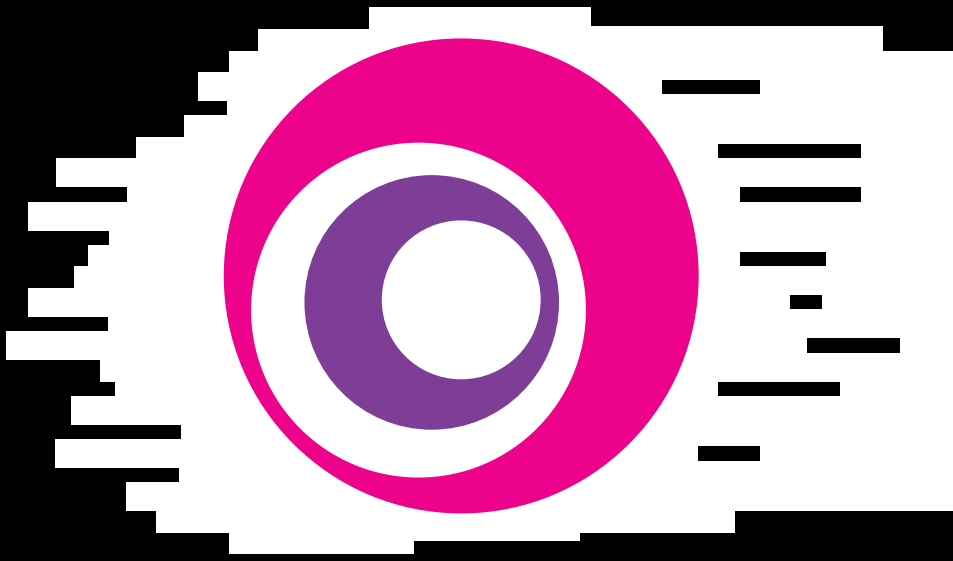
SCHOOL OF ELECTRICAL ENGINEERING
AND COMPUTER SCIENCE
OF APPLIED STUDIES



MtDTV

THE STUDY PROGRAM OF MULTIMEDIA TECHNOLOGIES & DIGITAL TELEVISION

SPECIALISED PROFESSIONAL STUDIES

BELGRADE, MMXII

EDITORIAL

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MtDTV

CONTENT

PREFACE

School of Electrical Engineering and Computer Science Applied Studies in Belgrade (VIŠER), including its study program Multimedia Technologies and Digital Television, became a carrier for the TEMPUS project no. 517022-TEMPUS-1-2011-1-RS-TEMPUS-JPCR, under the title Innovation and Implementation of the Curriculum Vocational Studies in the Field of Digital Television and Multimedia. Objective; stated project is a creation in relation to the dedicated studies program for the education of specialists, and their needs for working in the system within digital and multimedia,as well as an understanding of the digital TV studio with full technical and personnel infrastructure necessary for accomplishing the objective. The school is carrier of the project and coordinates fulfillment of the complete project together with 12 included partners from the South Eastern Europe region and European Union.

The publication is aiming to present new study program of Multimedia Technologies and Digital Television. Main courses of this program are related to fields of digital television and multimedia. represents one of the main parts of TEMPUS project.

European Commission
TEMPUS
bologna process

The main features of School of Electrical Engineering and Computer Science are following: It is a public, higher education institution, financing from the budget of the Republic of Serbia and the income from tuition fees. The main activity is tree year vocational and one year specialized professional education in the fields of electrical engineering, information technology and communications. Graduate students receive bachelor and master professional diplomas. The school has seven programs of basic studies, four programs of specialized professional studies, and one distance-learning program. More than hundred teachers work in VIŠER. Thanks to its human and infrastructure resources VIŠER is the local in leader ICT educational field and tends to become the leader in a broader region.

GENERAL

General development trends and manpower market point out the need for education of specialists in the field of multimedia and digital television. Present levels of technological – civilization development of the society implies inseparability of the daily activities from the contact with some forms of multimedia technologies: production and post production of sound, pictures, TV and radio programmes, musical and video editions, multimedia editions, graphic design, animation, Internet and marketing. Nevertheless, digital forms of sound and pictures, as well as digital television, present technological challenges.

The objective of the study program, the specialized vocational studies in Multimedia technology and digital television, is to establish **vocational electric and IT engineering – specialists in the field of multimedia technologies and digital television**. The program has been arranged on the basis of the heights European standards for education of professionals in the above-mentioned field. The outcome of the learning process is in the training of the students specifically for performing tasks of in the field of production and post-production multimedia technology and digital television. After graduation a wide spectra of vocations are being offered in relation to the digital television, radio, Internet, animation, studio work, and various similar forms of media.

