1. **Course title:** NETWORK TECHNOLOGIES
2. **Course code**

3. **Validity of course description:** 2012/2013

4. **Level of studies:** 1st cycle of higher education

5. **Mode of studies:** extramural studies

6. **Field of study:** COMPUTER SCIENCE (INFORMATICS)  
   (FACULTY SYMBOL) RAU

7. **Profile of studies:** general academic

8. **Programme:**

9. **Semester:** 5

10. **Faculty teaching the course:** Institute of Computer Science

11. **Course instructor:** Mirosław Skrzewski

12. **Course classification:** common

13. **Course status:** compulsory

14. **Language of instruction:** English

15. **Pre-requisite qualifications:** introduction to computer architecture, operating systems

16. **Course objectives:** objective of the course is to present basics of transmission channels operation and the principles of computer systems communication with the use of communication channels and direct connections with the environment.

17. **Description of learning outcomes:**

<table>
<thead>
<tr>
<th>Nr</th>
<th>Learning outcomes description</th>
<th>Method of assessment</th>
<th>Teaching methods</th>
<th>Learning outcomes reference code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Student possesses a general knowledge of the basic properties of wired, fiber optic and radio channels, knows the information signals properties and the methods to match them to the transmission channel properties</td>
<td>Written exam, tests on laboratory exercises</td>
<td>Lectures, Lab exercises</td>
<td>K1A_W05, K1A_W07, K1A_U05, K1A_U13</td>
</tr>
<tr>
<td>2</td>
<td>Student possesses the basic knowledge of the theory of information and the resulting properties of the information channels</td>
<td>Written exam, tests on laboratory exercises</td>
<td>Lectures, Lab exercises</td>
<td>K1A_W07, K1A_W12</td>
</tr>
<tr>
<td>3</td>
<td>Student possesses knowledge of channelization methods (FDM, TDM, WDM, CDM) and their use in transmission systems</td>
<td>Written exam, tests on laboratory exercises</td>
<td>Lectures, Lab exercises</td>
<td>K1A_W07, K1A_U05</td>
</tr>
<tr>
<td>4</td>
<td>Student knows and understand the concept of error rate, hamming distance, redundancy, coding efficiency, redundant codes, block codes</td>
<td>Written exam, tests on laboratory exercises</td>
<td>Lectures, Lab exercises</td>
<td>K1A_W07, K1A_U05, K1A_U13</td>
</tr>
<tr>
<td>5</td>
<td>Student possesses a basic knowledge of the operation of the link layer communication protocols, methods of providing reliable data transmission over unreliable links and flow control method</td>
<td>Written exam, tests on laboratory exercises</td>
<td>Lectures, Lab exercises</td>
<td>K1A_W07, K1A_W12, K1A_U05,</td>
</tr>
<tr>
<td>6</td>
<td>Student possesses a basic knowledge of algorithms, protocols, and standards relating to the operation of typical network services (translation of names, e-mail, web service)</td>
<td>Written exam, tests on laboratory exercises</td>
<td>Lectures, Lab exercises</td>
<td>K1A_W12, K1A_W15, K1A_U23</td>
</tr>
</tbody>
</table>

18. **Teaching modes and hours**

   Lecture / BA / MA Seminar / Class / Project / Laboratory

   Lecture - 20 h, Lab - 30 h

19. **Syllabus description:**

   **Lecture:**
   Basic concepts - a source of information, the amount of information, entropy source, signal, message encoding, transmission channel, mutual entropy, decision rules, channel throughput. Redundant coding, detection and correction of errors. Linear codes, block codes, cyclic codes, methods of encoding and decoding cyclic codes.
Properties of the information signals, the signal spectrum, bandwidth, signal modulations, sampling theorem. Basic parameters of the wired track, baseband signal transmission, the method of multiplexing channels. Phone channel, analog and digital telephone systems. Fiber optic channels. Radio channels. Spread Spectrum Systems. Synchronization problems in digital data transmission systems.

Communication protocols, methods of protocols description. Transmission of information between digital systems, algorithms of data transmission, processing the form of information, network services. The logical architecture of computer networks, ISO OSI reference model, division of tasks into layers, layer features, communication (interface) between-layer, data units, service layer, models of service delivery, addressing.

Transport of information, transmission organization, addressing. End systems synchronization, network modes of operation - connection oriented, connectionless, quality of service (QoS). Solutions of TCP/IP network, structure and functions of protocols, network addressing, auxiliary protocols (DNS, ARP, ICMP), the transport layer algorithms, addressing of access to services, safety of network communication.

**Laboratory:**
1. File transfer protocols
2. Communication protocols of input-output devices
3. Properties of baseband transmission
4. Design and control languages of modems
5. Principles of addressing in IP networks
6. Translation services of system names
7. Character oriented industrial network protocols
8. Methods of control of transmission correctness

20. **Examination:** semester 5

21. **Primary sources:**
Abramson N., Information Theory and Coding, McGraw-Hill, 1963,
Simmonds A., Data Communications and Transmission Principles, Palgrave Macmillan, 1997
Stallings W., Data and Computer Communication, Prentice Hall, 2006

22. **Secondary sources:**
Cappellini V. (editor), Data Compression and Error Control Techniques with Applications, Academic Press, 1985

23. **Total workload required to achieve learning outcomes**

<table>
<thead>
<tr>
<th>Lp.</th>
<th>Teaching mode</th>
<th>Contact hours / Student workload hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lecture</td>
<td>20/60</td>
</tr>
<tr>
<td>2</td>
<td>Classes</td>
<td>/</td>
</tr>
<tr>
<td>3</td>
<td>Laboratory</td>
<td>30/46</td>
</tr>
<tr>
<td>4</td>
<td>Project</td>
<td>/</td>
</tr>
<tr>
<td>5</td>
<td>BA/MA Seminar</td>
<td>/</td>
</tr>
<tr>
<td>6</td>
<td>Other</td>
<td>/25</td>
</tr>
<tr>
<td></td>
<td>Total number of hours</td>
<td>50/131</td>
</tr>
</tbody>
</table>

24. Total hours: 181

25. Number of ECTS credits: 8

26. Number of ECTS credits allocated for contact hours: 3

27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects): 4

26. **Comments:**
Calculation of credits:
• 50h contact time, including:
  • the presence on the lectures - 20h,
  • of attendance in the laboratory - 30h
• preparation for laboratory classes - 25h
• reports from the laboratory - 21h
• independent studies of specific topics (literature) - 60h
• preparation and the presence on the exam - 25 h

Approved:

(date, Instructor's signature)  (date, the Director of the Faculty Unit signature)