MODULE DESCRIPTION

Module code	
Module name	**Modelowanie i wizualizacja procesów fizycznych**
Module name in English	**Modelling and Visualisation of Physical Processes**
Valid from academic year	**2012/2013**

MODULE PLACEMENT IN THE SYLLABUS

Subject	**Computer Science**
Level of education	**1st degree** *(1st degree / 2nd degree)*
Studies profile	**General** *(general / practical)*
Form and method of conducting classes	**Full-time** *(full-time / part-time)*
Specialisation	
Unit conducting the module	**The Department of Computer Science Applications**
Module co-ordinator	**Grzegorz Słoń, PhD, Eng.**
Approved by:	

MODULE OVERVIEW

Type of subject/group of subjects	**Basic** *(basic / major / specialist subject / conjoint / other HES)*
Module status	**Non-compulsory** *(compulsory / non-compulsory)*
Language of conducting classes	**Polish**
Module placement in the syllabus - semester	**6th semester**
Subject realisation in the academic year	**Summer semester** *(winter / summer)*
Initial requirements	**Physics, the Fundamentals of Programming 2, Computational Methods** *(module codes / module names)*
Examination	**No** *(yes / no)*
Number of ECTS credit points	**5**

Method of conducting classes	Lecture	Classes	Laboratory	Project	Other
Per semester	**30**		**30**		

TEACHING RESULTS AND THE METHODS OF ASSESSING TEACHING RESULTS

Module target	The aim of the module is to familiarise students with mathematical description of physical phenomena and processes as well as with the principles of building digital models and making computer simulations of physical objects operation.

Effect symbol	Teaching results	Teaching methods *(l/c/l/p/other)*	Reference to subject effects	Reference to effects of a field of study
W_01	A student has knowledge as regards mathematical description of physical phenomena.	l	K_W01, K_W03	T1A_W01, T1A_W02, T1A_W07, InzA_W02
W_02	A student has knowledge as regards numerical methods of solving systems of differential equations.	l	K_W03, K_W07, K_W15, K_W16	T1A_W01, T1A_W02, T1A_W03, T1A_W04, T1A_W07, T1A_W09, InzA_W02, InzA_W04, InzA_W05
W_03	A student knows basic techniques concerning graphical presentation of simulation results.	l	K_W12	T1A_W04, T1A_W07, InzA_W02, InzA_W05
U_01	A student is able to obtain information from the literature on the subject as well as other sources, integrate them and draw conclusions.	l	K_U01	T1A_U01, T1A_U07
U_02	A student can plan as well as conduct simulation of a simple physical process.	l	K_U10	T1A_U10, T1A_U13, InzA_U05
U_03	A student can utilise the learnt mathematical models and methods to analyse and design modelling and visualisation algorithms.	l	K_U18, K_U21	T1A_U07, T1A_U08, T1A_U09, T1A_U10, T1A_U12, T1A_U13, T1A_U15, T1A_U16, InzA_U01, InzA_U02, InzA_U04, InzA_U05, InzA_U07, InzA_U08
K_01	A student is capable of working and co-operating in a team.	l	K_K03	T1A_K03, T1A_K04
K_02	A student understands the necessity of continuous self-betterment.	l/l	K_K01	T1A_K01

Teaching contents:

Teaching contents as regards lectures

Lecture number	Teaching contents	Reference to teaching results for a module
a.	Introduction to modelling physical processes. Deterministic and stochastic simulations.	W_01
b.	Modelling with the use of systems differential equations.	W_01, W_02
c.	Modelling with the use of operational calculus.	W_01, W_02
d.	The methods of numerical solutions of systems of differential equations.	W_01, W_02
e.	The basics of applying the method of finite elements in process analysis.	W_01, W_02, U_01, K_02
f.	Computer modelling parameters. Differential schemes.	W_01, W_02
g.	Modelling dynamic objects. The rules of models simplification.	W_01, W_02
h.	Technical aspects of simulation test.	W_01, W_02, W_03
i.	Programming devices.	W_02, W_03, K_02
j.	Graphics in programming environments.	W_03, K_02
k.	The visualisation of the results of computer simulation using basic programming tools.	W_03
l.	The simulations of sample mechanical processes.	W_01, W_02, U_01
m.	The simulations of sample electrical processes.	W_01, W_02, U_01
n.	Advanced packages of simulation software (e.g. MODELLUS, AnyLogic, and Easy Java Simulations).	U_01, K_02
o.	Data exchange among diverse user environments.	U_01, K_02

