SYLLABUS

1. Information about the program

1.1 Higher education institution	Universitatea Politehnica Timișoara
1.2 Faculty[1] / Department[2]	Electronics Telecommunications and Information Technologies / Communications Department
1.3 Field of study (name/code[3])	Electronics Telecommunications and Information Technologies Engineering / 20.20.10
1.4 Study cycle	Master
1.5 Study program (name/code/qualification)	Communications Networks Engineering / 20.20.10 / 232.25

2. Information about discipline

2.1a Name of discipline/The educational classe[4]	Selected Topics in Communications Engineering/DS						
2.1b Name of discipline in Romanian	Tehnici Avansate în Rețele de Comunicații						
2.2 Coordinator (holder) of course activities	ș.l. dr. ing. Asztalos Tibor						
2.3 Coordinator (holder) of applied activities[5]	ș.l. dr. ing. Asztalos Tibor						
2.4 Year of study[6]	I	**2.5** Semester	1	**2.6** Type of evaluation	E	**2.7** Regime of discipline[7]	DOB

3. Total estimated time (direct activities (fully assisted), partially assisted activities and unassisted activities[8])

3.1 Number of hours fully assisted/week	4 ,of which:	course	2	seminar/laboratory/project			2
3.1* Total number of hours fully assisted/sem.	56 ,of which:	course	28	seminar/laboratory/project			28
3.2 Number of on-line hours fully assisted/sem	0 ,of which:	course	0	seminar/laboratory/project			0
3.3 Number of hours partially assisted/week	0 ,of which:	project, research	0	training	0	hours designing M.A. dissertation	0
3.3* Number of hours partially assisted/ semester	0 ,of which:	project of research	0	training	0	hours designing M.A. dissertation	0
3.4 Number of hours of unassisted activities/ week	4.93 ,of which:	Additional documentation in the library, on specialized electronic platforms, and on the field					2
		Study using a manual, course materials, bibliography and lecture notes					1.93
		Preparation of seminars/ laboratories, homework, assignments, portfolios, and essays					1
3.4* Total number of hours of unasssited asctivities/ semester	69 ,of which:	Additional documentation in the library, on specialized electronic platforms, and on the field					28
		Study using a manual, course materials, bibliography and lecture notes					27
		Preparation of seminars/ laboratories, homework, assignments, portfolios, and essays					14
3.5 Total hrs./week[9]	8.93						
3.5* Total hrs./semester	125						
3.6 No. of credits	5						

4. Prerequisites (where applicable)

4.1 Curriculum	• Information Theory and Coding, Introduction to Computer Programming, Computer Network Architecture, Data Communications, Applied Computer Programming, Digital Radio Communications, Communications Protocols
4.2 Learning outcomes	• Abilities in programming in Matlab, in routing programming simulations with GNS3

5. Conditions (where applicable)

5.1 of the course	• Laptop, Video projector, Whiteboard, Internet access.
5.2 to conduct practical activities	• Laboratory equipped with PC, having Internet access and specific software such as Matlab, GNS3 and Cisco Packet Tracer

6. **Learning outcomes** acquired through this discipline

Knowledge	• C1. The student/graduate knows research methods, techniques, and paradigms • C8. The student/graduate knows the terminology and conventions of technical communication • C10. The student/graduate understands the concepts of traffic, bandwidth, and QoS
Skills	• A1. The Student/Graduate uses collaborative tools and contributes to projects • A10. The Student/Graduate assesses network needs and optimizes resources • A11. The Student/Graduate selects and applies communication methods appropriate to the context •
Responsibility and autonomy	• RA4 The Student/Graduate ensures the accuracy and relevance of the conclusions drawn • RA7 The Student/Graduate ensures quality and compliance with academic standards • RA10 The Student/Graduate proposes solutions for streamlining management and manages resources • RA11 The Student/Graduate takes responsibility for the correct and effective transmission of information

7. **Objectives of the discipline** (based on the grid of learning outcomes acquired)

- This course presents an overview of modern communications technologies and challenges. The main objective is to provide knowledge for understanding the technological developments, that are at the heart of the proliferation and fusion of networks taking place today. Another objective is providing skills in identifying problems and the appropriate method to be applied, especially in routing and congestion control. It prepares students to understand the issues facing the designers of next-generation data networks and to undertake applied projects or research in the areas of communications network design
- Specific objectives:
  - 1 Aquiring abilities in relevant data aquisition and interpretation in the field of communications networks in order to solve problems and to developeme creative projects
  - 2 Aquiring abilities in problems solving by integration of complex information resources in a new context
  - 3.Developement of team cooperation and research skills
- 4. Improvement of ideas communication

