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

# course syllabus and course requirements academic year 2023/2024 semester 1st

|  |  |
| --- | --- |
| Course title | Basic laws, Equations and Models 3. |
| **Course Code** | **IVB290ANVM** |
| **Hours/Week: le/pr/lab** | **1/2/0** |
| **Credits** | **3** |
| **Degree Programme** | **Electrical engineering BSc** |
| **Study Mode** | **full-time** |
| **Requirements** | **Mid-semester grade** |
| **Teaching Period** | **Autumn** |
| **Prerequisites** | **-** |
| **Department(s)**  **Course Director** | **Department of Automation**  **Dr. NYITRAY Gergely** |
| **Teaching Staff** | **Kovács Attila** |
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# course description

The aim of this course is to present the basic concepts of classical optics. The topics are the following: Geometric Optics, Photometric Units, Interference of Light, Interferometers, Diffraction of Light, Polarization of Light, Interaction of Electromagnetic Waves with a Substance, Waveguides and Optical Fibers, Lasers

# syllabus

## **goals and objectives**

Upon completion of this course, the student should be able to: interpret, and put into practice formulas and phenomena from the topic of optics and electromagnetic waves.

## **course content**

|  |  |
| --- | --- |
|  | TOPICS |
| LECTURE/PRACTICE | 1. The Refractive Index, Optical Path, Laws of Reflection and Refraction. Fermat’s Principle, The Critical Angle and Total Reflection, Plane-Parralel Plate. Refraction by a Prism, Thin Lenses, Image Formation, Spherical Mirrors. Optical Instruments, The Human Eye, Microscopes, Astronomical Telescopes. The Interference of Two Beams of Light, Huygens’s Principle, Young’s Experiment. Fresnel’s Biprism, Interferometric Measurements of Length, Interferometers. Interference Involving Multiple Reflections, Newton’s Rings, Fabry-Perrot Interferometer. Fresnel and Fraunhofer Diffraction, Rectangular Aperture, Circular Aperture. Resolving Power of a Telescope and Microscope, The Diffraction Grating. The Electromagnetic Character of Light, Light Vector in an Electromagnetic Wave. Energy and Intensity of the Electromagnetic Wave, The Polarization of Light. Waveguides: Planar, Rectengular, Circular, Optical Fibers; Lasers. |
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### **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. | Introduction: Course description. Orientation. The Rectilinear Propagation of Light, The Refractive Index, Optical Path, Laws of Reflection and Refraction |  | - | - |
| 2. | Fermat’s Principle, The Critical Angle and Total Reflection  Plane-Parallel Plate, Refraction by a Prism, Thin Lenses, Image Formation, Spherical Mirrors |  | - | - |
| 3. | Optical Instruments, The Human Eye, Microscopes, Astronomical Telescopes |  | - | - |
| 4. | The Interference of Two Beams of Light, Huygens Principle, Young’s Experiment |  | - | - |
| 5. | Fresnel’s Biprism, Interferometric Measurements of Length, Interferometers |  | - | - |
| 6. | Interference Involving Multiple Reflections, Newton’s Rings, Fabry-Perrot Interferometer |  | - | - |
| 7. | Fresnel and Fraunhofer Diffraction |  | - | - |
| 8. | Rectangular Aperture, Circular Aperture |  | - | - |
| 9. | - |  |  |  |
| 10. | Resolving Power of a Telescope and Microscope, The Diffraction Grating |  | - | - |
| 11. | The Electromagnetic Character of Light, Light Vector in an Electromagnetic Wave |  | - | - |
| 12. | Energy and Intensity of the Electromagnetic Wave, The Polarization of Light |  | - | - |
| 13. | Waveguides: Planar, Rectengular, Circular, Optical Fibers, Lasers |  | - | - |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| PRACTICE, LABORATORY PRACTICE | | | | |
| week | **Topic** | **Compulsory reading; page number**  **(from … to …)** | **Required tasks (assignments, tests, etc.)** | **Completion date, due date** |
| 1. | Introduction: Course description. Orientation. The Rectilinear Propagation of Light, The Refractive Index, Optical Path, Laws of Reflection and Refraction |  | - | - |
| 2. | Fermat’s Principle, The Critical Angle and Total Reflection |  | Möbius | 3th week |
|  | Plane-Parallel Plate, Refraction by a Prism, Thin Lenses, Image Formation, Spherical Mirrors |  | Möbius | 4th week |
| 4. | Optical Instruments, The Human Eye, Microscopes, Astronomical Telescopes |  | Möbius | 5th week |
| 5. | The Interference of Two Beams of Light, Huygens Principle, Young’s Experiment |  | Möbius | 6th week |
| 6. | Fresnel’s Biprism, Interferometric Measurements of Length, Interferometers |  | Möbius | 7th week |
| 7. | 1st WE |  |  |  |
| 8. | Interference Involving Multiple Reflections, Newton’s Rings, Fabry-Perrot Interferometer |  | Möbius | 9th week |
| 9. | - |  | - | - |
| 10. | Resolving Power of a Telescope and Microscope, The Diffraction Grating |  | Möbius | 11th week |
| 11. | The Electromagnetic Character of Light, Light Vector in an Electromagnetic Wave |  | Möbius | 12th week |
| 12. | Energy and Intensity of the Electromagnetic Wave, The Polarization of Light |  | Möbius | 13th week |
| 13. | Waveguides: Planar, Rectengular, Circular, Optical Fibers LASER |  | - | - |
| 14. | 2nd WE |  | - | - |
| 15. | RE-TAKE |  | - | - |

## **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**

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** |
| *Test 1* | *45* | *50 %* |
| *Test 2* | *45* | *50 %* |
| *homework* | *-* | *-* |

**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.*

Each WE’s results can be improved by a Re-take once during the study period/ on the first week of the Exams Period

1 final opportunity will be on the 2nd week of the Exams Period, as a Signature Re-take Exam.

**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.

## **Specified literature**

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

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

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

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

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