

COURSE SYLLABUS	
Course code	1120-BU200-ISA-9102
Course name	Calculus II
Course version	2026L
Level of education	first cycle programme
Form and mode of study	full-time study
Study profile	general academic profile
Field of study	Civil Engineering
Specialisation	-
Organizational unit	The Faculty of Civil Engineering
Implementing unit	The Faculty of Mathematics and Information Science
Course unit	n/a
Course groups	-
Course status	Obligatory
Language of the course	English
Study stage code	BU000-S2-ISA-1080
Number of ECTS credits	4

Part I

01. Learning outcomes and the method of conducting classes

Learning outcomes	see table "Learning outcomes"
Forms of classes and the number of hours in the semester	
tutorials	30,00 h
lectures	20,00 h

02. ECTS balance

Number of ECTS credits	4	
Course workload	Hours	ECTS
Total number of hours and ECTS credits for the course:		
Hours and ECTS credits for courses involving direct participation of academic teachers	55	2,20
Hours and ECTS credits involving student's independent work	45	1,80
Total	100	4,00
Number of hours involving direct participation of academic teachers:		
Hours connected with class participation	50	
Other synchronous hours	5	
Total	55	
Number of hours involving student's independent work:		
Hours for student's independent work	45	

03. Course content

Part I

Course content	1. Differential equations of order two with constant coefficients homogeneous and inhomogeneous. The method of invariance of constants and predictions. 2. the definite integral. Properties of the definite integral. Basic theorems of integral calculus. Geometrical and physical applications of the definite integral. 3. The undirected curvature integral. Curve length, static moments and inertias of a curve. 4. improper integrals. Convergence and divergence of improper integrals. 5 Number series. Criteria for convergence of numerical series: comparative, d'Alembert and Cauchy. Alternating series. Absolute and conditional convergence. Leibniz criterion. 6. Functional series and sequences. Area of convergence of a function series. 7. power series. Radius of convergence, interval of convergence and area of convergence of a power series. 8. Fourier series. Dirichlet conditions. Expansions by sines and cosines. 9. Riemann integral in n-dimensional space and its properties. 10. the double integral and its applications. 11. unoriented surface integral. The field of a surface patch. Static moments and inertias of the surface lobe. 12. triple integral and its application. Calculation of triple integrals using cylindrical and spherical coordinates. 13. directed curvature integral. Greens theorem. 14. oriented surface integral. Gauss theorem. 15. the Stokes theorem. 16. elements of vector analysis: gradient, divergence and rotation.
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Table: Learning outcomes

Knowledge	
Outcomes code	W1
Description	The student knows and understands the basic concepts and theorems of mathematical analysis, including the theory of higher order differential equations, the definition and properties of the definite integral, improper integral, and numerical and functional series. Understands the use of Fourier series in the analysis of differential equations and knows the basics of differential and integral calculus of functions of many variables. Can apply multiple integrals to engineering and physical problems.
Related field-of-study learning outcomes	K1_W01
Skills	
Outcomes code	U1
Description	The student is able to apply the tools of mathematical analysis to solve ordinary differential equations, especially in the context of boundary and initial problems. Knows how to use Fourier series expansions to analyze physical and technical problems, especially those related to heat conduction. He is skilled in calculating definite, improper and multiple integrals and applying them to the determination of areas, volumes and static and inertial moments. Can perform calculations in various coordinate systems, including cylindrical and spherical.
Related field-of-study learning outcomes	K1_U01
Outcomes code	U2
Description	The student is able to independently plan and implement the learning process, using available sources of knowledge and mathematical tools. He demonstrates the ability to systematically expand his knowledge of mathematical analysis and its applications in construction.
Related field-of-study learning outcomes	K1_U25
Social competence	
Outcomes code	K1

Part I	
Description	The student is aware of the need for continuous improvement of his professional and personal competence and takes action for his own development and the development of others.
Related field-of-study learning outcomes	K1_K02
Outcomes code	K2
Description	He is capable of critically evaluating his knowledge of mathematical analysis and its applications, as well as content acquired from various sources.
Related field-of-study learning outcomes	K1_K01
Part II	
04. Year and semester of studies	
Year	2026L
Semester	2
05. Course leader and course teachers	
Course leader	Agnieszka Zimnicka
lectures	Agnieszka Zimnicka
tutorials	Agnieszka Zimnicka
06. Course objective	
Course objective	In accordance with the Course Regulations
07. Teaching methods and techniques	
lectures	In accordance with the Course Regulations
tutorials	In accordance with the Course Regulations
08. Methods of verifying learning outcomes	
Knowledge	
Outcomes code	W1
Description	The student knows and understands the basic concepts and theorems of mathematical analysis, including the theory of higher order differential equations, the definition and properties of the definite integral, improper integral, and numerical and functional series. Understands the use of Fourier series in the analysis of differential equations and knows the basics of differential and integral calculus of functions of many variables. Can apply multiple integrals to engineering and physical problems.
Verification methods	in accordance with the Course Regulations
Skills	
Outcomes code	U1
Description	The student is able to apply the tools of mathematical analysis to solve ordinary differential equations, especially in the context of boundary and initial problems. Knows how to use Fourier series expansions to analyze physical and technical problems, especially those related to heat conduction. He is skilled in calculating definite, improper and multiple integrals and applying them to the determination of areas, volumes and static and inertial moments. Can perform calculations in various coordinate systems, including cylindrical and spherical.
Verification methods	in accordance with the Course Regulations
Outcomes code	U2
Description	The student is able to independently plan and implement the learning process, using available sources of knowledge and mathematical tools. He demonstrates the ability to systematically expand his knowledge of mathematical analysis and its applications in construction.

Part II	
Verification methods	in accordance with the Course Regulations
Social competence	
Outcomes code	K1
Description	The student is aware of the need for continuous improvement of his professional and personal competence and takes action for his own development and the development of others.
Verification methods	in accordance with the Course Regulations
Outcomes code	K2
Description	He is capable of critically evaluating his knowledge of mathematical analysis and its applications, as well as content acquired from various sources.
Verification methods	in accordance with the Course Regulations
09. Required and recommended reading list	
Required reading	In accordance with the Course Regulations
10. Other information	
Other information	-