Appendix No. 1.5 to the Resolution No. 61/2025
of the Rector of the University of Rzeszów

SYLLABUS

REGARDING THE QUALIFICATION CYCLE FROM 2026 TO 2029
ACADEMIC YEAR 2026/2027.

1. BASIC COURSE/MODULE INFORMATION

Course/Module title	Calculus 2
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 1, Semester 2
Course type	Major subject
Language of instruction	English
Coordinator	Svetlana Mincheva-Kamińska, PhD
Course instructor	Svetlana Mincheva-Kamińska, 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**
2	60	60						12

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)

Lecture – exam, classes – pass with a grade

2. PREREQUISITES

Knowledge of Calculus 1

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

3.1. Course/Module objectives

O1	Familiarization students with integrals: with the indefinite integral (primitive function) and methods of its calculation, with the Riemann integral of the real function of one variable and its applications in geometry and physics, and with the improper integral.
O2	Familiarization students with definitions, examples and theorems concerning number series, with convergence criteria and with methods of testing the convergence of number series.
O3	Familiarization students with sequences and functional series (including power series and Fourier series) and with the criteria of convergence (point and uniform) of function series.

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 and understands the basic methods of calculating indefinite integrals.	K_W01, K_W03
LO_02	The student is able to calculate indefinite integrals from elementary functions.	K_U02, K_U06
LO_03	The student knows and understands the basic concepts and theorems of the Riemann definite integral. Knows and understands the relationship between the Riemann integral and the indefinite integral. Knows and understands the definitions of improper integrals and their basic properties. Knows and understands the criteria for convergence of improper integrals and the most important examples of improper integrals.	K_W01, K_W02, K_W03, K_W04
LO_04	The student is able to use the Riemann integral to solve geometric and physical problems. Can use criteria for the convergence of improper integrals.	K_U01, K_U02, K_U06
LO_05	The student knows and understands the basic concepts of number series and the criteria for series convergence.	K_W01, K_W02,K_W03, K_W04

LO_06	The student is able to use series convergence criteria to study series convergence.	K_U01, K_U02
LO_07	The student knows the concepts of point and uniform convergence of functional sequences and series. Knows and understands basic theorems about sequences and function series. Knows the criteria for the convergence of functional series. Knows and understands the basic concepts and theorems concerning power series. Knows and understands the definition of the Fourier series and the point convergence theorem of the Fourier series.	K_W01, K_W02, K_W03, K_W04
LO_08	The student is able to use the criteria of convergence of function series to study the convergence of function series. Can expand functions into a power series and into a Fourier series.	K_U01, K_U02
LO_09	The student is able to critically evaluate the acquired knowledge concerning the basic issues of calculus and is ready to apply it in various areas of life and knowledge.	K_K01, K_K02, K_K03
LO_10	The student is aware of the limitations of their own knowledge; understands the need for further education. Independently searches the literature and the Internet for information on integral calculus and seeks the opinion of experts.	K_K01, K_K02, K_K03

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

A. Lectures

Content outline
Indefinite integrals (14 hours) Primitive function, indefinite integral – definition and properties. The substitution rule and rule for Integration by parts. Integration of rational, irrational, trigonometric functions.
Definite integrals (12 hours) Definite integral (Riemann integral). Properties and geometric interpretation of the definite integral. Evaluation methods. Applications of integrals to geometry and mechanics.
Improper integrals (6 hours) Improper integrals with infinite limits. Convergence criteria. Improper integrals of unbounded functions.
Numerical Series (12 hours)

Convergence and divergence of series. Fundamental convergence tests of series with non-negative terms. Absolute and conditional convergence of series. Criteria of Abel, Dirichlet and Leibniz. Operations on convergent series.
Sequences and function series (16 hours) Pointwise and uniform convergence of function sequences and function series. Properties of the limit of a uniformly convergent function sequence (series) (differentiation and integration of sequences and functional series). Power series. The radius of convergence of power series. Expansion of a functions into Taylor and Maclaurin series. Fourier series. Series expansion of periodic functions into a Fourier series. Examples and applications.

B. Classes, laboratories, seminars, practical classes

Content outline
Indefinite integrals (14 hours) Primitive function and indefinite integral, basic formulas; integration by parts and by substitution; methods of integration of rational, irrational, trigonometric functions.
Definite integrals (10 hours) Methods of calculation of definite integrals; applications of definite integrals in geometry and physics.
Improper integrals (6 hours) Improper integrals with infinite limits – definitions of convergence and divergence; improper integrals of unbounded functions – definitions; criteria for the convergence of improper integrals.
Numerical Series (12 hours) Definition of convergent and divergent numerical series; convergence and Cauchy condition; convergence tests of series with non-negative terms; absolute and conditional convergence of series with arbitrary terms; operations on convergent series; applications.
Sequences and function series (14 hours) Pointwise convergence area; uniform convergence; criteria for uniform convergence of functional sequences and functional series; properties of the limits of functional sequences and sums of functional series uniformly convergent. Power series and their convergence. Expansion of functions into power series. Fourier series: Fourier series for periodic functions; Fourier series with respect to the sine and cosine functions for periodic functions.

3.4. Methods of Instruction

Lecture – using the traditional method;
Classes – using the traditional method.

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 – LO_10	Observation and dialogue with students during classes, Student activity in class, Oral statements of students, Colloquium, Exam	lecture, classes

4.2 Course assessment criteria

Classes: passing on the basis of colloquia and activity in classes.

The condition for obtaining the completion of the classes is to obtain at least 50% of points from each colloquium. Being active during classes can increase the grade by a maximum of half a grade.

The final grade is determined according to the scale:

00 - 49 % of points – fail (2.0);

50 – 59 % of points – satisfactory (3.0); 60 – 69 % of points – satisfactory plus (3.5);

70 – 79 % of points – good (4.0); 80 – 89 % of points – good plus (4.5);

90 – 100 % of points – very good (5.5).

Lecture: written exam.

Assessment criteria: (percentage share in mastering knowledge – assessment)

00-49 % of points – fail (2.0);

50 – 59 % of points - satisfactory (3.0); 60 – 69 % of points - satisfactory plus (3.5);

70 – 79% pts.- good (4.0); 80 – 89% points – good plus (4.5);

90 – 100% points - very good (5.0).

The final grade from the exam is determined on the basis of a written exam and an interview with the student.

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

Activity	Number of hours
Course hours	120 (60 lectures + 60 classes)
Other contact hours involving the teacher (consultation hours, examinations)	12 (Consultation 8; Exam 4)

Non-contact hours - student's own work (preparation for classes or examinations, projects, etc.)	168 (Class Preparation 120; Exam Preparation 48)
Total number of hours	300
Total number of ECTS credits	12

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

6. Internships related to the course/module

Number of hours	*Not applicable*
Internship regulations and procedures	*Not applicable*

7. Instructional materials

Compulsory literature: 1. Paul Dawkins, *CALCULUS II*, **CALCII_COMPLETE.PDF** 2. E. Herman, G. Strang, *Calculus Volume 2*, https://ia800101.us.archive.org/15/items/CalculusVolume2LR/CalculusVolume2-LR 3. *Calculus II*, Math 152 Course Notes, **HTTPS://WWW.SFU.CA/~VJUNGIC/CALCULUS%202/CALCULUS2**
Complementary literature: 1. Asher Roberts, *Calculus II Notes*, https://www.asherbroberts.com/teaching/2025_spring_calculus_ii/Calculus_II_Notes_2025

Approved by the Head of the Department or an authorised person