

# SYLLABUS

REGARDING THE QUALIFICATION CYCLE FROM 2026 TO 2029

ACADEMIC YEAR 2027/2028

## 1. BASIC COURSE/MODULE INFORMATION

Course/Module title	Computer Tools in Mathematical Applications
Course/Module code *	
Faculty (name of the unit offering the field of study)	Faculty of Exact and Technical Sciences
Name of the unit running the course	Institute of Mathematics
Field of study	Mathematics
Qualification level	First-cycle studies (Bachelor's)
Profile	General academic
Study mode	Full-time
Year and semester of studies	Year 2, Semester 4
Course type	Specialisation course
Language of instruction	English
Coordinator	Ewa Rak, PhD
Course instructor	Ewa Rak, PhD

\* - as agreed at the faculty

### 1.1. Learning format – number of hours and ECTS credits

Semester (no.)	Lectures	Classes	Laboratories	Seminars	Practical classes	Internships	others	ECTS credits
4			30					2

### 1.2. Course delivery methods

conducted in a traditional way

involving distance education methods and techniques

### 1.3. Course/Module assessment (exam, pass with a grade, pass without a grade)

Laboratory classes - passing with a grade

## 2. PREREQUISITES

Basic knowledge about computers, basic programs in the MS Office, algebra with geometry, calculus 1 and 2.

### 3. OBJECTIVES, LEARNING OUTCOMES, COURSE CONTENT, AND INSTRUCTIONAL METHODS

#### 3.1. Course/Module objectives

O1	Familiarizing students with the basic capabilities of the Mathematica software.
O2	Familiarizing students with the basic capabilities of the <i>LaTeX</i> typesetting system.
O3	Visualization of results.

#### 3.2. COURSE/MODULE LEARNING OUTCOMES (TO BE COMPLETED BY THE COORDINATOR)

Learning Outcome	The description of the learning outcome defined for the course/module	Relation to the degree programme outcomes
LO_01	The student knows mathematical software packages and their potential for use in solving application problems.	K_Wo6
LO_02	The student is able to apply one selected package to create and analyze a mathematical model.	K_U21, K_U15
LO_03	Through the knowledge of mathematical packages, the student is ready to fulfill social obligations resulting from the nature of work related to analysis and modeling.	K_Ko4
LO_04	The student is ready to take action in solving problems and performing tasks typical for professions related to analysis and modeling.	K_Ko5

#### 3.3. Course content (to be completed by the coordinator)

- A. Lectures
- B. Classes, laboratories, seminars, practical classes

Content outline
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1. Introduction to Mathematica: command structure, conventions used in the program; basic mathematical operations, defining variables and using built-in functions, file operations.
2. 2. Data analysis and presentation of results. Creating charts and graphically presenting data. Building dynamic relationships between sheets and workbooks. Preparing summaries and reports using pivot tables.
3. Advanced mathematical operations in Mathematica: operations on vectors and matrices, integration, differentiation, solving equations and systems of equations.
4. Visualization of calculation results in 2D and 3D, and handling graphic objects in Mathematica.
5. Introduction to the *LaTeX* text editor.
6. Data presentation using the *LaTeX* environment.

### 3.4. Methods of Instruction

Laboratory classes - group work, problem solving, design, discussion.

## 4. Assessment techniques and criteria

### 4.1 Methods of evaluating learning outcomes

Learning outcome	Methods of assessment of learning outcomes (e.g. test, oral exam, written exam, project, report, observation during classes)	Learning format (lectures, classes,...)
LO_01	observation during classes	lab
LO_02	project, observation during classes	lab
LO_03	project, observation during classes	lab
LO_03	project, observation during classes	lab

### 4.2 Course assessment criteria

Individual assessment of completed tasks and projects, also during an individual discussion. Points will be awarded for progress on the tasks. The grade will be determined by the percentage score according to the following scale:

less than 50% of points – failure,  
 [50 – 60%] points – satisfactory (3.0), [60 – 70%] points – plus satisfactory (3.5), [70 – 80%] points – good (4.0), [80 – 90%] points – plus good (4.5), [90– 100%] points – very good (5.0).

## 5. Total student workload needed to achieve the intended learning outcomes – number of hours and ECTS credits

Activity	Number of hours
Course hours	30
Other contact hours involving the teacher (consultation hours, examinations)	2
Non-contact hours - student's own work (preparation for classes or examinations, projects, etc.)	20
Total number of hours	52
Total number of ECTS credits	2

\* One ECTS point corresponds to 25-30 hours of total student workload

## 6. Internships related to the course/module

Number of hours	<i>Not applicable</i>
Internship regulations and procedures	<i>Not applicable</i>

## 7. Instructional materials

<p>Compulsory literature:</p> <ol style="list-style-type: none"> <li>1. P. R. Wellin, R. J. Gaylord, S. N. Kamin, An Introduction to Programming with Mathematica, Cambridge University Press, 2005.</li> <li>2. F. Mittelbach, U. Fischer, The LaTeX Companion, 3rd edition (TTCT series), Addison-Wesley Professional, 2025.</li> <li>3. T. Oetiker, M. Serwin, H. Partl, I. Hyna, E. Schlegl, The Not So Short Introduction to LATEX or LATEX in 280 minutes, 2023 <a href="https://richardson.byu.edu/624/fall_2023/latex-introduction.pdf">https://richardson.byu.edu/624/fall_2023/latex-introduction.pdf</a></li> </ol>
<p>Complementary literature:</p> <ol style="list-style-type: none"> <li>1. S. Kottwitz, LaTeX Beginner's Guide, Packt Publishing, 2025.</li> <li>2. S. Wolfram, The Mathematica Book, Fifth Edition, Wolfram Media, Inc., 2003.</li> </ol>

Approved by the Head of the Department or an authorised person