

COURSE SYLLABUS AND COURSE REQUIREMENTS

ACADEMIC YEAR 2024/2025 SEMESTER SPRING

Course title	Engineering Physics 2
Course Code	IVB050ANMI
Hours/Week: le/pr/lab	2 Lectures, 2 Seminars
Credits	6
Degree Programme	Computer Science Engineering
Study Mode	BSC
Requirements	Signature and Exam
Teaching Period	Spring
Prerequisites	-
Department(s)	Automation
Course Director	Gergely Nyitray
Teaching Staff	Gergely Nyitray

COURSE DESCRIPTION

A short description of the course (max. 10 sentences).

Neptun: Instruction/Subjects/Subject Details/Basic data/Subject description

The aim of this course is to present the basic concepts of physics that students need to know for later courses and future careers. To emphasize that physics is a tool for understanding the real world. To teach transferable problem solving skills. Classical Mechanics deals with bodies at rest and in motion and the conditions of rest and motions when bodies are under the influence of forces. The topics are as follows: Kinematics, Newton's Laws, Forces, Work-Energy Theorem, Constants of motion (Energy, Linear Momentum, Angular Momentum), Multi-particle Dynamics, Rotational Dynamics, Oscillatory Motion, Lagrangian Formalism. Classical Thermodynamics is the description of the states of Thermodynamic Systems at near-equilibrium, that uses macroscopic, measurable properties. It is used to model exchanges of Energy, Work and Heat based on the Laws of Thermodynamics. Transport Processes concerns the exchange of Mass, Energy, Charge, Momentum and Angular Momentum between observed systems. Examples of transport processes include Heat Conduction, Fluid Flow, Molecular Diffusion and Electromagnetic Radiation.

SYLLABUS

Neptun: Instruction/Subjects/Subject Details/Syllabus

1. GOALS AND OBJECTIVES

Goals, student learning outcome.

Neptun: Instruction/Subjects/Subject Details/Syllabus/Goal of Instruction

Problem-solving skills are central to an introductory physics course, these include: Thinking logically and analytically, making simplifying assumptions, constructing mathematical models, using valid approximations.

2. COURSE CONTENT

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

	TOPICS
LECTURE	<ol style="list-style-type: none"> 1. <i>topic</i> Classical Mechanics 2. <i>topic</i> Classical Thermodynamics 3. <i>topic</i> Fluid Flow, Nonequilibrium Thermodynamics
PRACTICE	<ol style="list-style-type: none"> 1. <i>topic</i> Classical Mechanics 2. <i>topic</i> Classical Thermodynamics
LABORATORY PRACTICE	<ol style="list-style-type: none"> 1. <i>topic</i> 2. <i>topic</i> 3. <i>topic</i> 4. <i>etc.</i>

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.	Course description, Physics in general Kinematics in 1D,	3-9 [1a]		
2.	Kinematics in 2D	11-26 [1a]		
3.	Dynamics, Laws of Conservations	27-56 [1a]		
4.	Mechanics of a rigid body	57-77 [1a]		
5.	Oscillations	79-94 [1a]	Sample Test 1	Optional
6.	Analytical Mechanics	95-115 [1a]		
7.	Thermodynamic system, Extensive and Intensive Parameters, Ideal and Real gases, gas laws, Internal Energy, Work done, Heat exchange, Heat Capacity, Specific Heat, First Law, Quasi Static Processes (Isochoric, Isobaric, Isotherm, Isentropic, Polytropic)	7-33 [1b] 3-60 [3]	Exam1 (Mechanics)	
8.	Heat engines, Carnot Cycle, Carnot efficiency, Entropy, Second Law, Entropy Principle	46-58 [1b] 90-117 [3]	Project Work	Optional (week 14)
9.	Thermodynamic Potentials, Third Law, Maxwell's relations	148-168 [3]		
10.	Transport processes: fluid flow, inviscid flow, incompressible flow, vorticity, Euler- equation, Bernoulli Equation	65-74 [1b] [2a]	Sample Test 2	Optional
11.	Viscous Flow, Pressure drop, Hagen- Poiseuille law, Reynolds number, Barotropic Flow, Navier-Stokes Equation	[2b]		
12.	SPRING BREAK	-	-	-
13.	Exam Thermodynamics		Exam2 (Thermodyn.)	
14.	Retake Exam			

PRACTICE, LABORATORY PRACTICE				
week	Topic	Compulsory reading; page number (from ... to ...)	Required tasks (assignments, tests, etc.)	Completion date, due date
1.	Solving problems related to theory			
2.	Solving problems related to theory			
3.	Solving problems related to theory			
4.	Solving problems related to theory			
5.	Solving problems related to theory			
6.	Solving problems related to theory			
7.	Exam1 (Mechanics)		Exam1 (Mechanics)	
8.	Solving problems related to theory			
9.	SPRING BREAK			
10.	Solving problems related to theory			
11.	Solving problems related to theory			
12.	SPRING BREAK	-	-	-
13.	Exam2 (Thermodynamics)		Exam2 (Thermodyn.)	
14.	Retake Exam		Retake Exam (1,2)	

3. ASSESSMENT AND EVALUATION

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.)

