(*faculty stamp*)

Z1-PU7	WYDANIE N1	Strona 1 z 2

COURSE DESCRIPTION

1. Course title: Applied Mathematics	**2. Course code**
3. Validity of course description: 2012/2013	
4. Level of studies: 1st cycle of higher education	
5. Mode of studies: intramural studies	
6. Field of study: INDUSTRIAL AND ENGINEERING CHEMISTRY	RCH6
7. Profile of studies:	
8. Programme: general	
9. Semester: 3	
10. Faculty teaching the course:	
11. Course instructor: Jan Thullie, DSc, associate professor	
12. Course classification:	
13. Course status: compulsory	
14. Language of instruction: English	
15. Pre-requisite qualifications: basic knowledge of Mathematics, Unit Operations and Fluid Mechanics	
16. Course objectives: An objective of the course is to acquaint students with basic methods of chemical reactors calculations	
17. Description of learning outcomes:	

Nr	Learning outcomes description	Method of assessment	Teaching methods	Learning outcomes reference code
1.	Student knows basic types of ODE and PDE	examination	lectures	**K_W01 ++** **K_W14 +**
2.	Student knows finite difference method	examination	lecture	**K_W01 ++** **K_W14 +**
3.	Student has basic knowledge about stability of differential equations	examination	lecture	**K_W01 ++** **K_W14 +**
4.	Student knows basic methods of solving ODE and PDE	Credit test	class	**K_W01 ++** **K_U07 ++**
5.	Student is able to use iterative methods	Credit test	clas	**K_W01 ++** **K_U07 ++**
6.	Student understands the necessity of further professional training and the development of his/her engineering and personal competence	Observation and discussion	Lecture, class, consultation	**K_K01 +**

18. Teaching modes and hours

Lecture / BA /MA Seminar / Class / Project / Laboratory

Lecture 30 h., Class - 30 h

19. Syllabus description:

Ordinary differential equations (ODEs): general concepts, general and particular solution, initial conditions. Analytical methods for solving 1st order ODEs. Application of ODE to model steady state heat conduction and mass diffusion problems.ODE of 2-nd order: boundary conditions, solution of homogeneous and non-homogeneous equations. The use of 2nd order ODE in the portrayal of selected problems of chemical engineering.
Methods for solving linear equations: finite and iterative.

Partial differential equations (PDEs). Application of PDEs in the modelling of chemical engineering problems. Solution of PDEs. Finite differences method. Explicit and implicit schemas. Difference equations and their solutions. Non-steady state heat conduction or mass diffusion portrayals by the parabolic-type PDEs, marching approach and the Crank-Nicolson method. Description of convective mass or heat transport using PDEs. Conjugate boundary conditions. Elliptic and parabolic PDEs in two space dimension problems. ADI method. Non-linear parabolic PDE , approximation methods.

20. Examination: yes (semester 3)

21. Primary sources

1. D.U.von Rosenberg; Methods for the Numerical Solution of Partial Differential Equations, Elsevier 1969.
2. R.B. Bird, W.E. Stewart, E.N. Lightfoot: Transport Phenomena, J.Wiley, New York 2002.
3. R.G. Rice, D.D. Do; Applied Mathematics and Modeling for Chemical Engineers, Wiley 1995

22. Secondary sources: Lapidus L. Digital computation for chemical engineers, New York 1962

23. Total workload required to achieve learning outcomes

Lp.	Teaching mode :	Contact hours / Student workload hours
1	Lecture	30/30
2	Classes	30/15
3	Laboratory	/
4	Project	/
5	BA/ MA Seminar	/
6	Other	/15
	Total number of hours	60/60

24. Total hours:120

25. Number of ECTS credits: 4

26. Number of ECTS credits allocated for contact hours: 2

27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects):2

26. Comments:

Approved:

…… ……

(date, Instructor's signature) (*date , the Director of the Faculty Unit signature)*