SYLLABUS

1. Information about the program

1.1 Higher education institution	UNIVERSITY POLITEHNICA OF TIMISOARA
1.2 Faculty[1]/ Department [2]	ELECTRONICS, TELECOMUNICATON AND INFORMATION TECHNOLOGIES/ COM
1.3 Field of study (name/code[3])	ELECTRONIC ENGINEERING, TELECOMUNICATION AND INFORMATION TECHNOLOGIES
1.4 Study cycle	License
1.5 Study program (name/code/qualification)	TST-ENG/20/20/10/100/10/TST-ENG

2. Information about the discipline

2.1 Name of discipline/ formative category[4]			Optical Communications/DS				
2.2 Coordinator (holder) of course activities			Radu LUCACIU				
2.3 Coordinator (holder) of applied activities[5]			Radu LUCACIU				
2.4 Year of study[6]	4	**2.5** Semester	7	**2.6** Type of evaluation	D	**2.7** Regime of discipline[7]	DO

3. Total estimated time – hours / semester: direct teaching activities (fully assisted or partly assisted) and individual training activities (unassisted) [8]

3.1 Number of fully assisted hours / week	4 of which:	**3.2** course	2	**3.3** seminar / laboratory / project	0/1/1
3.1* Total number of fully assisted hours / semester	56 of which:	**3.2*** course	28	**3.3*** seminar / laboratory / project	0/14/14
3.4 Number of hours partially assisted / week	of which:	**3.5** training		**3.6** hours for diploma project elaboration	
3.4* Total number of hours partially assisted / semester	of which:	**3.5*** training		**3.6*** hours for diploma project elaboration	
3.7 Number of hours of unassisted activities / week	4.93 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			1.2
		hours of individual study after manual, course support, bibliography and notes			1.2
		training seminars / laboratories, homework and papers, portfolios and essays			2.53
3.7* Number of hours of unassisted activities / semester	69 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			16.8
		hours of individual study after manual, course support, bibliography and notes			16.8
		training seminars / laboratories, homework and papers, portfolios and essays			35.4
3.8 Total hours / week [9]	8.93				
3.8* Total hours /semester	125				
3.9 Number of credits	5				

4. **Prerequisites** (where applicable)

[1] The name of the faculty which manages the educational curriculum to which the discipline belongs
[2] The name of the department entrusted with the discipline, and to which the course coordinator/holder belongs.
[3] The code provided in HG - on the approval of the Nomenclature of fields and specializations / study programs, annually updated.
[4] Discipline falls under the educational curriculum in one of the following formative disciplines: Basic Discipline (DF), Domain Discipline (DD), Specialist Discipline (DS) or Complementary Discipline (DC).
[5] Application activities refer to: seminar (S) / laboratory (L) / project (P) / practice/training (Pr).
[6] Year of studies in which the discipline is provided in the curriculum.
[7] Discipline may have one of the following regimes: imposed discipline (DI) or compulsory discipline (DOb)-for the other fundamental fields of studies offered by UPT, optional discipline (DO) or optional discipline (Df).
[8] The number of hours in the headings 3.1 *, 3.2 *, ..., 3.8 * is obtained by multiplying by 14 (weeks) the number of hours in headings 3.1, 3.2, ..., 3.8. The information in sections 3.1, 3.4 and 3.7 is the verification keys used by ARACIS as: (3.1) + (3.4) ≥ 28 hours / wk. and (3.8) ≤ 40 hours / wk.
[9] The total number of hours / week is obtained by summing up the number of hours in points 3.1, 3.4 and 3.7.

4.1 Curriculum	• Physics
4.2 Competencies	• Optics, Electromagnetic field theory

5. Conditions (where applicable)

5.1 of the course	• Video projector, Internet connection, blackboard
5.2 to conduct practical activities	• Opto-electronic instrumentation, computers, blackboard

6. Specific competencies acquired through this discipline

Specific competencies	• The physical and technological bases of optical communications • Principles of design and analysis of point-to-point links on optical fibers • Understanding the impact of optical and electronic noise in a digital optical transmission
Professional competencies ascribed to the specific competencies	• Use of fundamentals in terms of devices, circuits, systems, instrumentation and electronics technology. • Application of basic methods for signal acquisition and processing. • Application of knowledge, concepts and basic methods related to computer system architecture, microprocessors, microcontrolers, programming languages and techniques. • Design, implementation and service operation of data, voice, video multimedia, based on understanding and applying fundamental concepts in communications and information transmission. •
Transversal competencies ascribed to the specific competencies	• Methodical analysis of field-related problems aimed at identifying acknowledged solutions, thus ensuring the accomplishment of professional tasks. • Adaptation to new technologies, professional and personal development through continuous training, using printed documentation sources, specialized software and electronic resources in Romanian and at least one foreign language.

7. Objectives of the discipline (based on the grid of specific competencies acquired - pct.6)

7.1 The general objective of the discipline	• The fundamentals of optical communication systems are presented, starting from the description of optical technologies specific to the physical level: fibers, lasers, receivers, modulators, amplifiers, multiplexers, demultiplexers, switches, etc. The architecture and principles of design and analysis of point-to-point links on optical fibers are also presented.
7.2 Specific objectives	• The student acquires knowledge about the physical and technological bases of optical communications, finally being able to design a point-to-point transmission line on optical fibers.

