UNIWERSYTET PRZYRODNICZY WE WROCŁAWIU

# Mathematics

Educational subject description sheet

## Basic information

| | |
|---|---|
| **Field of study**<br>Civil engineering | **Education cycle**<br>2022/23 |
| **Speciality**<br>- | **Subject code**<br>ID000000IBU(P)S.MI1AO.1209.22 |
| **Organizational unit**<br>The Faculty of Environmental Engineering and Geodesy | **Lecture languages**<br>english |
| **Study level**<br>Second-cycle (engineer) programme | **Mandatory**<br>optional |
| **Study form**<br>Full-time | **Block**<br>general subjects (conducted) in foreign languages |
| **Education profile**<br>Practical | **Disciplines**<br>Maths |
| | **Subject related to scientific research**<br>Yes |
| | **Subject shaping practical skills**<br>Tak |

| | |
|---|---|
| **Teacher responsible for the subject** | Joanna Kamińska |
| **Other teachers conducting classes** | Hanna Okrasińska-Płociniczak |

| | | |
|---|---|---|
| **Period**<br>Semester 1 | **Examination**<br>graded credit<br><br>**Activities and hours**<br>lecture: 15<br>practical classes: 15 | **Number of ECTS points**<br>2.0 |

## Goals

| | |
|---|---|
| C1 | The student has a basic knowledge of partial differential equations and their applications in science and technology. |

## Subject's learning outcomes

| Code | Outcomes in terms of | Effects | Examination methods |
|---|---|---|---|
| **Knowledge – Student knows and understands:** | | | |
| W1 | The student know and understands in-depth mathematical issues which are the basis of subjects related to construction theory and advanced building materials technology. | BU_P7S_WG01 | written credit |
| **Skills – Student can:** | | | |
| U1 | The student can work independently on a specific task, interact in a team assuming different roles in it and lead the team. | BU_P7S_UO20 | written credit |
| **Social competences – Student is ready to:** | | | |
| K1 | The student is ready to a critical assessment of the acquired knowledge and received content. | BU_P7S_KK01 | written credit |

## Balance of ECTS points

| Activity form | Activity hours* | |
|---|---|---|
| lecture | 15 | |
| practical classes | 15 | |
| lesson preparation | 20 | |
| consultations | 2 | |
| exam / credit preparation | 8 | |
| | | |
| **Student workload** | **Hours**<br>60 | **ECTS**<br>2.0 |
| **Workload involving teacher** | **Hours**<br>32 | **ECTS**<br>1.1 |
| **Practical workload** | **Hours**<br>15 | **ECTS**<br>0.6 |

* hour means 45 minutes

## Study content

| No. | Course content | Activities |
|---|---|---|

| | | |
|---|---|---|
| 1. | 1. Introduction to differential equations: applications and real-life examples<br><br>2. Heat and diffusion: applications, derivation of the equation in different contexts, initial condition and different kinds of boundary conditions<br><br>3. Heat and diffusion: separation of variables (Fourier method), solution of the heat problem for an axisymmetric rod, numerical illustrations<br><br>4. Heat and diffusion: inhomogeneous boundary conditions, numerical illustrations, real calculations<br><br>5. Waves: applications, examples of the occurrence of the wave equation, derivation of the string equation<br><br>6. Waves: d'Alembert's solution, Fourier's solution to the string problem, acoustic interpretation, numerical illustrations<br><br>7. Waves: resonance<br><br>8. Waves: vibrations of an elastic beam, numerical illustrations | lecture |
| 2. | Solving mathematical problems (provided to students as lists of tasks) related to subjects presented in lectures, analyzing obtained results. | practical classes |

## Course advanced

### Teaching methods:

text analysis, teamwork, discussion, lecture, classes, Part of the lectures and exercises on-line.

| Activities | Examination methods | Percentage in subject assessment |
|---|---|---|
| lecture | written credit | 50% |
| practical classes | written credit | 50% |

## Entry requirements

Calculus I, Calculus II.

## Literature

#### Obligatory


1. Trench, W.F., Introduction to Real Analysis (2013). Faculty Authored and Edited Books & CDs. 7. https://digitalcommons.trinity.edu/mono/7
2. Heinbockel J.H., Introduction to Calculus, Vol. I, Vol. II, 2012. (Paper or electronic copies for noncommercial use may be made freely without explicit permission of the author. All other rights are reserved).


#### Optional


1. Polyanin A.D., Valentin F.Z., Handbook of exact solutions for ordinary differential equations, 2nd ed., 2003 by Chapman & Hall/CRC, a CRC Press Company Boca Raton, London, New York, Washington, D.C.
2. Gradshteyn I.S., Ryzhik I.M., Table of Integrals, Series, and Products, seventh ed., 2007, Jeffrey A., Editor University of Newcastle upon Tyne, England, Zwillinger D., Editor Rensselaer Polytechnic Institute, USA, Translated from Russian by Scripta Technica, Inc. Amsterdam, Boston, Heidelberg, London, New York, Oxford, Paris, San Diego, San Francisco, Singapore, Sydney, Tokyo, Academic Press, Elsevier Inc.
3. Dullemond K. & Peeters K., Introduction to Tensor Calculus, Copyright @ 1991-2010 Kees Dullemond & Kasper Peeters.
4. Problems in Mathematical Analysis, under the editorship of B.P. Demidovich, MIR Publishers, second printing, Moscow 1970, translated from the Russian by G. Yankovsky.

## Kierunkowe efekty uczenia się

| Kod | Treść |
|---|---|
| BU_P7S_KK01 | Absolwent jest gotów do krytycznej oceny posiadanej wiedzy i odbieranych treści; |
| BU_P7S_UO20 | Absolwent potrafi pracować samodzielnie nad określonym zadaniem, współdziałać w zespole przyjmując w nim różne role oraz kierować pracą zespołu; |
| BU_P7S_WG01 | Absolwent zna i rozumie w pogłębionym stopniu zagadnienia matematyki, stanowiące podstawę przedmiotów z zakresu teorii konstrukcji i zaawansowanej technologii materiałów budowlanych; |