



## Subject card

Subject name and code	, PG_00057753						
Field of study	Green Technologies						
Date of commencement of studies	October 2022	Academic year of realisation of subject			2022/2023		
Education level	first-cycle studies	Subject group			Obligatory subject group in the field of study		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			English		
Semester of study	1	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Physical Chemistry -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Jacek Czub					
	Teachers	dr inż. Łukasz Nierzwicki prof. dr hab. inż. Jacek Czub					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	30.0	0.0	0.0	45
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours		Self-study		SUM
	Number of study hours	45	5.0		25.0		75
Subject objectives	The aim of the subject is to teach the students skills in usage of computers for evaluation and analysis of the experimental results. Skills in using software for engineers, esp. chemical engineers, including data bases, will also be trained. Another aim is to give students basic knowledge in statistics of one variable and two variables (linear regression), as well as in the fundamentals of algorithms and hardware of digital computers.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_K06] has awareness of the importance of non-technical aspects and effects of engineering activities, including its impact on the environment and the associated responsibility for decisions.	Student acquires knowledge about modern computers, including computer architecture, representation of various types of data in computer memory and basic programming.  Student acquires introductory knowledge on numerical methods and statistics.			[SK3] Assessment of ability to organize work [SK5] Assessment of ability to solve problems that arise in practice [SK2] Assessment of progress of work		
	[K6_U03] is able to use information and communication technologies relevant to the common tasks of engineering, is able to use known methods and mathematical-physical models to describe and explain phenomena and chemical processes	Student knows how to effectively use text editors and spreadsheets and is capable of creating simple python programs for solving engineering and scientific problems.  Student knows how to apply rudimentary statistical reasoning and numerical methods.			[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools		

Subject contents	<p>LECTURES: History of computers, architecture of a numerical computer, algorithms and flow charts, numerical formats of different types of data, basic classes of software (operating systems), digital-to-analog and analog-to-digital conversion, basic programming in python; elementary statistics of one and two variables, linear regression, statistical tests, numerical instability, solving non-linear equations (e.g. bisection method), numerical interpolation and integration.</p> <p>LABORATORY: General section: using advanced functionalities of MSOffice class software (Word, Excel), basic programming in python</p> <p>Applied section: solving four assigned problems in linear regression, solving non-linear equations, numerical interpolation and numerical integration.</p>		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	final test in lectures	50.0%	30.0%
	solving four numerical assignments	100.0%	70.0%
Recommended reading	Basic literature	1. R. Johnson, Elementary Statistics, Boston 1992 and later editions 2. B. Carnahan, H. A. Luther, J. O. Wilkes, Applied Numerical Methods, New York 1984 and later editions	
	Supplementary literature	1. Lecture notes, examples, text problems and briefs published in the website of the Department of Physical Chemistry or given to the students.	
	eResources addresses	Adresy na platformie eNauczanie:	

<p>Example issues/ example questions/ tasks being completed</p>	<p>Answer each question in a concise manner, with up to 4-5 sentences per answer. The set draws on the topics covered in class, but also provides you with an opportunity to expand your knowledge on the subject and rethink certain issues that might have arisen in the lab.</p> <p>Feel free to search for answers in the Internet, but please make sure that you answer with your own words, based on your best understanding of each topic!</p> <p>1. You can easily interpolate between any two points using a straight line, and between any three points using a parabola. Can you interpolate between any N points using a single polynomial (that is, find one function that passes through all those points)? If so, what is the intuitive way to do it? [1.5 pt]</p> <p>2. Suppose that you want to numerically solve an equation whose variables cannot be separated, that is, you cannot explicitly write it in the form <math>y = f(x)</math>. (A good example is the one considered in the class, <math>(x^2)^2 + (y^3)^2 - 9 = x^2 - 2y</math>, which describes a parabola intersecting a circle.) Provided that you have a good solving algorithm at hand (e.g. Excels Solver), how would you determine the number of solutions for this equation? [1.5 pt]</p> <p>--</p> <p>The bisection method in mathematics is a root-finding method that repeatedly bisects an interval and then selects a subinterval in which a root must lie for further processing. It is a very simple and robust method, but it is also relatively slow (see: <a href="https://en.wikipedia.org/wiki/Bisection_method">https://en.wikipedia.org/wiki/Bisection_method</a>). Task: write a python script for solving the following equation in the proper interval with precision = <math>10^{-8}</math>. Show results using pyplot. <math>\sin x e^x + 1 = 0</math>, <math>x \in [4, 1]</math></p> <p>--</p> <p>2. What will be the output of the following python codes:</p> <p>a)</p> <pre>message = 'meet me at Pigalle on Thursday 12th, 3:45 am' for character in message:     if character.isdigit():         print(character, end="")</pre>
<p>Work placement</p>	<p>Not applicable</p>