

FACULTY:	Department of Mechanical Engineering
FIELD OF STUDY:	Transport
ERASMUS COORDINATOR OF THE FACULTY:	Dr hab. inż. Agnieszka Kułakowska, Prof. PK
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COURSE TITLE:	Mathematics II
LECTURER'S NAME:	Prof. Volodymyr Sushch
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COURSE CODE (USOS):	5S
ECTS POINTS FOR THE COURSE:	4 ECTS
ACADEMIC YEAR:	2025/2026
SEMESTER: (W – winter, S – summer)	S
HOURS IN SEMESTER:	30 + 30
LEVEL OF THE COURSE: (1 <sup>st</sup> cycle, 2 <sup>nd</sup> cycle, 3 <sup>rd</sup> cycle)	1 <sup>st</sup> cycle
TEACHING METHOD: (lecture, laboratory, group tutorials, seminar, other-what type?)	Lecture + practice
LANGUAGE OF INSTRUCTION:	English
ASSESSMENT METHOD: (written exam, oral exam, class test, written reports, project work, presentation, continuous assessment, other – what type?)	Written exam
COURSE CONTENT:	<p><b>1. Integral calculus</b>  <b>The indefinite integral of real-valued functions of a single real variable</b></p> <ul style="list-style-type: none"> <li>• Formal definition</li> <li>• Properties of integrals</li> <li>• Finding the value of an integral (integration)</li> <li>• Higher derivatives</li> </ul> <p><b>Techniques for computing integrals</b></p> <ul style="list-style-type: none"> <li>• Integration by substitution</li> <li>• Integration by parts</li> <li>• Integration by trigonometric substitution</li> <li>• Integration by reduction formulae</li> <li>• Integration by partial fractions</li> <li>• Integration using Euler's formula</li> </ul> <p><b>The definity integral (the Riemann integral)</b></p> <ul style="list-style-type: none"> <li>• Definition and properties</li> <li>• Fundamental theorem of calculus (the Newton-Leibniz theorem)</li> </ul> <p><b>Applications of definity integrals</b></p> <p><b>Improper integrals</b></p> <ul style="list-style-type: none"> <li>• Convergence of the integral</li> <li>• Singularities</li> </ul> <p><b>2. Ordinary differential equations (ODE)</b>  Basic concepts and classifying of differential equations. Solutions of differential equations (a particular solution and the general solution of a differential equation). Initial-value and boundary-value problems.  First order ODE: Separable equations, Homogeneous equations, Exact equations, Linear equations (homogeneous and non-homogeneous), Bernoulli equations, Solved problems.  Second order linear ODE: Linear differential equations (linearly independent solutions, the Wronskian), Linear homogeneous ODE with constant coefficients, (the characteristic equation), Linear non-homogeneous ODE with constant coefficients, The method of undetermined coefficients, Variation of parameters, Linear ODE with variable coefficients.</p>
ADDITIONAL INFORMATION:	

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