The study program has been adjusted to the development in mentioned fields, basic studies (first level of higher education) program of Audio and video technologies and it is adjusted to the Bologna declaration corresponding to the higher education requests.

In accordance with Higher Education legislative of Republic of Serbia School of Electrical Engineering and Computer Science gained official accreditation in 2012 for study program Multimedia Technologies and Digital Televison.

STUDY PROGRAM

Purpose of the study program

Study program Multimedia technologies and digital television study programs have clearly defined the following purposes:

- education of students for recognizable and defined professions related to the multimedia production and production of digital television
- providing competencies for working on the tasks of production and post production in the field of multimedia and digital television which are socially justified and useful.
- satisfying needs of the public and private sector by improving knowledge and vocations which are necessary in the dynamic development of techniques and technologies in the field of multimedia and digital television with permanent adjustment to changes.

Specialist program of Multimedia technology and digital television, which merges contemporary knowledge from the stated fields with basic studies and it is composed on the bases of multiannual experiences gained in the School of Electrical Engineering and Computer Science's Audio and video technology study program .

STUDY PROGRAM

Objectives of the study program

Objectives of the Multimedia technology and digital television specialists' studies are to:

- translate general, as well as professional knowledge, develop creative capabilities and qualified mastering of specific practical skills in the field of multimedia technology and digital television;
- integrate basic technical, IT and artistic knowledge in accordance to the needs of manufacturing, educational and service vocations from the above mentioned fields;
- qualify for the works in the public and private sector;
- qualify for the team work and work in the multicultural environment.

Structure of the study program

Title of the study programe:
Multimedia technologies and digital television

Types of studies:
Specialist vocational studies lasting one year (two semesters – 60 ECTS).
Professional title:
Vocational electrical and IT engineer – specialist.

Conditions for enrolement:
Basic vocational or academic studies lasting three years (180 ECTS).

Courses:
- **10 optional**
- **Final Work**

Method of performing the studies

Study program is compliant to the Bologna declaration and the Law on Higher Education. Tuition is performed though lectures, practice

STUDY PROGRAM

and preparation of the final essay. All courses last one semester. 105 hours of active tuition is planned for each course. The rest of the program is planned for consultations, team work and individual work of the students. Each course takes 8 ECTS. Final Work takes 12 ECTS. School provides tuition base: schoolrooms and rooms for auditory tuition, dedicated laboratories for the study program (audio studio, TV studio, studio for animation and picture editing, and multimedia laboratories), as well as PC laboratories linked to broadband and the library.

Multimedia technology and digital television study program is integral, integrated and interdisciplinary (technical – technological sciences and arts), compliant to the contemporary scientific achievements, totally adjusted to the Bologna declaration' principles.

Vocational engineer – specialist for multimedia technologies and digital television should be trained to apply and follow top-up technologies applied in the field of multimedia and digital television.

STUDY PROGRAM

Competency of the specialized engineers

Specialist studies prepare students for:

- **development of the fundamental knowledge in specialized fields of multimedia technologies and digital television,** and recognizing all phases of implementation;
- **identification of all problems in multimedia technologies and digital television**;
- effective functioning in a **multidisciplinary environment**;
- **understanding of the legal, ethical and social problems** which multimedia technologies and digital television are faced with;
- **keeping up-to-date with current developments** within contemporary systems of multimedia technologies and digital television;
- **development of learning capabilities** during the whole working period;
- effective multimedia **communication**;
- awareness and development **for professionalism and team work**.

Outcome of the learning process is the training of the students for performing tasks in production and post-production, in the field of multimedia technologies and digital television. Wide spectra of vocations related to the digital television, radio, Internet, animation, studio work, various types of media and similar are being offered after graduation.

INFRASTRUCTURE

Study program Mutlimedia technologies and Digital television possess space and equipment for performing educational process: amphitheaters and classrooms; general dedicated laboratories with contemporary working surrounding, program tools; specialised laboratories.

Specialised laboratories of study program Mutlimedia technologies and Digital television are:

- Multimedia HDTV studio;
- TV studio complex;
- Audio studio complex;
- Studio for animation and sound editing;
- Multimedia laboratory;

Equipment and functions of the above mentioned studios form a unique unit that provides performance in the field of multimedia. In order to provide an educational and laboratory base, the School started establishing a dedicated multimedia HD television studio, which is in completion phase.

Multimedia digital HD television studio will be completed using

INFRASTRUCTURE

existing equipment and new equipment from funds of TEMPUS project. Equipment will be in digital HD format 16:9, resolution 1920x1080 and DV format 16:9/4:3, resolution 720x576. Multimedia HD television studio will be multifunctional and flexible.

