COURSE SYLLABUS AND COURSE REQUIREMENTS
ACADEMIC YEAR 2022/2023 SEMESTER AUTUMN

Course title	*Engineering Mathematics 3.*
Course Code	MSB295ANEP
Hours/Week: le/pr/lab	1\2\0
Credits	3
Degree Programme	BSc
Study Mode	*Full time*
Requirement type	Mid-semester grade
Teaching Period	autumn
Prerequisites	Engineering Mathematics 2.
Department(s)	Department of Engineering Mathematics
Course Director	Ildikó DR. PERJÉSINÉ DR. HÁMORI
Teaching Staff	*Ákos PILGERMÁJER*

COURSE DESCRIPTION

A short description of the course (max. 10 sentences).
Neptun: Instruction/Subjects/Subject Details/Basic data/Subject description

The presentations give some elements of important mathematical techniques which is used in civil engineering practice. Upon completion of this course the student should be able to:

- interpret, and put into practice first- and second order ordinary differential equations (ODEs),
- model and analyse problems where random comes into consideration,
- apply quantities of descriptive statistics to describe data sets,
- interpret and implement basic statistical computations of inferential statistics.

SYLLABUS

Neptun: Instruction/Subjects/Subject Details/Syllabus

1. GOALS AND OBJECTIVES

Goals, student learning outcome.
Neptun: Instruction/Subjects/Subject Details/Syllabus/Goal of Instruction

The presentations give some elements of important mathematical techniques which is used in civil engineering practice. Upon completion of this course the student should be able to:

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- model and analyse problems where random comes into consideration,
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2. COURSE CONTENT

Neptun: Instruction/Subjects/Subject Details/Syllabus/Subject content

	TOPICS
LECTURE	**ORDINARY DIFFERENTIAL EQUATIONS** 1. Ordinary differential equations (ODE), classification 2. First order ODE. 3. Second order ODE. **ELEMENTS OF PROBABILITY THEORY** 1. Mathemathical model of random phenomena, kolmogorov axioms of probability. 2. Combinatorial, geometric probability spaces. 3. Conditional probability, independence of events. Multiplication privciple of probabilities. Theorem of total probability. Bayes' theorem. 4. Discrete, continuous random variables. Probability mass function, probability density function, cumulative distribution function, mean, variance. 5. Vector random varoables. Distributions, covariance, correlation, independence of random variables. 6. Common discrete, continuous distributions. 7. Markov-, csebisev- inequalities.Law of large numbers. Central limit theorem. **ELEMENTS OF STATISTICS** 1. Sample, experimental distribution (function), experimental densitiy function, histograms, statistics. 2. Point estimates of mean and variance by methods of moments and maximum likelihood. 3. Interval estimates by confidence intervals. 4. Hipothesis tests. Null, alternative hipotheses, statistical tests, critical value. 5. Common parametric and nonparametric tests. Linear regression.
PRACTICE	**Ordinary Differential equations** 1. Ordinary Differential equations (ODE), classification 2. First order ODE. 3. Second order ODE. **Elements of Probability theory** 1. mathemathical model of Random phenomena, Kolmogorov axioms of probability. 2. Combinatorial, geometric probability spaces. 3. Conditional probability, independence of events. Multiplication principle of probabilities. Theorem of Total probability. Bayes' theorem. 4. Discrete, continuous random variables. Probability mass function, probability density function, cumulative distribution function, mean, variance. 5. Vector random variables. Distributions, covariance, correlation, independence of random variables. 6. Common discrete, continuous distributions. 7. Markov-, Csebisev- inequalities.law of large numbers. Central limit theorem. **Elements of statistics** 1. Sample, experimental distribution (function), experimental densitiy function, histograms, statistics. 2. Point estimates of mean and variance by methods of moments and maximum likelihood. 3. Interval estimates by confidence intervals. 4. Hipothesis tests. Null, alternative hipotheses, statistical tests, critical value. 5. Common parametric and nonparametric tests. Linear regression.
LABORATORY PRACTICE	None.

DETAILED SYLLABUS AND COURSE SCHEDULE

ACADEMIC HOLIDAYS INCLUDED

LECTURE

week	**Topic**	**Compulsory reading; page number (from … to …)**	**Required tasks (assignments, tests, etc.)**	**Completion date, due date**
1.	Ordinary Differential equations (ODEs), classification methods. First order separable ODE. First order linear ODE	…	…	…
2.	Second order ODEs. Lack of x or y variable, constant coefficient linear ODEs.			
3.	Build the mathematical model of randomness. Sample space, algebra of events, probability. Probability space. Addition and multiplication rules. Combinatorial, geometric probability spaces.			
4.	Mid-term test 1 (MTT1)		MTT1	
5.	Conditional probability, independence of events. Multiplication principle of probabilities. Theorem of Total Probability. Bayes' theorem.			
6.	Discrete, continuous random variables. Probability mass function, probability density function, cumulative distribution function, mean, variance.			
7.	Vector random variables. Joint, marginal, conditional distributions, covariance, correlation, independence of random variables.			
8.	Common distributions, their properties.			
9.	Autumn break.			
10.	Markov-, Csebisev- inequalities. Law of large numbers. Central limit theorem. Sample, experimental distribution (function), experimental densitiy function, histograms, statistics.			
11.	Point estimates of the mean and variance by methods of moments and maximum likelihood. Confidence intervals.			
12.	Mid-term test 2 (MTT2)		MTT2	
13.	Hipothesis tests. Null, alternative hipotheses, statistical tests, critical value. Common parametric and nonparametric tests. Linear regression.			
14.	Mid-term test 3 (MTT3)		MTT3	
15.	Retake of the missing test (only one) or upgrade of the worst.		Retakes	

