Course code: **Plan position:**

A. INFORMATION ABOUT THE COURSE

B. Basic information

Name of course	***Chemical reactors engineering***
Field of studies	Chemical Technology
Level of studies	Second degree
Profile of studies	General academic
Form of studies	Stationary
Specialty	1. Waste material engineering 2. Industrial Biotechnology 3. Chemical and Foodstuff Analytics 4. Modern Materials Technologies
Unit responsible for the field of studies	Faculty of Chemical Technology and Engineering / Department of Chemical and Biochemical Engineering
Name and academic degree of teacher(s)	Sylwia Kwiatkowska-Marks, BEng PhD, Justyna Miłek, BEng, PhD, Ilona Trawczyńska, BEng, PhD Sławomir Żak, BEng, PhD
Introductory courses	Fundamentals of Chemical Engineering Physical Chemistry Fundamentals of Mathematical Analysis
Introductory requirements	Basic knowledge on Mass,- Momentum- and Energy Transfer

C. Semester/week schedule of classes

Semester	Lectures (W)	Auditorium classes (Ć)	Laboratory classes (L)	Project classes (P)	Seminar (S)	Field classes (T)	Number of ECTS points
Summer	30	30					6

2. LEARNING OUTCOME

No.	Learning outcomes description	The reference to the learning outcomes of specific field of study	The reference to the learning outcomes for the area
KNOWLEDGE			
W1	Student has detailed knowledge of chemical engineering in the field of chemical reactor engineering.	K_W04	P7S_WG
SKILLS			
U1	On successful completion of the course student can evaluate the usefulness and ability to use new achievements in materials, apparatus and research methods to design processes run in chemical reactors.	K_U09	P7S_UW
U2	Student can applied the mathematical models to select and design suitable reactor for specific chemical process.	K_U10	P7S_UW

SOCIAL COMPETENCES			
K1	On successful completion of the course student is supposed to understand the need for lifelong learning, he can inspire and organize the learning process of the others.	K_K01	P7S_KK P7S_KO

3. TEACHING METHODS

A. Traditional methods used

Standard lecture with presentation. Calculations (excercise classes) performed by students under supervision of academic staff. Outdoor classes - visits of production companies.

4. METHODS OF EXAMINATION

Written colloquium from lectures and calculations classes

5. SCOPE

Lectures	The basic terms: extent, conversion, product yield and selectivity, independent reactions. Type of reactors: industrial reactors, lab reactors and micro-reactors. Thermal insulation. Rate of reaction. Homogeneous process kinetics. General mole balanced equation - methodology and application. Ideal reactors for a single reaction: batch and semi-batch reactor, continuous stirred tank reactor, plug flow reactor, mixed flow reactors in series. Introduction to reactors design. Real reactors – Residence Time Distribution. Fundamentals of control and reactors optimization.
Calculations Classes	Solving of engineering problems discussed during the lectures.

6. METHODS OF VERIFICATION OF LEARNING OUTCOMES

LEARNING OUTCOME	Form of assessment					
	Oral examination	Written exam	Colloquium	Project	Presentation	Reports
W1			×			
U1			×			
U2			×			
K1			×			

7. LITERATURE

Basic literature	1. O. Levenspiel: Chemical Reaction Engineering, Wiley & Sons, Inc. New York 1999. 2. M.E. Davis, R.J. Davis: Fundamentals of Chemical Reaction Engineering, McGraw – Hill, New York, 2003. 3. G.F. Froment, K. B. Bischoff, J. de Wilde: Chemical Reactor Analysis and Design, John Wiley & Sons, Inc. New York, 2011.
Supplementary literature	1. Jean -Pierre Corriou: Process Control. Theory and Applications, Springer-Verlag, London 2004. 2. H.F. Rase: Chemical Reactor Design for Process Plants. Case Studies and Design Data, John Wiley & Sons Inc., New York, 1977.

8. TOTAL STUDENT WORKLOAD REQUIRED TO ACHIEVE EXPECTED LEARNING OUTCOMES EXPRESSED IN TIME AND ECTS CREDITS

Student's activity		Student workload– number of hours
Classes conducted under a direct supervision of an academic teacher or other persons responsible for classes	Participation in classes indicated in point 1B	60
	Supervision hours	20

Student's own work	Preparation for classes	20
	Reading assignments	10
	Other (preparation for exams, tests, carrying out a project etc)	40
Total student workload		**150**
	Number of ECTS points	**6**