After finalization of the above mentioned television studio, the study program will have the most contemporary multimedia digital television studio where lectures for all courses in the field of digital video and audio techniques, since it is of special importance for courses related to the television techniques, television production and post production.

TV studio complex (Recording studio, TV control room, analogue and digital video editing room)

Studio for television recording is equipped with professional TV cameras and lighting. Studio is connected to TV control room. TV studio provides recording of informative type of programs, and small talk show, from here TV signal can be forward to TV control room. TV control room enables full signal control, picture adjustments, synthesis of audio and video signals with computer graphics for complete TV picture. TV studio has HD camcorders, BETA SP and SVHS

cameras, digital video mixer and monitoring system. Video editing room provides linear and non-linear editing of recorded footage. Video servers (with FinalCut Server and ToolsOnAir software) and videocassette recorders provide different possibilities for recording of video footage.

Audio studio complex (5.1 control room – digital audio editing, sound recording studio, analogue control room – analogue audio editing).

5.1 control room is exclusive facility, which by its appearance, equipment and functionality represents step forward in similar facilities. It has 5.1 monitoring system Dynaudio Air 15, Digidesign ProTools HD3 system with 3 interfaces in Apple Mac Pro computer, AVID HD I/O 16 channel audio interface and Digidesign C24 console. Recording studio is well equipped with the microphones set of highest rank. Analogue control room is designed for training students in "classical" analogue audio systems. All these rooms are interconnected with installations into one functional unit, which makes great flexibility and functionality in everyday use.

INFRASTRUCTURE

Studio for animation and picture editing

Studio for classical animation has a number of lighting tables. Studio for computer animation is equipped with new computers and appropriate corresponding software for 2D and 3D animation.

Multimedia laboratory

Multimedia laboratory of studies program Multimedia Technologies and Digital Television and Audio and video technologies was designed with 20 workstations for students, and 1 workstation for lecturer. Every workstation consists of Apple iMac computer, headset, MIDI keyboard, M-Box interface. Laboratory has HD projection and it is acoustically treated, adequately lightened and secured with CCTV.

INFRASTRUCTURE

CURRICULA

Study program Multimedia technologies and digital television are based on the contemporary knowledge and achievements of theory and practice of the leading domestic and European university centers. Vocational professional studies are performed during one year of study. Study program has got 10 optional courses, out of which 6 should be selected.

Curricula contain 10 optional courses scheduled per following method:

Semester	Courses	
1st	5 courses	all optional
	3 to be selected	
2nd	5 courses	all optional
	3 to be selected	
	Final Work is mandatory	

Following groups of courses are represented in the study programe structure:

- Multimedia
- IT

Multimedia courses:

- HD and 3D TV
- Computer Animation 2
- Media Sound Recording and Production
- Applied Acoustics
- TV production
- Multimedia Postproduction

IT courses:

- Internet Telephony and IP TV
- Marketing Research
- Satellite communicational systems
- Wireless communicational systems

Educational process is being implemented through lectures, practice

and individual or team work on adequate projects. Exams are taken through colloquiums, seminar essays. Educational process comprehends design of individual or team works and projects under supervision of skilled tutors and mentors, respecting especially individual capabilities and interest of the students.

No.	Course	Y	S	Lt	P	Lb	ECTS
1.	HD and 3D TV	1	1	4	3	0	8
2.	Computer Animation 2	1	1	4	3	0	8
3.	IntertentIn Telephony and IP TV	1	1	4	3	0	8
4.	Media Sound Recording and Production	1	1	4	3	0	8
5.	Marketing Research	1	1	4	3	0	8
6.	Applied Acoustics	1	2	4	3	0	8
7.	TV production	1	2	4	3	0	8
8.	Multimedia postproduction	1	2	4	3	0	8
9.	Satellite Communication Systems	1	2	4	3	0	8
10.	Wireless Communications Systems	1	2	4	3	0	8
11.	Final Work	1	2				12

Y-Year, S - Semester, Lt - Lectures, P - Practice,
Lb - Laboratory work, ECTS - European Credit Transfer System

SYLLABUS

Study Program: MTDTV

Type and Level of Studies: Second level of higher education, Specialised professional studies

Course Title: HD and 3D TV

Instructor(s): Mile Petrovic, PhD

Course Status: Elective

Number of ECTS: 8

Prerequisites: none

Course Objectives: Introduction to the principles, technologies and equipment used in HD and 3D television systems.

Course Outcomes: Training for the jobs of engineer-specialist in the field of digital HD and 3D TV.

