

Faculty: FACULTY OF TELECOMMUNICATIONS AND MANAGEMENT

Department: INFORMATION TECHNOLOGIES

Professional Field: 5.3 COMMUNICATION AND COMPUTER TECHNOLOGY

Specialty: CYBER SECURITY OF COMMUNICATION TECHNOLOGIES

Educational-qualification degree: BACHELOR

LEARNING COURSE DESCRIPTION

1. Course title: *ENGINEERING MATHEMATICS 2*

2. Course code: *B.43.009.1*

3. Type of the course: *compulsory*

4. Level: *Bachelor*

5. Year of study: *first*

6. Semester: *second*

7. Number of credits: *4.5*

8. Name of the lecturer: *Assoc. Prof. Dr. Krasimira Ivanov*

9. Course learning outcomes:

The aim of the course is to provide students with theoretical and practical knowledge in order to ensure the necessary mathematical equipment for the study of the disciplines included in the curriculum of the specialty.

Students who have completed their training in the discipline must acquire:

Basic knowledge of the principles and methods related to solving problems using numerical, power and functional series, Fourier series and their application, different types of discrete sets and functions, relations, Boolean algebra, modeling using graphs, and basic elements of combinatorics and probability theory.

Practical skills to apply basic mathematical methods to solve real problems and make basic calculations.

Competencies: Upon successful completion of the course students should be able to:

- explain concepts, principles and apply mathematical methods related to the using of engineering mathematics;
- choose the most appropriate methods for modeling a real task;
- solving tasks by applying certain mathematical methods;
- to make well-grounded conclusions about a problem.

10. Teaching methods:

Teaching methods: the training in *Engineering Mathematics 2* is carried out in the second semester according to the current curriculum through lectures grouped in two academic hours per week for 15 weeks and seminars, grouped in one academic hour per week for 15 weeks.

Project-based learning: During the lectures, the students get acquainted with the material. The training material is illustrated with examples and applications that make it easier for students to practice. The lectures are illustrated with graphic material, which is presented with multimedia projections and supplemented with examples and tasks that are solved on a whiteboard. Seminar exercises are held in a computer lab.

11. Prerequisites:

Students should have prior knowledge in the disciplines: mathematics from secondary education and *Engineering Mathematics 1*.

Courses using the discipline are: Networks and Protocols 1, Computer Architectures, Fundamentals of Economics, Digital Economics, Networks and Protocols 2.

12. Course contents:

The course focuses on: The curriculum of the discipline presents the classical mathematical theory in various fields, accompanied by practical examples and scientific calculations in accordance to the modern technological challenges and specifics of the specialty. The curriculum of the course presents the classical mathematical theory in various fields, accompanied by practical examples and scientific calculations given the modern technological challenges and the specifics of the specialty.

Section One of the curriculum discusses the basic concepts and methods related to numerical, power and functional series, Fourier series and their application. Section two presents discrete sets and multi-sets, as well as operations related to them, fuzzy sets, and operations with them. In Section three, ordered tuples, relations and operations on them, and relational algebra are introduced. Section four discusses Boolean functions and Boolean algebra. Section five introduces elements of graph theory, as well as possibilities for modeling based on using graphs. Section six gives the basics of combinatorics. Section seven briefly presents elements of probability theory.

13. Bibliography

Basic literature:

1. John Bird. Higher engineering mathematics. 8th ed. Routledge, CRC Press, Taylor & Francis Group, LLC. 2017. ISBN: 978-1-138-67357-1 (pbk), ISBN: 978-1-315-26502-5 (ebk). www.routledge.com/cw/bird
2. M. Soskova. Notes on discrete mathematics and algorithms (М. Соскова. Записки по дискретна математика и алгоритми.) 2016 г. <https://store.fmi.uni-sofia.bg/fmi/logic/msoskova/LectureNotesDMA.pdf> (in Bulgarian)
3. A.I. Gusev, V.S. Kireev, A.N. Tikhomirova. Discrete Mathematics: A Collection of Problems (А.И. Гусева, В.С. Киреев, А.Н. Тихомирова. Дискретная математика: сборник задач.) М.: ИНФРА-М, 2018. — 224 с. ISBN 978-5-16-011887-1 (ИНФРА-М, print), ISBN 978-5-16-105604-2 (ИНФРА-М, online) (in Russian)
4. A.I. Belousov, S. B. Tkachev. Discrete mathematics: a textbook for universities. 5th ed. (А. И. Белоусов, С. Б. Ткачев. Дискретная математика: учебник для вузов. 5-е изд.) - Москва: Издательство МГТУ им. Н. Э. Баумана, 2015. - 743. ISBN 978-5-7038-3845-7 (in Russian)
5. Michal Jezewski, Robert Czabanski and Jacek Leski. Introduction to Fuzzy Sets In: P. Prokopowicz et al. (eds.), Theory and Applications of Ordered Fuzzy Numbers, Studies in Fuzziness and Soft Computing 356, DOI 10.1007/978-3-319-59614-3_1. https://www.researchgate.net/publication/320448791_Introduction_to_Fuzzy_Sets

Additional literature:

1. Guanrong Chen, Trung Tat Pham Introduction to Fuzzy Sets, Fuzzy Logic, and Fuzzy Control Systems. CRC Press Taylor & Francis Group, 2019. ISBN 9780367397883
2. Carmel Gafa. A very brief introduction to Fuzzy Logic and Fuzzy Systems. Towards Data Science, 2020. <https://towardsdatascience.com/a-very-brief-introduction-to-fuzzy-logic-and-fuzzy-systems-d68d14b3a3b8>
3. Dennis G. Zill. Advanced Engineering Mathematics. Loyola Marymount University. Sixth edition. Burlington, MA, USA: Jones & Bartlett Learning, 2017. ISBN: 978-1-284-10590-2
4. K.A. Stroud, Dexter Booth. Engineering Mathematics (8th Edition). Red Globe Press, 2020, <https://www.macmillanihe.com>
5. K.A. Stroud, Dexter Booth. Advanced Engineering Mathematics (6th Edition). Red Globe Press, 2020, <https://www.macmillanihe.com>
6. Abul Hasan Siddiqi, Mohamed Al-Lawati, Messaoud Boulbrachene. Modern Engineering Mathematics. CRC Press, Taylor & Francis Group, LLC, 2018 ISBN-13: 978-1-4987-1205-7

14. Assessment methods and criteria:

The course ends with an exam.

The final grade in the course is formed on the basis of an exam at the end of the semester. Students have the right to be exempted from the exam on the basis of successfully solving tasks from Tests with a grade of not less than four on both controls.

15. Language of instruction: Bulgarian