***Annex 1***

*Recommended template: “Course Description, Syllabus, Course Requirements”*

# course syllabus and course requirements academic year 2022/2023 semester Autumn

| Course title | Electromagnetic Fields |
| --- | --- |
| **Course Code** | **IVB038AN** |
| **Hours/Week: le/pr/lab**  | **2 Lectures, 2 Seminars** |
| **Credits** | 5 |
| **Degree Programme** | **Electrical Engineering** |
| **Study Mode**  | **BSC** |
| **Requirements** | **Signature and Exam** |
| **Teaching Period** | **Fall (Autumn)** |
| **Prerequisites** | **-** |
| **Department(s)****Course Director** | **Automation****Gergely Nyitray** |
| **Teaching Staff** | **Gergely Nyitray** |
| **Hours/Week: le/pr/lab**  | **2 Lectures, 2 Seminars** |
|  |  |

# course description

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

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

The topics of the course are as follows: Electrostatics, Special Techniques, Electric Field in Matter, Magnetostatics, Magnetic Fields in Matter, Electrodynamics, Propagation of Electromagnetic Waves

# syllabus

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

## **goals and objectives**

*Goals, student learning outcome.*

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

The aim of this course is to present the basic concepts of electromagnetism that students need to know for later courses and future careers.

## **course content**

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

|  | TOPICS |
| --- | --- |
| LECTURE | 1. *topic* Fundamental interactions, continuous charge distributions, the electric field, field lines, flux
2. *topic* Applications of Gauss’s Law
3. *topic* Electric Potential, Work and Energy in electrostatics
4. *topic* Conductors, capacitors
5. *topic* Laplace’s equation, Method of images
6. *topic* Polarisation, Field of a polarised object, the electric displacement, linear dielectrics
7. *topic* The Drude model
8. *topic* Magnetic fields, Magnetic forces, the Biot-Savart law
9. *topic* AUTUMN BREAK
10. *topic* Ampere’s law, comparison of magnetostatics and electromagnetics
11. *topic* Magnetization, diamagnets, paramagnets, ferromagnets
12. *topic* Electromagnetic induction, Faraday's Law, the induced electric field, inductance
13. *topic* Maxwell’s Equations, electromagnetic waves, reflection and transmission, guided waves
14. *topic* **Final Exam**
15. *topic* Retake Exam
 |
| PRACTICE | 1. *topic* Same topics as in the lecture
2. *topic* Same topics as in the lecture
3. *topic* Same topics as in the lecture
4. *etc.*
 |
| laboratory practice | 1. *topic*
2. *topic*
3. *topic*
4. *etc.*
 |

### **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. | The electric field | 58-61 [1] |  |  |
| 2. | Divergence and curl of electrostatics fields | 65-76 [1] |  |  |
| 3. | Electric potential | 77-87 [1] |  |  |
| 4. | Work and energy in electrostatics, conductors | 90-103 [1] |  |  |
| 5. | Laplace’s equation, the method of images | 110-124 [1] | Sample Test 1 | optional |
| 6. | Electric field in matter | 160-193 [1] |  |  |
| 7. | The Drude model | 84-99 [2] |  |  |
| 8. | Magnetostatics | 202-215 [1] |  |  |
| 9. | Autumn Break |  | Sample Test 2 | optional |
| 10. | The divergence and curl of B | 221-232 [1] | Project Work | optional (week 14)  |
| 11. | Magnetic fields in matter | 255-278 [1] |  |  |
| 12. | Electrodynamics | 285-331 [1] |  |  |
| 13. | Electromagnetic waves | 364-411 [1] |  |  |
| 14. |  |  |  |  |
| 15. |  |  |  |  |

| 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. | Solving problems related to theory |  |  |  |
| 8. | Solving problems related to theory |  |  |  |
| 9. | AUTUMN BREAK |  |  |  |
| 10. | Solving problems related to theory |  |  |  |
| 11. | Solving problems related to theory |  |  |  |
| 12. | Solving problems related to theory |  |  |  |
| 13. | **Final Exam** |  |  |  |
| 14. | Retake Exam |  |  |  |
| 15. |  |  |  |  |

## **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.)*

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.*

***Mid-term assessments, performance evaluation and their ratio in the final grade***

| **Type** | **Assessment** | **Ratio in the final grade** |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

***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.*

***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.

***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%*** |
| 1. *Sample Test 2 (optional)*
 |  | ***0 %*** |
| 1. *Project Work (optional)*
 |  | ***100%*** |
|  |  |  |

***Requirements for the end-of-semester signature***

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

If the number of class absences does not exceed 30% of the contact hours. Due to the autumn break, the maximum number of contact weeks is only 14.

***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.*

Since the attendance is required to obtain end-of-semester signature, no further actions are available.

***Type of examination*** *(written, oral):*

Accumulated knowledge is tested on the one hand, during the semester as a written exam: the students have to solve physical problems. These problems will be computational tasks. On the other hand, project work can be given and their solutions are also acceptable. It is very important to emphasize that **the results of the project's work should be reported orally**. This means that the **students must be able to answer the questions connected to the project work** asked by the lecturer. Failing this, the project work will not be accepted even if the solution is correct. Submitting a project work is not compulsory, but if successfully completed is equivalent to the final exam.

***Re-takes***

In case the exam fails or the student wants to improve the result a retake exam will be organized (up to two times). **The first retake exam will be scheduled for week 15.**  **The last one will be held in the first week of the examination period.** 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) | 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.

## **Specified literature**

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

##### **compulsory reading and availability**

[1.] David J. Griffiths “Introduction to Electrodynamics” 2008 Pearson Education, Inc.publishing as Pearson Benjamin Cummings ISBN 0-13-919960-8

[2.] L. Solymar, D. Walsh, & R.R.A. Syms “Electrical Properties of Materials”, Oxford University Press, 2014

##### **recommended literature and availability**

[3.] Gambiattista, Richardson, Richardson: “College Physics” McGraw-Hill International Edition 2007,

ISBN-13 978-0-07-110608-5