COURSE DESCRIPTION CARD - SYLLABUS

Course name
Optical networks

Course

Field of study
Electronics and Telecommunications

Year/Semester
IV/VII

Area of study (specialization)

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
English

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
15

Other (e.g. online)

Tutorials
0

Projects/seminars
0

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
prof. dr hab. inż. Wojciech Kabaciński,
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Responsible for the course/lecturer:
dr hab. inż. Remigiusz Rajewski,
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Prerequisites

The student should have a basic knowledge of probability, optimization and graph theories, functions and structures of telecommunication networks. The students should also know optoelectronics and optical communication, including knowledge required to understand the operation of advanced optical communication systems. He should be able to use bibliography in English (books, scientific and technical journals, application notes, catalogs, instructions, recommendations, etc.). He should also be able to communicate in English in a professional environment.

Course objective

To get students familiar with architectures and operation of optical networks and devices used in such networks.

Course-related learning outcomes

Knowledge

1. Has general knowledge about architectures and topologies of optical networks.

2. Has general knowledge of devices used in optical networks.

3. Has an idea about the future evolution of optical networks.

Skills

1. Can design logical and physical topologies of optical networks.

2. Can evaluate the usefulness and chose appropriate network devices.

3. Can evaluate the risk of faults in the network and design methods for their localization.

Social competences

1. Is aware of the significance of optical networks in telecommunication network evolution.

2. Is aware of the influence of optical networks on the information society.

3. Has competences to work in a team to realize projects on optical networks.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge aquired during the lectures is verified by the final exam. This exam is in the oral or/and written form, depending on the number of students. The oral exam consists of a set of 5 questions, a set of questions is drawn from at least 10 sets; answer to each question is marked in 0-5 points. 50% of points are needed to pass the exam. The written exam consists of 45-60 questions of multiple choice type. Students get 1 point for the correct answer and 0 points for wrong answer or lack of answer. 50% of points are needed to pass the exam. In questionable cases, there is a possiblity to correct the mark by answering for some questions in oral.

The final mark from the laboratory depends on the simulation program and the final report. In the simulation program, there should be implemented all features describing during the round of the subject's laboratories. In the final report, there should be a theoretical description of the topic implemented in the simulation program as well as a discussion of achieved results. The final marks are as follows: 5.0 - in the simulation program there are implemented all features introduced during the round of subject's laboratories, and they are working properly; 4.5 - the simulation program missed the routing feature, and others are working properly; 4.0 - the simulation program has a lack of two features, and others are working properly; 3.5 - the simulation program has the essential future working correctly, and one or two other features are implemented, however, they are not working properly; 3.0 - the simulation program has only the essential feature; 2.0 - the simulation program is not working, or student did not prepare such a simulation program at all

Programme content

Lectures: What are optical networks. Types of optical networks. Transport networks. WDM networks. Broadcast and Select networks. Elements and devices in optical networks: ROADM, OXC, types, configurations, architectures. Switching elements. switching fabrics: architectures and parameters, comparison. Optical packet and burst switching. Contention resolution. Routing and wavelength assignment. Network topology design methods. Protection and restoration methods. Optical access

networks: EPON, GEPON, WDM PON.

Laboratory: classes are based on OMNeT++ network simulator. In the beginning, students go through the first steps in the OMNeT++ simulation environment (Hello world-type programs) and with essential optical elements needed to create a simple optical network. In the next step, they design different optical network topologies, run simulation experiments, and compare different optical network topologies adopting RIP and OSPF routing protocols for optical networks.

Teaching methods

Lectures: Lectures are conducted in the traditional form, with computer presentations that are available earlier to students. Some lectures, or their parts, are led as interactive or problem lectures, where students participate in solving some problems or examples, especially in proving of some mathematical theorems.

Laboratory: classes are run using exercises and project methodology. Depending on the subject, the lecturer gives students blackboard examples, demonstrates exercises, and present a presentation on multimedia programming. Then students are given some problems which should be solved also by preparing some software (simulation) experiments. The lecturer advises in writing a simulation program being prepared by the students

Bibliography

Basic

1. R. Sivarajan, K.r N. Ramaswami: Optical Networks: A Practical Perspective (Morgan Kaufmann Series in Networking)

2002, 2010

2. T. E. Stern, G. Ellinas, K. Bala: Multiwavelength Optical Networks: Architectures, Design, and Control

3. B. Mukherjee: Optical WDM Networks, Springer. 2006

Additional

1. W. Kabaciński: Nonblocking Electronic and Photonic Switching Fabrics. Springer, 2005

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	31	2,0
Student's own work (literature studies, preparation for laboratory classes, preparation for tests/exam, project preparation) [1]	44	1,0

[1] delete or add other activities as appropriate