PRACTICE, LABORATORY PRACTICE

week	**Topic**	**Compulsory reading; page number (from … to …)**	**Required tasks (assignments, tests, etc.)**	**Completion date, due date**
1.	Ordinary Differential equations (ODEs), classification methods. First order separable ODE. First order linear ODE			
2.	Second order ODEs. Lack of x or y variable, constant coefficient linear ODEs.			
3.	Consultation for MTT1			
4.	Build the mathematical model of randomness. Sample space, algebra of events, probability. Probability space.			

	Addition and multiplication rules. Combinatorial, geometric probability spaces.			
5.	Conditional probability, independence of events. Multiplication principle of probabilities. Theorem of Total Probability. Bayes' theorem.			
6.	Discrete, continuous random variables. Probability mass function, probability density function, cumulative distribution function, mean, variance.			
7.	Vector random variables. Joint, marginal, conditional distributions, covariance, correlation, independence of random variables.			
8.	Common distributions, their properties.			
9.	Autumn break			
10.	Markov-, Csebisev- inequalities. Law of large numbers. Central limit theorem. Sample, experimental distribution (function), experimental densitiy function, histograms, statistics.			
11.	Consultation for MTT2			
12.	Point estimates of the mean and variance by methods of moments and maximum likelihood. Confidence intervals.			
13.	Consultation for MTT3			
14.	Hipothesis tests. Null, alternative hipotheses, statistical tests, critical value. Common parametric and nonparametric tests. Linear regression.			
15.	Retake of the missing test (only one) or upgrade of the worst.			

3. ASSESSMENT AND EVALUATION

(Neptun: Instruction/Subjects/Subject Details/Syllabus/Examination and Evaluation System)

ATTENDANCE

In accordance with the Code of Studies and Examinations of the University of Pécs, Article 45 (2) and Annex 9. (Article 3) a student may be refused a grade or qualification in the given full-time course if the number of class absences exceeds 30% of the contact hours stipulated in the course description.

Method for monitoring attendance *(e.g.: attendance sheet / online test/ register, etc.)*

Online tests or catalogue

ASSESSMENT

Cells of the appropriate type of requirement is to be filled out (course-units resulting in mid-term grade or examination). Cells of the other type can be deleted.

Course resulting in mid-term grade *(PTE TVSz 40§(3))*

Mid-term assessments, performance evaluation and their ratio in the final grade *(The samples in the table to be deleted.)*

Type	Assessment	Ratio in the final grade
MTT1	*30 points*	*30 %*
MTT2	*50 points*	*50 %*
MTT3	*20 points*	*20 %*

Every midterm test is compulsory. You must inform the lecturer in advance in case of absence of a test and show a valid reason at most once in the semester. A test is passed if reached 40 %. The midterm grade is formed from passed midterm test points as a weighted average of the points of your tests by means of the table above.

Opportunity and procedure for re-takes (PTE TVSz 47§(4))

The specific regulations for improving grades and resitting tests must be read and applied according to the general Code of Studies and Examinations. E.g.: all tests and assessment tasks can be repeated/improved at least once every semester, and the tests and home assignments can be repeated/improved at least once in the first two weeks of the examination period.

Retakes are in the last week of semester (see detailed schedule above). If someone fails with the retake, there will be an overall retake from the whole semester in the first two week of exam period.

Grade calculation as a percentage

based on the aggregate performance according to the following table

Course grade	Performance in %
excellent (5)	85 % …
good (4)	70 % ... 85 %
satisfactory (3)	55 % ... 70 %
pass (2)	40 % ... 55 %
fail (1)	below 40 %

The lower limit given at each grade belongs to that grade.

4. SPECIFIED LITERATURE

In order of relevance. (In Neptun ES: Instruction/Subject/Subject details/Syllabus/Literature)

COMPULSORY READING AND AVAILABILITY

[JRC] Jeffrey R. Chasnov, *Differential Equations for Engineers*, 2019-2022, The Hong Kong University of Science and Technology, Department of Mathematics, Clear Water Bay, Kowloon, Hong Kong Link

[AH] Anthony Hayter, *Probability and Statistics for Engineers and Scientists, 4th edition, 2012, Brooks/Cole, Cengage Learning*

RECOMMENDED LITERATURE AND AVAILABILITY

[RAND] randomservices.org

[EL] Moodle and TEAMS course materials