



## Subject card

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|---|--|--|---|-------------------------------------|--|------------|-----|
| Subject name and code                       | Multimedia Systems and Terminals, PG_00048132  |  |   |                                     |  |            |     |
| Field of study                              | Electronics and Telecommunications   |  |   |                                     |  |            |     |
| Date of commencement of studies             | October 2021   |  | Academic year of realisation of subject |                                     | 2023/2024  |            |     |
| Education level                             | first-cycle studies  |  | Subject group                           |                                     | Optional subject group<br>Subject group related to scientific research in the field of study |            |     |
| Mode of study                               | Full-time studies  |  | Mode of delivery                        |                                     | at the university  |            |     |
| Year of study                               | 3  |  | Language of instruction                 |                                     | Polish   |            |     |
| Semester of study                           | 6  |  | ECTS credits                            |                                     | 3.0  |            |     |
| Learning profile                            | general academic profile   |  | Assessment form                         |                                     | exam   |            |     |
| Conducting unit                             | Department of Multimedia Systems -> Faculty of Electronics, Telecommunications and Informatics   |  |   |                                     |  |            |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor   |  | prof. dr hab. inż. Andrzej Czyżewski    |                                     |  |            |     |
|   | Teachers   |  | prof. dr hab. inż. Andrzej Czyżewski    |                                     |  |            |     |
|   |  |  | dr hab. inż. Grzegorz Szwoch            |                                     |  |            |     |
| Lesson types and methods of instruction     | Lesson type  | Lecture  | Tutorial                                | Laboratory                          | Project  | Seminar    | SUM |
|   | Number of study hours  | 15.0   | 0.0                                     | 15.0                                | 0.0  | 0.0        | 30  |
|   | E-learning hours included: 0.0   |  |   |                                     |  |            |     |
| Learning activity and number of study hours | Learning activity  | Participation in didactic classes included in study plan |   | Participation in consultation hours |  | Self-study | SUM |
|   | Number of study hours  | 30   |   | 3.0                                 |  | 42.0       | 75  |
| Subject objectives                          | Presenting fundamentals of audio and video compression and resulting file formats. Explaining protocols of multimedia transmission. Familiarization with issues related to the creation of APIs using integrated development environments. Teaching practical skills in programming and in configuring multimedia transmission systems, including the creation of voice IP, teleconferencing calls made using stationary and mobile terminals. Explaining fundamentals of data acquisition technology and principles of preservation of rights to the content. |  |   |                                     |  |            |     |

