STUDY MODULE DESCRIPTION FORM

Name of the module/subject	Code
Scientific data visualization	**1010622211010657868**

Field of study	Profile of study (general academic, practical)	Year /Semester
Mechanical Engineering	**(brak)**	**1 / 1**
Elective path/specialty	**Subject offered in:**	**Course (compulsory, elective)**
Virtual Design Engineering	**Polish**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
Second-cycle studies	**full-time**

No. of hours	No. of credits
Lecture: **1** Classes: **-** Laboratory: **1** Project/seminars: **-**	**2**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
(brak)	**(brak)**

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**100 2%**
Technical sciences	**100 2%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	As for all the graduates of first degree of Mechanics, FWMT
2	**Skills**	As for all the graduates of first degree of Mechanics, FWMT
3	**Social competencies**	As for all the graduates of first degree of Mechanics, FWMT

Assumptions and objectives of the course:

Gain the knowledge of scientific data visualization systems and selected topics on computational geometry (3D modelling, parametric curves, triangulation) and digital lighting/rendering.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. knows the basic methods, techniques and tools used in scientific data visualization in the field of mechanics - [T2A_W07]
2. has a theoretically founded detailed knowledge of issues related to the scientific data visualization resulting from engineering calculations of mechanics - [T2A_W04]
3. has a knowledge on developments and the most important new achievements in scientific data visualization - [T2A_W05]

Skills:

1. is able to obtain information from literature, databases and other properly selected sources (also in English); is able to integrate the information obtained, to make interpretations and draw conclusions - [T2A_U01]
2. is able to assess the suitability and ability to use new information technology in applications in the field of mechanical engineering - [T2A_U03]
3. can set the directions of further learning and has a the ability to self-learning - [T2A_U05]
4. is able to use to formulate and solve engineering tasks and simple research problems selected programming languages? and scientific data visualization tools and techniques - [T1A_U09]
5. is able to assess the suitability and ability to use new scientific data visualization techniques in the field of mechanical engineering - [T2A_U12]
6. is able to assess the usefulness of scientific data visualization methods and tools in engineering tasks - [T2A_U18]

Social competencies:

1. understands the need for lifelong learning; is able to inspire and organize the learning process of others - [T2A_K01]
2. is able to interact and work in a group, taking different roles - [T2A_K03]
3. is able to properly identify priorities from the implementation of tasks specified by himself or others - [T2A_K04]

Assessment methods of study outcomes

Oral and written tests. Evaluation of the results of individual tasks.

Course description

Geometry. 3D model. Parametric curves and surfaces. Data sources (numerical calculations, experiment, medical diagnostics). Visualization. Techniques of data representation - scalar and vector fields, cross-sections, isometrics, lines of current

ribbons, glyphs \ vectors, volumetric visualization. Choosing \ determining variables for visualization. Vorticity, line integral convolution. An overview of the possibilities of visualization systems on the example of selected software (eg ParaView). Data processing pipelines and filters (including those created in Python).

Lighting and rendering models.

Basic bibliography:

1. U. Ayachit. The ParaView Guide. Community Edition. http://paraview.org/paraview-guide/

2. http://www.bu.edu/tech/support/research/training-consulting/online-tutorials/introduction-to-scientific-visualization-tutorial/

3. M. Gągolewski, M. Bartoszuk, A. Cena. Przetwarzanie i analiza danych w języku Python. PWN, Warszawa, 2016. ISBN: 9788301189402

Additional bibliography:

1. https://en.wikipedia.org/wiki/Scientific_visualization

2. https://en.wikipedia.org/wiki/Line_integral_convolution

3. http://www.bu.edu/tech/support/research/training-consulting/online-tutorials/paraview/

Result of average student's workload

Activity	Time (working hours)
1. Participation in the lecture	15
2. Fixation of the lecture	7
3. Preparation for laboratory exercises	4
4. Participation in laboratory exercises	15
5. Strengthening exercises and report content	9
6. Preparing to pass (lab.)	2
7. Consultation	2

Student's workload

Source of workload	hours	ECTS
Total workload	54	2
Contact hours	32	1
Practical activities	32	1