Attendance Sheet

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-unit with final examination

Mid-term assessments, performance evaluation and their weighting as a pre-requisite for taking the final exam

Mid-term tests are not compulsory, they are just for practice.

Type	Assessment	Weighting as a proportion of the pre-requisite for taking the exam
1. Sample Test 1 (optional)		0%
2. Sample Test 2 (optional)		0 %
3. Project Work (optional)		0%

Requirements for the end-of-semester signature

(Eg.: mid-term assessment of 40%)

According to the **general Code of Studies and Examination** students must be present for 70% of contact hours. Even with a medical certificate, the 30% limit cannot be significantly exceeded. **If a student misses more than 30% (4 occasions) of the contact hours the course is automatically considered to be failed** (and the end-of-semester signature is denied). **In this case, no re-takes will be possible.** Due to the spring break, the maximum number of weeks is only 13. The medical certificate does not exempt students from attending classes. **It worth noting that the reason why the exam and the first retake are included in the timetable is that students are obliged to be there. So, if a student does not attend these, it is considered an absence.**

Re-takes for the end-of-semester signature (PTE TVSz 50§(2))

The specific regulations for grade betterment and re-take must be read and applied according to the general Code of Studies and Examinations. E.g.: all the tests and the records to be submitted can be repeated/improved each 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.

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Type of examination (written, oral):

Accumulated knowledge is tested on the one hand, during the semester as a written exam (Exam1, Exam2): the students have to solve physical problems. These problems will be computational tasks (final exam). On the other hand, project work can be given and their solutions are also acceptable. Solution of the project work does not automatically guarantee successful completion of the course. **As a first step**, the solution to the project work (results only) should be sent to the instructor as a Teams message. If these values are correct, **the second step** is for the student to solve a similar but much simpler problem in the presence of the instructor. If the student is not able to do this, the project be rejected. If the solution is correct, the student has earned a satisfactory grade. The final mark is improved in **the third step** on the basis of a detailed report on the solution of the project, during which the student has to answer the questions asked by the instructor. Submitting a project work is not compulsory, but if successfully completed is equivalent to the final exam. In case the exam fails or the student wants to improve the result a retake exam will be organised (up to two times). **The first retake exam will be scheduled for week 14 (both exams can be improved).**

The last one will be held in the first week of the examination period (both exams can be improved). If someone's performance (during the semester) is better than 40% the student may receive a final grade (or improve it during the examination period).

The exam is successful if the result is minimum 40 %.

Calculation of the grade (TVSz 47§ (3))

The mid-term performance (Sample Tests) accounts for 0 %, the performance at the exam accounts for 100 % in the calculation of the final grade. Successfully completed project work is equivalent to the final exam.

Calculation of the final grade based on aggregate performance in percentage.

Course grade	Performance in %
excellent (5)	86 % ...
good (4)	71 % ... 85 %
satisfactory (3)	56 % ... 70 %
pass (2)	40 % ... 55 %
fail (1)	below 40 %

4. SPECIFIED LITERATURE

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

COMPULSORY READING AND AVAILABILITY

- [1.a] Gergely Nyitray: "Fundamental Laws, Equations and Models I", ISBN-13 978-0-07-110608-5, available online
- [1.b] Gergely Nyitray: "Fundamental Laws, Equations and Models II", ISBN 978-963-429-348-4, available online
- [2] The Feynman "Lectures on Physics", available online: <https://www.feynmanlectures.caltech.edu/>
- [2.a] The Feynman "Lectures on Physics", available online: https://www.feynmanlectures.caltech.edu/II_40.html
- [2.b] The Feynman "Lectures on Physics", available online: https://www.feynmanlectures.caltech.edu/II_41.html
- [3.] Dilip Kondepudi, Ilya Prigogine: "Modern Thermodynamics", Wiley 2015 ISBN 9781118371817

RECOMMENDED LITERATURE AND AVAILABILITY

- [4.] Gambiattista, Richardson, Richardson: "College Physics" McGraw-Hill International Edition 2007, ISBN-13 978-0-07-110608-5