# Politehnica University of Bucharest

# Faculty of Electronics, Telecommunications and Information Technology

**COURSE DESCRIPTION**

**1. Program identification information**

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| 1.1 Higher education institution | POLITEHNICA University of Bucharest |
| 1.2 Faculty | Electronics, Telecommunications, Information Technology |
| 1.3 Department | Applied Electronics and Information Engineering |
| 1.4 Domain of studies | Computers and Information Technology  |
| 1.5 Cycle of studies | Bachelor of Science  |
| 1.6 Program of studies | Information Engineering  |

**2. Course identification information**

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| 2.1 Name of the course | Computer Networks |
| 2.2 Lecturer | Stefan Stancescu |
| 2.3 Instructor for practical activities | Catalin Sandu |
| 2.4 Year of studies | 4 | 2.5 Semester | 1 | 2.6 Evaluation type | Verification | 2.7 Course choice type | Mandatory |

**3. Total estimated time** (hours per semester for academic activities)

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| 3.1 Number of hours per week, out of which | 3 | 3.2 course | 2 | 3.3 practical activities | 1 |
| 3.4 Total hours in the curricula, out of which | 42 | 3.5 course | 28 | 3.6 practical activities | 14 |
| Distribution of time | hours |
| Study according to the manual, course support, bibliography and hand notes | 15 |
| Supplemental documentation (library, electronic access resources, in the field, etc) | 20 |
| Preparation for practical activities, homeworks, essays, portfolios, etc. | 30 |
| Tutoring |  |
| Examinations | 10 |
| Other activities |  |
| 3.7 Total hours of individual study | 75 |  |  |
| 3.9 Total hours per semester | 117 |  |  |
| 3. 10 Number of ECTS credit points | 2 |  |  |

**4. Prerequisites (if applicable)**

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| 4.1 curricular | Operating Systems, Computer Systems Archiutecture, Decision and estimation in information processing |
| 4.2 competence-based | Data Structures and Algorithms , Basic abilities in usual programming language,  |

**5. Requisites (if applicable)**

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| 5.1 for running the course | Internet, projector |
| 5.2 for running of the applications | Mandatory presence at laboratories (according to the regulations of PUB) |

**6. Specific competences**

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| Professional competences | C1.1. C1.5 C1.2 Definitions of concepts, recognition, construction and use of computer communication system models. C2.3. 2-4 C2.3 C2.1 The role, structure, description, interaction in operation, construction and evaluation for computer networks software components. Methods and design technologies for them.C3.2 C3.1 C3.3 3-5 Identifying classes, patterns of problems and methods for solving typical systems using tools and engineering methods, developing and implementing solutions for real problems. |
| Transversalcompetences | CT1 and CT3 Tracking logic discovery of methods for solving problems by modeling the computing system behavior builds a rational, orderly knowledge and respect for laws and social conventions, thus ensuring positive social behavior in the fulfillment of professional duties. |

**7. Course objectives (as implied by the grid of specific competences)**

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| 7.1 General objective of the course | The study of principles and methods of organization, analysis, design and operation of computer networks and interconnected computer networks in the Internet. |
| 4.2 Specific objectives | Knowledge of the open systems principles and implementation of computer network layers through protocols and services: usual communication technologies, link layer, MAC intermediate layer, networking layer, IP and the Internet addressing, the transport layer, TCP, TCP / IP, QoS congestion, introduction in traffic and queuing theory. |

