

## **Graph theory**

<b>Course title</b>	<b>Graph theory</b>
<b>Course code</b>	Mate3017
<b>Branch of science</b>	Mathematics
<b>Science sub-sector</b>	Discrete mathematics
<b>Credit points</b>	2
<b>ECTS credit points</b>	3

<b>Total contact hours</b>	32
Number of lectures	16
Seminars and practical work hours	16

### **Course developer(s)**

Dr.math., Associate professor Armands Gricāns  
(Armands Gricāns <http://de.du.lv/mrc/ag.htm>)

**Prior knowledge (title of the course, part of the program where the course to learn)**

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### **Course summary**

The course is designed for Bachelor's study program "Mathematics" students.

The course aims to acquaint students with basic chapters of the graph theory: connected graphs, weighted graphs, planar graphs, Eulerian graphs, Hamiltonian graphs, graph coloring, the degree sequence problem.

### **Results:**

- be able to apply the methods of the graph theory.

### **Course content**

Lectures – 16 contact hours, seminars – 16 contact hours

Basic notions of graph theory. Connected graphs. Weighted graphs. Planar graphs. Eulerian graphs. Hamiltonian graphs. Graph coloring. The degree sequence problem.

### **Course plan**

Lectures – 16 contact hours, seminars – 16 contact hours

### **Lecture topics:**

1. Basic notions of graph theory.
2. Connected graphs. Trees.
3. Weighted graphs.
4. Planar graphs.
5. Eulerian graphs.
6. Hamiltonian graphs.
7. Graph coloring.
8. The degree sequence problem.

### ***Seminar topics:***

1. Basic notions of graph theory. Breadth-first search.
2. Depth-first search.
3. Prim's method. Kruskal's method.
4. Floyd's method.
5. Dijkstra's method. Bellman-Kalaba method.
6. Fleury's method. Roberts-Flores method.
7. Greedy coloring method.
8.  $l$ -procedure.

### ***Students' independent work:***

During the semester must fulfill 5 independent works.

Each of the students' independent work options is individual. A report on the individual performance of the work is to be submitted by the beginning of the session.

### ***Requirements for credits***

The course provides the knowledge, skills, skills acquisition.

During the study course examination form – marked pass.

Requirements of the course learning – regular attendance and active work in 50%, independent work execution of 50%.

Used in study methods and forms – lectures, seminars, independent work.

The course is acquired in Latvian.

### ***Basic Training***

1. D.P. Acharjya, Kumar Sree. Fundamental Approach to Discrete Mathematics, New Age Publications, 2009.
  2. J. Dambītis. Modernā grafu teorija, Datorzinību centrs, 2002.
  3. Chartrand Gary. Introduction to Graph Theory, McGraw-Hill, 2005.
  4. Jean Gallier. Discrete Mathematics, Springer, 2011.
  5. A. Gricāns. Grafu teorijas lekcijas. <http://de.du.lv/matematika/dm/dm-1.html>
  6. Meng Koh Khee. Introduction to Graph Theory : H3 Mathematics, World Scientific, 2007.
  7. I. Strazdiņš. Diskrētā matemātika, Zvaigzne ABC, 2001.
  8. Емеличев В.А., Мельников О.Н., Сарванов В.Н., Тышневич Р.И. Лекции по теории графов, Наука, 1990.
- Ф.А. Новиков. Дискретная математика для программистов, Питер, 2001.

### ***Further reading***

1. A. Andžāns, J. Čakste, T. Larfelds, L. Ramāna, M. Seile. Vidējās vērtības metode, "Mācību grāmata", 1996.
2. Balakrishnan R. A Textbook of Graph Theory, Springer, 2000.
3. A. Bauls. Grafu teorijas metodes ģeogrāfijā, LVU, 1986.
4. Bollobas Bela. Modern Graph Theory, Springer, 1998.
5. E. Ģingulis. Attīstīsim savas matemātiskās spējas, Zvaigzne ABC, 1997.
6. Handbook of Graph Theory / Ed.by Jonathan L.Gross, Jay Yellen, CRC Press, 2004.
7. Aigner Martin. Discrete Mathematics, American Mathematical Society, 2007.

8. Pemmaraju Sriram. Computational Discrete Mathematics : Combinatorics and Graph Theory with Mathematica, Cambridge University Press, 2006.
9. Tutte W.T. Graph Theory, Cambridge University Press, 2001.
10. Л.Ю. Березина. Графы и их применение, Просвещение, 1979.
11. Берж К. Теория графов и ее применения, ИЛ, 1962.
12. Сачков В.Н. Введение в комбинаторные методы дискретной математики, Наука, 1982.
13. Р. Уилсон. Введение в теорию графов, Мир, 1977.
14. Зыков А.А. Теория конечных графов, Наука, 1969.

***Periodicals and other sources of information***

***Remarks***

***We identify programs and portions (A, B, C, D) adheres to this course***

Bachelor's study program "Mathematics" Part B.