

<b>STUDY MODULE DESCRIPTION FORM</b>		
Name of the module/subject <b>Broadband networks</b>		Code <b>1010802241010820621</b>
Field of study <b>Technical Applications of Internet</b>	Profile of study (general academic, practical) <b>general academic</b>	Year /Semester <b>2 / 4</b>
Elective path/specialty <b>-</b>	Subject offered in: <b>Polish</b>	Course (compulsory, elective) <b>obligatory</b>
Cycle of study: <b>Second-cycle studies</b>	Form of study (full-time, part-time) <b>full-time</b>	
No. of hours Lecture: <b>1</b> Classes: <b>-</b> Laboratory: <b>2</b> Project/seminars: <b>-</b>		No. of credits <b>4</b>
Status of the course in the study program (Basic, major, other) <b>major</b>		(university-wide, from another field) <b>from field</b>
Education areas and fields of science and art <b>technical sciences</b> <b>Technical sciences</b>		ECTS distribution (number and %) <b>4 100%</b> <b>4 100%</b>
<b>Responsible for subject / lecturer:</b> dr inż. Janusz Kleban email: janusz.kleban@et.put.poznan.pl tel. 61 665 3929 Electronics and Telecommunications ul. Polanka 3, 60-965 Poznań		<b>Responsible for subject / lecturer:</b> prof. dr hab, inż. Wojciech Kabaciński email: wojciech.kabacinski@put.poznan.pl tel. 61 665 3929 Electronics and Telecommunications ul. Polanka 3, 60-965 Poznań
<b>Prerequisites in terms of knowledge, skills and social competencies:</b>		
1	<b>Knowledge</b>	Knows basic technologies used to solve practical problems in telecommunication and computer science. [K_W04]
2	<b>Skills</b>	Is able to look for information required during design process and take educational courses, if needed, especially through Internet and distance education. [K_U05]
3	<b>Social competencies</b>	Knows the limitations of their own knowledge and skills; can precisely formulate questions; understands the need for further education and systematic reading of scientific journals in the field. [K_K01] Can work individually and in team; knows the responsibility for tasks realized in team. [K_K02]
<b>Assumptions and objectives of the course:</b> To make students familiar with the architecture, standards, applications, and evolution of broadband networks. Current solutions in the optical networks will be also presented.		
<b>Study outcomes and reference to the educational results for a field of study</b>		
<b>Knowledge:</b>		
1. Knows trends in evolution of multimedia services, Future Internet, and technical solutions which are to be used in telecommunication networks to realize such services for all Internet users.. - [K_W03]		
2. Knows devices, protocols, and telecommunication techniques, which will be used in the Future Internet. - [K_W16]		
<b>Skills:</b>		
1. Can critically analyze current solutions of multimedia networks and propose their improvements. - [K_U10]		
2. Can work in the group of several people; can prepare and present report with results of work. - [K_U11]		
3. Can formulate requirements for a network which should realize basic multimedia services; can choose and evaluate a broadband technique which should be used in a network to ensure required QoS. - [K_U15]		
<b>Social competencies:</b>		
1. Knows the need for popularization of knowledge on broadband networks and Future Internet. - [K_K04]		
2. Can formulate their own opinion on currently used and available technologies and solutions in broadband networks required for introducing the Future Internet. - [K_K07]		

<b>Assessment methods of study outcomes</b>	
Written exam from knowledge presented during lectures. Short questions and reports from laboratory exercises.	
<b>Course description</b>	
<p>Lectures:</p> <ol style="list-style-type: none"> <li>1. Evolution of telecommunication networks towards broadband networks.</li> <li>2. Multimedia services and their provision through telecommunication networks.</li> <li>3. ATM ? basic terminology, standards, network architecture, interfaces.</li> <li>4. ATM ? ATM layer and adaptation layer, QoS mechanisms, parameters of ATM networks.</li> <li>5. Packet networks ? basic terminology, pros and cons, TCP/IP protocols.</li> <li>6. QoS in IP networks: DiffServe, IntServe, and MPLS models.</li> <li>7. Integration in IP networks: VoIP, IP/WDM.</li> <li>8. Integration in IP networks ? cont.</li> <li>9. Broadband access networks and convergent networks.</li> <li>10. Optical networks.</li> <li>11. Internet in optical networks.</li> <li>12. Reliability in optical networks.</li> <li>13. Devices in optical networks.</li> <li>14. Devices in optical networks - cont.</li> <li>15. Telecommunication network management.</li> </ol> <p>Laboratory:</p> <ol style="list-style-type: none"> <li>1. Network tools.</li> <li>2. Network protocols analysis.</li> <li>3. Network configuration ? RIP.</li> <li>4. Network configuration ? RIP2.</li> <li>5. Network configuration ? EIGRP.</li> <li>6. Basic of ATM networks.</li> <li>7. Configuration of QoS parameters in ATM networks.</li> <li>8. Routing in ATM networks</li> <li>9. Configuration of a VoIP server.</li> <li>10. Call handling in VoIP</li> </ol>	
<p><b>Basic bibliography:</b></p> <ol style="list-style-type: none"> <li>1. K. Ahmad, Sourcebook of ATM and IP Internetworking. IEEE Press, Wiley Interscience, 2002</li> <li>2. M. Bromirski, Telefonía VoIP. Multimedialne sieci IP, Wydawnictwo BTC, 2006.</li> <li>3. B. Mukherjee, Optical WDM Networks, Springer 2006.</li> <li>4. S.S. Dixt, IP over WDM, J. Wiley &amp; Sons, 2003.</li> </ol>	
<p><b>Additional bibliography:</b></p> <ol style="list-style-type: none"> <li>1. H. J. Chao, B. Liu: High Performance Switches and Routers, A John Wiley &amp; Sons, 2007.</li> <li>2. T.E. Stern, K. Bala, Multiwavelength Optical Networks. A layered Approach. Addison-Wesley, 1999.</li> <li>3. W. D. Simpson, Video over IP: A Practical Guide to Technology and Applications, Focal Press, Elsevier, 2005.</li> <li>4. K.H. Liu, IP over WDM, J. Wiley &amp; Sons, 2002.</li> <li>5. A.S. Tanenbaum, Sieci komputerowe, Helion, Gliwice, 2004.</li> <li>6. K. Wajda, Sieci szerokopasmowe, Wydawnictwo Fundacji Postępu Telekomunikacji, Kraków, 2000.</li> <li>7. K.H. Liu, IP over WDM, J. Wiley &amp; Sons, 2002.</li> </ol>	
<b>Result of average student's workload</b>	
Activity	Time (working hours)
1. Lectures	30
2. Laboratory	30
3. Preparation for laboratory	30
<b>Student's workload</b>	

<b>Source of workload</b>	<b>hours</b>	<b>ECTS</b>
Total workload	90	4
Contact hours	60	2
Practical activities	60	2