POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

COURSE DESCRIPTION CARD - SYLLABUS

Course name

Optoelectronics in stage and multimedia technology [N1Eltech2>OwTSiM]

Course

Field of study
Electrical Engineering

Year/Semester
4/7

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
10

Laboratory classes
10

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Student starting this item should have basic knowledge of semiconductors, optics, electrotechnics, electronics and metrology, lighting engineering and optical radiation. Also should have ability to realize the efficient self-education in the area related to the chosen field of study and have awareness of the necessity of broadening of the competence in the field of electrical engineering and willingness to cooperate in a team.

Course objective

Providing students with basic knowledge of optoelectronics useful in the design and application process, including stage technology, multimedia devices and systems.

Course-related learning outcomes

Knowledge:
The student:

- has knowledge about the importance and scope of the optoelectronics,
- has knowledge about structure and principles of optoelectronic devices,
- has knowledge about generation, transmission and detection of optical signals,
- has knowledge of basic optoelectronic elements, their properties, parameters and applications,
- has knowledge of the construction of stage and multimedia technology systems.

Skills:
The student:
- is ability to characterize the importance and scope of the optoelectronics,
- has the ability to plan and carry out simple engineering tasks using basic optoelectronic elements used in stage and multimedia equipment.

Social competences:
The student appreciates the possibilities offered by using optical radiation to solve technical problems, is able to think and act in an entrepreneurial manner in the field of optoelectronics. Is aware of the safe handling of strong sources of optical radiation and the threats it can pose to the environment.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

1. Lectures:
Lecture content is reviewed during the final class session in the form of a 45-minute final test covering the presented topics. The test consists of approximately 25-30 questions (test, calculation, and problem-solving questions) with various scoring options, with a pass mark of 50%. Additionally, individual activity in class and outside of class is assessed through evaluation of homework assignments.
2. Laboratory exercises:
- tests and rewards for knowledge necessary to solve the problems posed in the laboratory tasks,
- continuous estimation in all classes - rewards for increased skill in using the principles and methods learned,
- assessment of knowledge and skills related to the implementation of the measurement task, and evaluation of the report on the completed exercise.
Awarding additional points for activity during classes, particularly for:
- effective application of acquired knowledge during the measurement task,
- ability to work collaboratively within a team implementing a specific measurement task,
- accuracy in preparing reports.

Programme content

Theoretical issues presented in close connection with practice include: the interaction of optical radiation, the basics of laser and fiber optic technology, optoelectronic emitters and detectors, stage devices and systems.

Course topics

TThe lecture covers a range of topics, such as:
- optical radiation: properties, parameters, description, wave-particle duality, wave phenomena,
- methods of generating optical radiation,
- LEDs, superelectroluminescent and laser diodes, LASER: principle of operation, parameters, properties, electronic, power supply systems, applications, safety,
- photoconductive photodetectors: photoresistors, photodiodes, phototransistors - principle of operation, parameters, properties, electronic signal conditioning systems, applications,
- thermal photodetectors: thermocouples, bolometers, pyroelectric,
- radiation photodetector arrays: CCD, CMOS,
- optical fibers: principle of operation, types, types, properties, applications,
- optoelectronic systems: optocouplers, optical amplifiers, rotational speed sensors, optical encoders,
- stage systems: construction, basic functions, requirements for facilities such as theaters, television studios, stages, film studios, etc.,
- construction, operation of basic stage and multimedia lighting devices, including floodlights, moving lighting devices, multimedia screens, controllers and communication interfaces.
2. Laboratory:

Implementation of work in teams and carrying out experiments including measurements of electrical parameters of optoelectronics elements such as:
- acquisition and transmission of measurement information in open and closed optical links,
- industrial fiber optic links,
- optoelectronic signal separation,
- measurements of parameters of selected photoemitters and photodetectors,
- checking selected parameter systems of stage technology devices,
- configuring and testing a simple stage lighting system.

Teaching methods

1. Lectures: multimedia presentations (included schemes, photos) expanded by examples shown on a board. Presentation of electronic components, such as LEDs, light guides, cooling systems, stage technology devices, etc.
2. Laboratory exercises: teamwork and performing experiments including: the connection of a measuring system, measuring the indicated quantities, preparing a report.

Bibliography

Basic:
1. A. Cysewska-Sobusiak, J. Parzych, Optoelektronika i fotonika. Zagadnienia wybrane, Wyd. Politechniki Poznańskiej, Poznań 2020.
2. B. Ziętek, Optoelektronika, Wydawnictwo Uniwersytetu Mikołaja Kopernika, 2011
3. Z. Bielecki, A. Rogalski, Detekcja sygnałów optycznych, WNT, Warszawa 2001.
4. K. Booth, S. Hill, Optoelektronika WKŁ, Warszawa 2001.
5. Z. Kaczmarek - Światłowodowe czujniki i przetworniki pomiarowe, Agenda Wydawnicza PAK, Warszawa 2006.
6. R. Jóźwicki - Technika laserowa i jej zastosowania, Oficyna Wyd. Politechniki Warszawskiej, Warszawa 2009.
7. M. Miłek, Metrologia elektryczna wielkości nieelektrycznych, Oficyna Wydawnicza Uniwersytetu Zielonogórskiego, 2006.
8. R. E. Dunham, Set Lighting Technician's Handbook, Film Lighting Equipment, Practice, and Electrical Distribution, Taylor & Francis, 2018.
9. R. Cadena, Automated Lighting, The Art and Science of Moving and Color-Changing Lights, Taylor & Francis, 2017.

Additional:
1. A. Cysewska-Sobusiak - Modelowanie i pomiary sygnałów biooptycznych, Wyd. Politechniki Poznańskiej, Poznań 2001.
2. J. Siudak - Wstęp do współczesnej telekomunikacji światłowodowej, WKŁ, Warszawa 1999.
3. Parzych J., Pomiarowy model detekcji promieniowania w układzie dioda LED - przetwornik CCD, Przegląd Elektrotechniczny, nr 6, 2016, s. 176-179.
4. Szlaferek M., Parzych J., Układy chłodzenia diod i matryc LED, Poznan University of Technology Academic Journals, Electrical Engineering No 88, Computer Applications in Electrical Engineering 2016, Poznan 2016, s. 273-287.
5. Parzych J., Hulewicz A., Krawiecki Z., Matryce światłoczułe - właściwości, parametry, zastosowania, Poznan University of Technology Academic Journals, Electrical Engineering, No 92, Poznań 2017, s. 189-204.
6. https://muzykaitechnologia.pl/
7. http://www.lightingandsoundamerica.com/

Breakdown of average student's workload

	Hours	ECTS
Total workload	55	2,00
Classes requiring direct contact with the teacher	20	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	35	1,50