GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00057753		
Field of study	Green Technologies		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2024/2025
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		

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 anaysis 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. Stident 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

<table>
<tr><td>Subject contents</td><td>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-todigital 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.
LABORATORY:
General section: using advanced functionalities of MSOffice class software (Word, Excel), basic programming
in python

Applied section: solving four assigned problems in linear regression, solving non-linear equations, numerical interpolation and numerical integration.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>final test in lectures</td><td>50.0%</td><td>30.0%</td></tr>
<tr><td>solving four numerical assignments</td><td>100.0%</td><td>70.0%</td></tr>
</table>
</td></tr>
<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>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</td></tr>
<tr><td>Supplementary literature</td><td>1. Lecture notes, examples, text problems and briefs published in the website of the Department of
Physical Chemistry or given to the students.</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
</table>
</td></tr>
</table>

Example issues/ example questions/ tasks being completed	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.
	
	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!
	
	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]
	
	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 y = f (x). (A good example is the one considered in the class, (x 2)^2 + (y 3)^2 9 = x^2 2 y, 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 numberof solutions for this equation? [1.5 pt]
	
	--
	
	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:https://en.wikipedia.org/wiki/Bisection_method).Task: write a python script for solving the following equation in the proper interval with precision = 10 8 . Show results using pyplot. sin x e^x + 1 = 0, x [4, 1]
	
	--
	
	2. What will be the output of the following python codes:
	
	a)
	
	message = 'meet me at Pigalle on Thursday 12th, 3:45 am'
	for character in message:
	  if character.isdigit():
	  print(character, end='')

Work placement	Not applicable