8. **Content**

8.1 Course	Number of hours	Of which online	Teaching methods
1. Overview of nowadays communications networks . Architectures. Characteristics .5G communications Networks. Technologies. Challenges. Trends	2	0	Powerpoint presentation, discussion examples , problems solving, case study, demonstration, comparative analyses, use of Internet applets and videos.
2. Internetworking terms and devices. Concatenated Virtual Circuits, Connectionless Internetworking. Tunneling. Fragmentation	2	0	
3.Multiaccess communication Orthogonal frequency division multiple access. Code Division Multiple Access. Sparse Code Multiple Access. Non-orthogonal Multiple Access	4	0	
4. Routing. Properties of routing algorithms Routing Metrics. Routing Strategies:flooding, spanning tree, random. Routing Algorithms Types Static versus dynamic Single-path versus multipath Flat versus hierarchical Host-intelligent versus router-intelligent	8	0	

Intradomain versus interdomain Link-state versus distance vector Path vector routing Hybrid Routing Routing Protocols vs. Routed Protocols Routing Information Protocol (RIP) (features and mode of operation , routing updates, timers, RIP format, advantages of RIP format, advantages of RIPv2) Open Shortest Path First (OSPF) (features and mode of operation, terminology, Designated and backup designated router, routing hierarchy, SPF algorithm, OSPF packet format, OSPF virtual links and transit areas)			
5.Exterior routing Protocols. Border Gateway Protocol (BGP) (features and mode of operation components of a BGP network, BGP messages, attributes,BGP path selection) Multiprotocol label switching (MPLS).Traditional routing versus label routing, mode of operation, multiprotocol support, terminology, Label swapping.GMPLS	4	0	
6. Congestion control. Congestion control principles. Traffic shaping.TCP congestion control and algorithms. Congestion control in ATM networks.Congestion control in Frame Relay networks. Router congestion control	4	0	
7. Neural networks in wireless communications. Supervised NN. Feed-forward NN. Recurrent NN. Unsupervised NN. Competitive NN Unsupervised recurrent NN. Optimisation of routing and congestion control by using intelligent techniques . Applications of neural networks in wireless senzor networks	6	0	

Bibliography[10]	1.Corina Botoca, Selected Topics In Communications Engineering , Course notes. Power point presentations, https://cv.upt.ro, http://intranet.etc.upt.ro , 2 Corina Botoca, Cristina Stolojescu- Crisan, Selected Topics In Communications Engineering, Editura Politehnica 2015 3. William Stallings, Data and Computer Communications (8th Edition), Prentice Hall, Inc, 2009 4.www.ibm.com/redbooks, TCP/IP Tutorial and Technical Overview,, Lydia Parziale, David T. Britt, Chuck Davis, Jason Forrester, Wei Liu, Carolyn Matthews, Nicolas Rosselot 5..http://www.cisco.com/en/US/docs/internetworking/technology/handbook, Alcatel-Lucent Network Routing Specialist II (NRS II) Self-Study Guide. Preparing for the NRS II Certification Exams, John Wiley and sons-2011

8.2 Applied activities[11]	Number of hours	Of which online	Teaching methods
1.Cisco routers configuration using Dynamips GNS3 2. Cisco routers configuration using Cisco Packet Tracer	2	0	simulation, case study and discussion, comparative
3. Open Shortest Path First routing	2	0	
4. Border Gateway protocol routing	2	0	

5.Multiprotocol label switching	2	0	analyses, demonstration
6. Congestion control using neural networks	2	0	
7. Shortest Path developement by using neural networks	2	0	

	Bibliography[12] 1.Corina Botoca, Selected Topics In Communications Engineering, Course notes. Power point presentations http://intranet.etc.upt.ro, https://cv.upt.ro , 2 Corina Botoca, Cristina Stolojescu- Crisan, Selected Topics In Communications Engineering, Editura Politehnica 2015, 3. Corina Botoca, Cristina Stolojescu- Crisan, Selected Topics In Communications Engineering, laboratory works, https://cv.upt.ro, 4. http://www.cisco.com/en/US/docs/internetworking/technology/handbook 2007

9. Evaluation

Type of activity	**9.1** Evaluation criteria[13]	**9.2** Evaluation methods	**9.3** Share of the final grade
9.4 Course	Hole course knowledege aquisition. Speed in understanding and solving problems. Abilities in developement of new solutions to a given problem	Written examination with a duration of 2,5 hours Theoretical subjects (3 topics on choice) and aplicative subiects	50%
9.5 Applied activities	**S:**		
	L: Seriosity in labs works Ability of routers configurations by using different protocols	Continuous oral evaluation at each lab. Written evaluation through tests	50%
	P:		
	Pr:		
	Tc-R[14]:		
9.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified[15]			
• Minimum mark is 5 at exam and 5 for activity			

Date of completion 25.09.2025	**Course coordinator (signature)**	**Coordinator of applied activities (signature)**
Head of Department (signature)	**Date of approval in the Faculty Council** [16] 07.10.2025	**Dean (signature)**