Teaching contents as regards laboratory classes

Laboratory class number	Teaching contents	Reference to teaching results for a module
p.	Building mathematical models of simple physical phenomena.	U_02, K_01, K_02
q.	Numerical methods of solving systems of differential equations – Euler and Heun methods.	U_02, U_03, K_01, K_02
r.	Numerical methods of solving systems of differential equations – fourth-order	U_02, U_03,

	Runge-Kutta method.	K_01, K_02
s.	Differential schemes in computer modelling.	U_02, K_02
t.	Simplifying complex models.	U_02, K_02
u.	Building models in different programming environments.	U_02, U_03, K_02
v.	Modelling physical phenomena using systems of differential equations – motion mechanics - creating a computer application - 1	U_02, U_03, K_01, K_02
w.	Modelling physical phenomena using systems of differential equations – motion mechanics - creating a computer application - 2	U_02, U_03, K_01, K_02
x.	Modelling physical phenomena using systems of differential equations – an electrical circuit - creating a computer application - 1	U_02, U_03, K_01, K_02
y.	Modelling physical phenomena using systems of differential equations – an electrical circuit - creating a computer application - 2	U_02, U_03, K_01, K_02
z.	Graphical presentation of the results of modelling - 1	U_02, U_03, K_01, K_02
aa.	Graphical presentation of the results of modelling - 2	U_02, U_03, K_01, K_02
bb.	Utilising specialist packages of simulation software.	U_02, U_03, K_01, K_02
cc.	The application of the finite elements method in modelling boundary phenomena - 1	U_02, U_03, K_01, K_02
dd.	The application of the finite elements method in modelling boundary phenomena - 2	U_02, U_03, K_01, K_02

The methods of assessing teaching results

Effect symbol	**Methods of assessing teaching results** *(assessment method, including skills – reference to a particular project, laboratory assignments, etc.)*
W_01	A written test during the classes.
W_02	A written test during the classes.
W_03	A written test during the classes.
U_01	A written test during the classes.

U_02	A practical test (students' independent work assessment) while creating an application in the laboratory.
U_03	A practical test (students' independent work assessment) while creating an application in the laboratory.
K_01	A practical test (students' independent work assessment) while creating an application in the laboratory.
K_02	A practical test (students' independent work assessment) while creating an application in the laboratory.

STUDENT'S INPUT

ECTS credit points		
	Type of student's activity	**Student's workload**
1	Participation in lectures	**30**
2	Participation in classes	
3	Participation in laboratories	**30**
4	Participation in tutorials (2-3 times per semester)	**2**
5	Participation in project classes	
6	Project tutorials	
7	Participation in an examination	
8		
9	**Number of hours requiring a lecturer's assistance**	**62** *(sum)*
10	**Number of ECTS credit points which are allocated for assisted work** *(1 ECTS credit point=25-30 hours)*	**2.48**
11	Unassisted study of lecture subjects	**15**
12	Unassisted preparation for classes	
13	Unassisted preparation for tests	**18**
14	Unassisted preparation for laboratories	**15**
15	Preparing reports	**15**
16	Preparing for a final laboratory test	
17	Preparing a project or documentation	
18	Preparing for an examination	
19	Preparing questionnaires	
20	**Number of hours of a student's unassisted work**	**63** *(sum)*
21	**Number of ECTS credit points which a student receives for unassisted work** *(1 ECTS credit point=25-30 hours)*	**2.52**
22	**Total number of hours of a student's work**	**125**
23	**ECTS credit points per module** *1 ECTS credit point=25-30 hours*	**5**
24	**Work input connected with practical classes** *Total number of hours connected with practical classes*	**93**
25	**Number of ECTS credit points which a student receives for practical classes** *(1 ECTS credit point=25-30 hours)*	**3.72**