambridge.
Wolfram Stephen, (2002). A New Kind of Science, Wolfram Media.

8.2	Seminary / Laboratory	Teaching methods	Observations (hours and bibliographic references)
1.	Selecting project themes, presentation of evaluation criteria	Debate	2
2.	Project development (stage 1)	Discussions with each team	2
3.	Project development (stage 2)	Discussions with each team	2
4.	Project development (stage 3)	Discussions with each team	2
5.	Project development (stage 4)	Discussions with each team	2
6.	Project development (stage 5)	Discussions with each team	2
7.	Project development (stage 6)	Discussions with each team	2
8.	Interim evaluation	Team presentations accopagned by discussions (recommandations)	2
9.	Project development (stage 7)	Discussions with each team	2
10.	Project development (stage 8)	Discussions with each team	2
11.	Project development (stage 9)	Discussions with each team	2
12.	Project development (stage 10)	Discussions with each team	2
13.	Projects presentations – **Exhibition**	Students presentations & discussions - invitation to join the audience and participate in the final discussions will be addressed to the FCS professors and students, as well as to other UAIC members	2
14.	Projects presentations - **Exhibition**	Students presentations & discussions - invitation to join the audience and participate in the final discussions will be addressed to the FCS professors and students, as well as to other UAIC members	2

Bibliography

Tutorials: Autodesk Maya, Rhino/Grasshopper, MotionBuilder, Massive software, MEL, Python, Perl, Unity
http://www.massivesoftware.com/
http://www.autodesk.com/products/maya/overview
https://unity3d.com/

9. Course content synchronization with the expectations of the community representatives, professional associations and employers from the program domain

Entertainment industry (film, theater, video game industries), Architecture & Urbanism, Aerospace Industry, Medicine & Biology

10. Evaluation

Activity Type	**10.1 Evaluation criteria**	**10.2 Evaluation methods**	**10.3 The weight of each evaluation form (%)**
10.4 Course	Project evaluation: theoretical work- algorithms and graphical methods, documentation of the theoretical part	Presentation (10 min); Q&A (5 min)	30%
10.5 Seminary/ Laboratory	Project evaluation: experimental work, scenario complexity, modeling, rendering and animation techniques	Presentation (15 min); Q&A (5 min)	70%
10.6 Minimal performance standards: Learning the programming languages used in visual arts (ex. MEL, Python, etc.) and mathematical issues associated with the field of computer science, with the duty to accomplish a proposed project.			

Date Course Teacher Seminary/Laboratory Teacher

Department Date of Approval Director of the Department