M142	**Integral and Discrete Transforms**	L	P	S	ECTS
		1	1	0	3

Course objectives. To inform students about some integral and discrete transforms – Laplace and Fourier, as well as Haar wavelet analysis.

Prerequisites. Knowledge of basic results of the mathematical analysis.

Course content.

1. Laplace transforms (definition, properties). Inverse Laplace transform. Applications of Laplace transforms.
2. Discrete Laplace transform (definition, properties).
3. Fourier integral and Fourier transform (properties). Inverse Fourier transform. Applications of Fourier transforms.
4. Discrete Fourier transform (definition, properties). Fast Fourier transform.
5. Haar wavelets – definition, properties. Haar decomposition and reconstruction algorithms for function-signals.

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Describe Laplace transform and inverse Laplace transform, as well as its basic properties.
2.	Define Fourier transform and inverse Fourier transform, as well as its basic properties.
3.	Formulate discrete Fourier transform and inverse discrete Fourier transform.
4.	Formulate basic ideas of Haar wavelet analysis.
5.	Apply Laplace and Fourier integral and discrete transforms in simpler examples.

RELATING THE LEARNING OUTCOMES, ORGANIZATION OF THE EDUCATIONAL PROCESS AND ASSESSMENT OF THE LEARNING OUTCOMES

TEACHING ACTIVITY	ECTS	LEARNING OUTCOME **	STUDENT ACTIVITY*	EVALUATION METHOD	POINTS	
					min	max
Attending lectures and exercises	1	1-5	Lecture attendance, discussion, team work and independent work on given tasks	Attendance lists, tracking activities	0	4
Written exam (Mid-terms)	1	1-5	Preparing for written exam	Evaluation	25	48
Final exam	1	1-5	Revision	Oral exam	25	48
TOTAL	3				50	100

Teaching methods and student assessment. Lectures and exercises are obligatory. The exam consists of a written and an oral part. Upon completion of the course, students can take the exam. Successful midterm exam scores replace the written exam.

Can the course be taught in English: Yes

Basic literature:

1. G. Bachman, L. Narici, E. Beckenstein, *Fourier and Wavelet Analysis* , New York, Springer-Verlag, 2000. (chapters 6, 7)
2. M. Krasnov, A. Kiselev, G. Makarenko, E. Shikin: *Mathematical Analysis for Engineers*, Vol. 2, (chapters 27, 28), Mir Publishers, Moscow, 1990.

Recommended literature:

1. C. Gasquet, C. Witomski, *Fourier Analysis and Applications - Filtering, Numerical Computation, Wavelet*, Springer-Verlag, New York, 1999
2. Y. Nivergelt, *Wavelets made easy*, Birkhauser, Boston, 2001.
3. I. Ivanšić, *Fourierovi redovi. Diferencijalne jednadžbe*, Odjel za matematiku, Osijek, 2000. (chap. A.)
4. M. Nurkanović, Z. Nurkanović, *Laplaceova transformacija i primjena*, PrintCom, Tuzla, 2010.