Code **Course item:**

1. INFORMATION ABOUT THE COURSE

A. Basic information

Name of course	***MATHEMATICAL MODELING IN CHEMICAL ENGINEERING***
Study level	*SECOND DEGREE*
Unit running the study programme	*Faculty of Chemical Technology and Engineering / Department of Chemical and Bioprocess Engineering*
Study programme	*Chemical Technology*
Speciality	*1. Technology of Chemical Processes* *2. Industrial Biotechnology* *3. Chemical and Foodstuff Analytics*
Name of teacher (s) and his academic degree	*Ireneusz Grubecki, DSc, PhD, Eng*
Introductory courses	*Mathematics, Chemical engineering and technology*
Prerequisites	*No prerequisites*

B. Semester/week schedule of classes

Semester	Lectures	Classes	Laboratories	Project	Seminars	Field exercises	ECTS
summer	15	30					4

2. EFFECTS OF EDUCATION (acc. to National Qualifications Framework)

Knowledge	*The aim of the course is to acquire the knowledge in mathematics, computer science allowing to use mathematical methods in chemistry. On successful completion of the course student is supposed to: acquire the knowledge on software of computer technology serving in modelling and design of chemical processes, know models, general technological principles, and principles of technological process modelling.*
Skills	*On successful completion of the course student is supposed to describe mathematically the problems on chemical engineering and technology, select a suitable calculation methods and make a suggestion of calculation scheme to solve defined problem.*
Competences	*On successful completion of the course student is supposed to, for example: active to, willing to, creative, open to, cooperative with, be able to, organized, etc.*

3. TEACHING METHODS

Multimedia lecture and classes.

4. METHODS OF EXAMINATION

Written test from lectures and classes.

5. SCOPE (Syllabus)

Lectures	*An introduction to Mathematical Modeling basic terms; Classification of Mathematical Models: grouping of models into opposite pairs, classification based on mathematical complexity, classification according to scale (degree of physical detail); Model formulation: Balances and conservation principles, Transport phenomena models, Boundary condition, Empirical model building: Dimensional systems, Dimensionless equations, Empirical models; Strategies for simplifying mathematical models; Numerical methods: algebraic equation (AE), Ordinary differential equation (ODEs), Boundary-value problems (BVP),*

	Partial differential Equations (PDEs); Statistical analysis of mathematical models: Linear regression, Weighted least squares, Confidence intervals and regions, Correlation between parameters, Non-linear regression.
Classes	*Solving of calculation problems considered on a lectures.*

6. **LITERATURE**

Basic literature	*1. Rasmuson A., Anderson B., Olsson L., Anderson R. Mathematical Modeling in Chemical Engineering. Cambridge University Press, New York, 2014.* *2. Seinfeld J.H., Lapidus L. Mathematical methods in chemical engineering, Vol. 3, Process modeling, estimation, and identification. Prentice-Hall, 1974.*
Supplementary literature	*1. Aliev A.V., Mishchenkova O.V., Lipanov A.M. Mathematical modeling and numerical methods in chemical physics and mechanics. Apple Academic Press: CRC Press/Taylor & Francis Group, 2016.*