M058	FIN-obligatory-Semester 2 MR,IPM-elective-Year 1	**Introduction to Integral Theory**	L+P+S 2+2+0	ECTS 5

Course objective. Students should be introduced to fundamental ideas and methods of Lebesgue's theory of integration, which represent the basis for many other courses.

Course prerequisites. Introduction to Measure Theory.

Course contents.

1. Measurable functions. Topology on $[-\infty,\infty]$. Definition and properties of measurable functions. Simple functions. Almost everywhere property.
2. Lebesgue's integral. Integrals of non-negative simple functions. Integrals of non-negative functions. Levi's monotone convergence theorem. Fatou's lemma. Integral of measurable functions. Integrals over subsets**.** *Lebesgue's dominated convergence theorem.* Lebesgue and Riemann integral. Chebyshev's, Cauchy's , Hölder's and related inequalities. The space Lpi. Convergence of sequences of measurable functions: convergence almost everywhere, convergence in Lp, convergence in measure.

Expected learning outcomes:

After completing the course, students are expected to:

- be familiar with drawbacks of the Riemann integral;
- know the concept and properties of measurable functions;
- understand the structure of the integral;
- be able to use the theorem of convergence in solving specific tasks;
- understand the connection between the Riemann integral and the Lebesgue integral;
- get the necessary knowledge for the application of the theory of integration to other courses.

Teaching methods and student assessment. Lectures and exercises are obligatory. The final examination consists of both a written and an oral part that can be taken after completion of all lectures and exercises. During the semester, students can take 2-3 mid-term exams that replace the written examination.

Can the course be taught in English: Yes.

Basic literature:

1. D. Jukić, Mjera i integral, Odjel za matematiku, Osijek, 2012.
2. D.Jukić, Recenzirani nastavni materijali dostupni na web stranici predmeta

Recommended literature:

1. D. L. Cohn, Measure theory, Birkhäuser, 1980.
2. S. Mardešić, *Matematička analiza 2: Integral i mjera,* Školska knjiga, 1977
3. W.Rudin, Principles of Mathematical Analysis, Mc Graw-Hill, Book Company, 1964.
4. R. L. Schilling, *Measures, integrals and martingales*,Cambridge University Press, New York, 2005.
5. H. J. Wilcox, D. L. Myers, An Introduction to Lebesgue Integration and Fourier Series, Dover, New york, 1994.