



University Textbook

MATEMATIKA 2 – ODABRANA POGLAVLJA ZA PRIMJENU U PROMETU (MATHEMATICS 2 – SELECTED CHAPTERS FOR THE APPLICATION IN TRAFFIC ENGINEERING)

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Author's overview of the textbook

In the light of new e-technologies and the global knowledge available by making a few moves on the touchscreen, it is easy to overlook the benefits of a good old book – paper edition, of course. There are so many e-courses, online courses, webinars, e-textbooks, Wikipedia, etc. trying to draw our attention. These modern approaches to the existing knowledge and the learning process certainly find their place in the academic community as well. Students are easily seduced by the phrase “information just a few clicks away”. The availability of facts in the digital form is then mistaken for creative knowledge and competence. For example, courses in Mathematics at the undergraduate level for future engineers form the basis for logical and analytical thinking and problem-solving. It is often overlooked and hidden underneath the introduction of various mathematical tools and techniques obligatory for fresh undergraduate students. Only through the extensive training and exercises, one can obtain the routines necessary for the successful following of subsequent lectures and the application of techniques to the real problems in e.g. transport and traffic engineering. The effectiveness of an engineer is closely related to the effort and time spent in solving the basic problems at the early stages of the learning process.

At the Faculty of Transport and Traffic Sciences, University of Zagreb, the students enrol during the first year in courses entitled Mathematics I and Mathematics II, each in the duration of one semester. Af-

ter being introduced to Vector Algebra and Calculus of the functions of one variable, in Mathematics II they have to deal with Matrices and Analyses of functions of several (two) variables. The textbook *Mathematics 2 – Selected Chapters for the Application in Traffic Engineering* follows the agenda of the course Mathematics II. This is a university textbook (Croatian Edition), *Manualia Universitatis studiorum Zagradiensis*, a status obtained through a rigorous review process by the University of Zagreb. The textbook is published by the Faculty of Transport and Traffic Sciences in 2015 and is primarily intended for the students of that Faculty. The topics covered by the book, however, are appropriate for all students of technical sciences, future engineers in need of the basic course in Calculus of the functions of two variables. As the title suggests, this is not an elementary textbook. Certain topics are prerequisites for the successful following of the text.

The textbook is divided into five chapters, more or less interconnected through the topics they cover. The text begins with the algebraic introduction to matrices and systems of linear equations, often used in the transport problems and input-output analysis. Several examples give appropriate insight into the application from the economical point of view. What follows is the topic of series, the definition and conditions of convergence of series, Taylor and Fourier series and their applications. The third and the fourth chapter present the core of the book, covering the analysis of functions, mainly of two variables. Finding the natural domains of such functions, partial derivatives and double integrals are just a few subjects explained into detail with a lot of solved examples and exercises left for the readers. Interesting applications of double integrals are given through the problems in mechanics. As a conclusion, in the fifth chapter the ordinary differential equations (ODEs) are presented together with the methods for finding their solutions.

It is always a difficult task to find the appropriate amount of mathematical formality in the textbooks for future engineers. In the engineer's approach, the topics that give mathematical literacy often lack formality and completeness usually found in mathematical papers on the scientific level. Such an approach is used in this textbook as well, with all the important definitions and results. There are very few complete proofs and proved theorems, those that seemed to be fundamental or simply too important to be omitted. The rest of the results and formulas are given without proof, but accompanied by many solved examples and even more unsolved ones, left as an exercise. More detailed coverage may be found in the referenced literature and the interested readers are encouraged to do so.

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