**8. Content**

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| 8.1 Lectures | Teaching techniques | Remarks |
| 1. Introduction to computer networks. Network models. Open Systems Interconnection. | Ppt presentation on projector | 2 hours |
| 2. The physical level. Twisted pair cable signals, coaxial and optical. Wireless environment. Environment specific errors. | Ppt presentation on projector | 2 hours |
| 3. Medium Access Control in Local Area Networks. CSMA/CD, token bus, token ring. MAC mechanisms. Ethernet networks. | Ppt presentation on projector | 4 hours |
| 4. The data link layer. Frames, flow and error control . Sliding window protocols. | Ppt presentation on projector | 2 hours |
| 5. The network layer. Addressing and routing. Routing protocols. IP. Address resolution protocols. | Ppt presentation on projector | 4 hours |
| 6. Transport layer. Connection and connectionless links. TCP and UDP protocols. TCP/IP stack | Ppt presentation on projector | 4 hours |
| 7. Application layer. Network servers. Elements of cloud computing and of data centers. | Ppt presentation on projector | 2 hours |
| 8. Elements of traffic theory. Markov processes and chains | Ppt presentation on projector | 2 hours |
| 9. Elements of queuing theory | Ppt presentation on projector | 2 hours |
| 10. Congestion and quality of service in computer networks. Congestion control algorithms | Ppt presentation on projector | 4 hours |
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| Bibliography[1] A. Tanenbaum – "Computer Networks" V’th Ed., Prentice Hall 2011 [2] R. Srikant - "The Mathematics of Internet Congestion Control" Ed. Springer 2004[3] Stefan Stancescu – Lecture Notes, <http://stst.elia.pub.ro/programa/rc.htm> |
| 8.2 Practical applications | Teaching techniques | Remarks |
| LINUX utilities in packet tracing | Work at integrated station | 2 hours |
| Data link layer, sliding windows, CRC | Work at integrated station | 2 hours |
| ICMP UDP TCP/IP  | Work at integrated station | 2 hours |
| Subnetting, CIDR | Work at integrated station | 2 hours |
| Firewall NETFILTER NETKIT | Work at integrated station | 2 hours |
| Network Simulator, Routing Algorithms. | Work at integrated station | 2 hours |
| Final laboratory colloquium | Work at integrated station | 2 hours |

**9. Bridging the course content with the expectations of the epistemic community representatives, professional associations and employers representatives for the domain of the program**

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| The industry has a strong demand for qualified engineers with specializations related to the design and maintenance of computer networks and the development of software applications in distributer environment, in internet, in cloud computing, which require detailed knowledge of tiered structure of protocols and services for computer networks and interconnected computer networks; the actual development of complex distributed systems, communications equipments, wireless mobile included, presume mandatory abilities to design and implement complex information systems. The course syllabus meets these concrete actual requirements of technology development and evolution, subscribed to Europe 2020 plan, in Electronic Engineering domain. In the context of actual IT fast progress, the course areas are targeted to all aspects of economic and social life in aim to move towards the knowledge society in which human experience is outsourced in independent systems dedicated to areas ranging from system utilities in telecommunications, military, field security (surveillance systems), industrial automation (inspection systems products), robotics (human-machine interface systems) and others. This course provides graduates with appropriate skills and training needs of current scientific qualifications and modern quality and competitive technique, allowing them rapid employment after graduation. Perfectly framed with the POLITEHNICA University of Bucharest policy, both in terms of content and structure and in terms of skills and international openness offered to students. |

**10. Evaluation**

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| Type of activity | 10.1 Evaluation criteria | 10.2 Evaluation methods | 10.3 Weight in the final mark |
| 10.4 Lectures | Knowledge of fundamental theoretical concepts;- Knowledge of how to apply the theory to specific problems. | Written test verification over the entire field, mainly exercises and problems | 50 |
| 10.5Technical essays | Differential analysis of techniques and theoretical methods; perspectives. | Written essay upon a agreed lecture subject covering last issues on theme | 20 |
| 10.6Practical applications | Knowledge of how to apply the theory to specific problems. | Laboratory work on Linux OS | 30 |
| 10.7 Minimal performance standard |
| Course achievement proven by obtaining at least 50% of each score |

Date Lecturer Instructor for practical activities

10.10.2015 Conf. dr. ing. Stefan Stancescu Drd. Catalin Sandu

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Date of department approval Director of Department,

10.12.2015 Prof. Dr. Ing. S. Paşca

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