General Information:

Name of Course: # Applied Analysis

Course Code: PM-TRTNM702HA
Semester: **1**st
Number of Credits: 6
Allotment of Hours per Week: **5** Lessons /Week
Evaluation: Signature (with grade)
Prerequisites: -

Instructors: **Ákos Pilgermajer, assistant professor**
Office: 7624 Hungary, Pécs, Boszorkány u. 2. Office Nº B-345
E-mail: pilgermajer@mik.pte.hu

Introduction:
This course provides introduction to the basic mathematical background and concepts of signal processing. The course is intended to teach students mathematical techniques for the analysis of signals.

Learning Outcomes:
Upon completion of the course, students should be able to:

- identify basic properties of convolution and compute the convolution of functions
- state the basic properties of the Fourier and Laplace transforms and use these properties in problem solving
- compute forward/inverse Fourier and Laplace transforms of functions and find Fourier series representations of periodic functions
- use the Laplace transform to solve differential equations
- demonstrate competency in working with both time- and frequency-domain representations of signals
- explain the relationships amongst the various representations of LTI systems (e.g., differential equation, frequency response, transfer function, impulse response)
- explain the fundamentals of sampling and the implications of the sampling theorem

General Course Description and Main Content:
Brief Syllabus: The purpose of this course is to introduce students basic and advanced mathematical methods as Fourier and Laplace transforms and their applications in signal processing.

Methodology:
The course is based mainly on face to face lectures combined with exercises guided by the instructor and individual work with regular consultations.

Schedule:
The rough outline of the schedule is as follows:

1. Signals and systems (12 hours): basic definitions/concepts, review of complex analysis, signal properties, basic signal transformations, elementary signals, signal representations using elementary signals.
2. Linear time-invariant (LTI) systems (12 hours): convolution, properties of convolution, representation of signals using impulses, impulse response and convolution representation of LTI systems, properties of LTI systems, response of LTI systems to complex exponential signals.
3. Fourier series (12 hours): Fourier series definition, finding Fourier series representations of signals, convergence of Fourier series, properties of Fourier series, Fourier series and frequency spectra, Fourier series and LTI systems.
4. Fourier transform (16 hours): Fourier transform definition, convergence of Fourier transform, Fourier transform properties, Fourier transform of periodic signals, frequency spectra of signals, frequency response of LTI systems, applications.
5. Laplace transform (16 hours): Laplace transform definition, relationship between Laplace transform and Fourier transform, region of convergence, finding the inverse Laplace transform, properties of the Laplace transform, solving differential equations using the unilateral Laplace transform

Attendance:
Attending is required all classes, and will impact the grade (max. 10%). Unexcused absences will adversely affect the grade, and in case of absence from more than 30% of the total number of lesson will be grounds for failing the class. To be in class at the beginning time and stay until the scheduled end of the lesson is required, tardiness of more than 10 minutes will be counted as an absence. In the case of an illness or family emergency, the student must present a valid excuse, such as a doctor's note.

Evaluation + Grading
Grading will follow the course structure with the following weight: the assignments taken at the end of each topic is equally weighted and gives 90% of the term mark**.** The remaining 10% will be assessed according to participation, progress, effort and attitude. Please note that attendance will adversely affect one's grade, both in direct grade reduction and in missing work. The final grade will be based on the following guidelines:

5. Outstanding work. Execution of work is thoroughly complete and demonstrates a superior level of achievement overall with a clear attention to details. The student is able to synthesize the course material with new concepts and ideas in a thoughtful manner, and is able to communicate and articulate those ideas in an exemplary fashion.

4. High quality work. Student work demonstrates a high level of craft, consistency, and thoroughness throughout its work. The student demonstrates a level of thoughtfulness in addressing concepts and ideas, and participates in group discussions. Work may demonstrate excellence but less consistently than above at grade ‘5’.

3 Satisfactory work. Student work addresses all of the assignment objectives with few minor or major problems.

2. Less than satisfactory work. Overall work is substandard, incomplete in significant ways, and lacks craft and attention to detail.

1. Unsatisfactory work. Work exhibits several major and minor problems with basic conceptual premise, lacking both intention and resolution. Overall the assignments are severely lacking, and is weak in clarity, craft and completeness.

Grading Scale:

Numeric Grade:	5	4	3	2	1
Evaluation:	89%-100%	77%-88%	66%-76%	55%-65%	0-50%

PTE Grading Policy:
Information can be found on PTE’s main website (www.pte.hu) under the 'Code of studies and examinations' menu.

Students with Special Needs:
Students with a disability and needs to request special accommodations, please, notify the Deans Office. Proper documentation of disability will be required. All attempts to provide an equal learning environment for all will be made.

Readings and Reference Materials:

- **Continuous-Time Signals and Systems,** M. D. Adams, University of Victoria, Victoria, BC, Canada, 2013, ISBN 978-1-55058-495-0