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| Learning outcomes               | Course outcome   | Subject outcome  | Method of verification   |
|                                 | [K6_U31] can identify telecommunications network architectures, differentiates their areas and functional elements, evaluates the quality of service delivery, calculates parameters of functional elements  | The student knows and can apply quality measures relating to multimedia content, both objective and subjective. He knows the definitions of distortions of sound and image. Understands the principles of subjective quality measurements. Is able to determine the impact of transmission quality on the achieved values of the Quality of Service and Quality of Experience parameters.  | [SU2] Assessment of ability to analyse information<br>[SU3] Assessment of ability to use knowledge gained from the subject<br>[SU4] Assessment of ability to use methods and tools |
|                                 | [K6_W04] Knows and understands, to an advanced extent, the principles, methods and techniques of programming and the principles of computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, and organisation of systems using computers or such devices   | The student knows and distinguishes the architecture of computer systems. He can divide software into layers, starting from firmware, through middleware and high-level software related to application programming. The student uses scripting languages and API programming interfaces.  | [SW1] Assessment of factual knowledge  |
|                                 | [K6_W35] Knows the concepts of the technique of signal transmission, operation of telecommunications networks and multimedia services and the rules for providing them   | The student knows the principles of building multimedia applications, data transmission protocols, in particular sound and image, which are used in data exchange processes between terminals and the network environment.   | [SW1] Assessment of factual knowledge  |
|                                 | [K6_W05] Knows and understands, to an advanced extent, methods of supporting processes and functions, specific to the field of study   | The student understands the principles of interaction of stationary and mobile terminals in the context of processes related to the implementation of data exchange functions, building services and applications based on network resources, estimating the availability of computational power and choosing the rules of division of tasks between local hardware resources and fog computing services and cloud applications. | [SW1] Assessment of factual knowledge  |
| Subject contents                | 1. Introduction. History of multimedia communication development. Service synchronising in multimedia systems. Quality of transmitted multimedia content. 2. Multimedia content types and elements. Hypermedia, interactive media. Hypertext features, HTML, XML, XHTML. 3. Script languages: PHP (hypertext preprocessor), JAVA Script. Formats of audio, computer graphics and video transmission. 4. Multimedia programming interfaces API. Review of standards and tools available on various platforms and operational systems. 5. Modular multimedia applications in the ISDN standard 6. Multimedia software implemented to BRI i PRI interfaces 7. Multimedia transmission. Selected platforms and protocols. IPv6 (Internet Protocol Version 6) as a service delivery protocol. VOD (Voice Over Data). Architecture and implementations: ATM (VoATM), IP (VoIP). Standard H.323. SIP. Multimedia Messaging Service (MMS). 8. Quality of multimedia transmission. Quality of Service. Objective and subjective quality of transmission - synchronous, asynchronous and isochronous. Delay, jitter, packet loss, isolated and sequential errors. Methods of quality assessment – objective and subjective measurements. Distortions, parasite artefacts and noise. Sound quality evaluation. Speech intelligibility and clarity. Methods for image and video quality assessment. 9. Recording and broadcasting of multimedia content. Multimedia studio and broadcasting system. Recording media (magnetic, optical, magnetooptical). Broadcasting vs. multicasting. Water-marking and Digital Rights Management. 10. Multimedia servers. Configuration and organisation of multimedia servers. Management of multimedia content – technology and QoS issues. 11. Multimedia terminals. Videophone. Universal headset with integrated services. Multimedia workstation. Set-top-box. 12. Audio & video rendering. Image and video rendering; graphic animation. Surround sound, displays and projectors (panoramic and stereoscopic projection). Man-machine interfaces. Multimedia interfaces. 13. Videoconferencing. Organisation principles, configuring, selection of transmission channels. Videoconference terminals. MUD (Multi User Domain) – interactive multi-user environments. Selected systems: VideoTalks (AT&T). 14. Advanced multimedia services. Video/News on Demand, Nearly Video on Demand, on-line services, distance learning, transaction services, telemedicine. 15. Services in mobile 2G and 3G systems. HF band usage. Delivery services in the interactive broadband networks. Lecture recapitulation and future development prospects. Virtual reality and telepresence systems. |  |  |
| Prerequisites and co-requisites | No requirements  |  |  |
| Assessment methods and criteria | Subject passing criteria   | Passing threshold  | Percentage of the final grade  |
|                                 | Written exam   | 51.0%  | 50.0%  |
|                                 | Practical exercise   | 51.0%  | 50.0%  |

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| Recommended reading  | Basic literature         | Andrzej Czyżewski: Dźwięk cyfrowy. Wybrane zagadnienia teoretyczne, technologia, zastosowania. Exit, 2001, ISBN: 978-83-87674-08-3, Kategorie: Informatyka, Multimedia, Dźwięk cyfrowy, 552 strony, format B5; Alicja Wieczorkowska: Multimedia. Podstawy teoretyczne i zastosowania praktyczne., PJWSTK, 2008, ISBN: 978-83-89244-67-3, Kategorie: Informatyka, Multimedia, 336 stron; Anna Korzyńska, Małgorzata Przytułska: Przetwarzanie obrazów. Ćwiczenia., PJWSTK, 2006, ISBN: 978-83-89244-37-6, Kategorie: Informatyka, Multimedia, Zawiera CD, 110 stron |
|  | Supplementary literature | materiały i artykuły w zbiorach bibliotecznych KSMM  |
|  | eResources addresses     | Adresy na platformie eNauczanie:<br>Systemy i terminale multimedialne 2024 - Moodle ID: 17179<br><a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=17179">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=17179</a>   |
| Example issues/<br>example questions/<br>tasks being completed |                          |  |
| Work placement   | Not applicable           |  |