8. Content [10]

8.1 Course	Number of hours	Teaching methods [11]
Introduction to optical communications. Evolution of optical communications	1	Presentation at the right pace, presentation of numerical examples when appropriate, asking questions and stimulating answers;
The basics of digital communications through the optical channel (models, attenuation, dispersion, noise....)	2	
Optical fibers (monomode, multimode, dispersion, attenuation, polarization, non-linear properties, manufacturing technologies)	6	
Optical sources for communications (laser diodes,	5	

[10] It details all the didactic activities foreseen in the curriculum (lectures and seminar themes, the list of laboratory works, the content of the stages of project preparation, the theme of each practice stage). The titles of the laboratory work carried out on the stands shall be accompanied by the notation "(*)".
[11] Presentation of the teaching methods will include the use of new technologies (e-mail, personalized web page, electronic resources etc.).

electroluminescent diodes, optical transmitters)		PowerPoint presentation accompanied by examples on the blackboard
Optical receivers (pin photodiodes, avalanche photodiodes, quantum optical receivers). Receiver noise	5	
Optical amplifiers (EDFA- Erbium Doped Fiber Amplifiers, SOA-Semiconductor Optical Amplifiers)	3	
Optical components with optical fibers (directional couplers, WDM couplers, attenuators, isolators, circulators, filters, modulators)	3	
Designing a point-to-point link on optical fibers	3	
Bibliography [12] A. Mihaescu, *Comunicatii Optice*, (Editura de Vest , 2005) Govind P. Agraval, *Fiber-optic Communication Sistems* (Willey, 2010) B. Chomycz, *Planning Fiber Optics Networks*, (McGrawHill, 2009)		
8.2 Applied activities [13]	Number of hours	Teaching methods
Laboratory works. Themes: 1.Total internal reflection 2. Fundamentals of fiber optics 3. Optical fiber coupling 4. Numerical aperture (NA) of a multimode fiber 5. Optical fiber transmission loss 6. M-Z optical fiber interference 7. Optical fiber temperature sensing principle 8. Optical fiber pressure sensing principle 9. Optical fiber splitter 10. Variable optical attenuator (VOA) 11. Optical fiber isolator 12. Fiber-based optical switch 13. Wavelength division multiplexing (WDM) principle 14. Principle of EDFA (Erbium-doped Fiber Amplifier) 15. Transmission of analogue audio frequency signal in free optical space	14 hours	Presentation, measurements, simulations, discussions
Project: Design of a point-to-point fiber optic communication system: Components of a point-to-point fiber optic link. The thermal noise characteristic W of the receiver. Calculation of receiver sensitivity. The power budget. The budget of rise times.	14 hours	
Bibliography [14] A. Mihaescu, *Comunicatii Optice*, (Editura de Vest , 2005).		

9. Corroboration of the content of the discipline with the expectations of the main representatives of the epistemic community, professional associations and employers in the field afferent to the program

[12] At least one title must belong to the discipline team and at least one title should refer to a reference work for discipline, national and international circulation, existing in the UPT library.
[13] Types of application activities are those specified in footnote 5. If the discipline contains several types of applicative activities then they are sequentially in the lines of the table below. The type of activity will be in a distinct line as: "Seminar:", "Laboratory:", "Project:" and / or "Practice/training".
[14] At least one title must belong to the discipline team.

- Similar courses are taught at technical universities around the world:
- University of Sydney, Australia – Optical Communication Systems
- University of Glasgow, Scotia– Optical Communications
- Polytechnic University of Catalonia Barcelona, Spania– Optical Communications
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10. Evaluation

Type of activity	**10.1** Evaluation criteria [15]	**10.2** Evaluation methods	**10.3** Share of the final grade
10.4 Course	Theoretical knowledge of the course principal items. The abilty and speed of understanding or of finding solutions	Two distributed written exams, with two theachers. Each of the two exams lasts an hour and a half; each of them represent half of the course	2/3
10.5 Applied activities	**S:**		
	L: The degree of involvement of the student in carrying out the laboratory work. Attendance is required for all lab.	The sheets with the laboratory work are checked; Test. The final grade for the practical activities is the average of the grades obtained at lab and project.	1/6
	P[16]**:** Knowledge of the project pincipal items. Calculation abilities. The abilty and speed of understanding or of finding solutions.	The project is presented and a mark is given	1/6
	Pr:		
10.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified [17])			
• The minimum volume of knowledge required for the promotion of the discipline is 0.5 of the volume of knowledge taught. Grade 5 for the two components of the final grade (exam and practical activities)			

Date of completion	**Course coordinator (signature)**	**Coordinator of applied activities (signature)**
21.06.2023		
Head of Department (signature)	**Date of approval in the Faculty Council** [18]	**Dean (signature)**
	14.09.2023	

[15] Syllabus must contain the procedure for assessing the discipline, specifying the criteria, methods and forms of assessment, as well as specifying the weightings assigned to them in the final grade. The evaluation criteria shall be formulated separately for each activity foreseen in the curriculum (course, seminar, laboratory, project). They will also refer to the forms of verification (homework, papers, etc.)

[16] In the case where the project is not a distinct discipline, this section also specifies how the outcome of the project evaluation makes the admission of the student conditional on the final assessment within the discipline.

[17] It will not explain how the promotion mark is awarded.

[18] The endorsement is preceded by the discussion of the board's view of the study program on the discipline record.