Course Content:

Theoretical instruction:

1. The introductory lecture. HD and 3D television systems in Europe and worldwide.
2. HD television system structure.
3. Generating HD and SDI video signals.
4. HD television studio. HD cameras and servers.
5. HD television standards. HDTV and multichannel audio (5.1).
6. HD interfaces. Parallel and serial digital HD interfaces (HDMI, SDI, DVI, ASI).
7. HD image compression using H.264/MPEG4-AVC standards.
8. HD signals multiplexing. Channel coding. Digital modulation (OFDM and COFDM).
9. Satellite, cable and terrestrial broadcasting systems for HD signals.
10. HD video signal transmission over the Internet. IPTV applications.
11. 3D television systems. Auto-stereoscopy. Tridimensional sense of space.
12. HD and 3D video signal transmission using DVB-T2 standard.
13. Standards for generating and storage of HD and 3D video material.
14. HD and 3D television signal receivers (LCD, plasma, LED, 3D displays and glasses).

Practical instruction (Problem solving sessions/Lab work/Practical training):

Practical exercises accompanying the lectures with the implementation of specific tasks in the multimedia HD television studio.

Textbooks and References:

1. M. Petrovic, " Lectures in the form of PowerPoint presentations".
2. M. S. De Alencar "Digital Television systems", Cambridge University press, 2009.
3. H. M. Ozaktas, L. Onural: „Three-Dimensional Television",Springer-Verlag, Berlin-Heidelberg, 2009.
4. T. Vaughan, „Principles of 3D video and Blu-ray standard", Cyber Link, 2009.

Number of active lessons: 105				**Other classes:**
Lectures: 60	**Exercises:** 45	**Other:**	**Research study:**	

Instruction methods: Teaching is organized through lectures and laboratory exercises.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities	5	**Written exam**	40
Practical work	35	**Oral exam**	
Colloquium(s)	10		
Seminar(s)	10		

SYLLABUS

Study Program: MTDTV

Type and Level of Studies: Second level of higher education, Specialised professional studies

Course Title: Computer Animation 2

Instructor(s): Snežana Trstenjak

Course Status: Elective

Number of ECTS: 8

Prerequisites: none

Course Objectives: Students master advanced techniques od 3D modeling and animation.

Course Outcomes: Students will be trained to independently or within a team create complex computer animation projects (high-level). Practical instructions are realized using Maya, Adobe Premiere and Digital Fusion (Adobe After Effects).

Course Content:

Theoretical instruction:

1. Visual simulation of natural phenomens. Introductory class – simulation algorythms.
2. Procedural modeling and animation. Advanced techniques. Deformers.
3. Subdivision srufaces. Multiresolution surfaces. Patch modeling. Tessalation.
4. Shaders. Procedural maps. Multilayered maps. Cartoon look. Fur simulation. Photorealistic rendering.
5. Animation using simulation: mechanics and dynamics, soft and rigid bodies, force fields, collision, interaction. Composite rendering (in layers). Particle simulation, fields, controls, instancing.
6. Procedural animation. Cloth simulation. Hair simulation.
7. Advanced rendering (mental ray).
8. Fluid simulation, animation and rendering.
9. Using fluid simulation for cloud rendering, fire and smoke...
10. Using layered render in postproduction. Alpha channel, depth channel.

Practical instruction (Problem solving sessions/Lab work/Practical training):
Are conducted in a simulated production environment to enable students to learn or increase their software skills and become ready to undertake production work in a compressed timeframe.

Textbooks and References:

1. Natasa Teofilovic ,Umetnost pokreta u prostoru praznine, Arhitektonski fakultet Univeryiteta u Beogradu 2011
2. Hooks, Ed, Acting for Animators: A Complete Guide to Performace Animation, US, Portsmouth, Heinemann,2003
3. Jones, Angie and Jamie Oliff, Thinking Animation: Bridging the Gap Between 2D and CG, US, Boston,
4. Thomson Course Technology PTR, 200
5. O'Neil, Rob, Digital Character Development: Theory and Practice, USA, Burlington, Elsevier: Morgan Kaufmann Publishers, 2008

Number of active lessons: 105				**Other classes:**
Lectures: 60	**Exercises:** 45	**Other:**	**Research study:**	

Instruction methods: Teaching is organized through lectures and laboratory exercises.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities	10	**Written exam**	40
Practical work	10	**Oral exam**	
Colloquium(s)	40		
Seminar(s)			

SYLLABUS

Study Program: MTDTV, NRT

Type and Level of Studies: Second level of higher education, Specialised professional studies

Course Title: IP telephony and IP TV

Instructor(s): Žarko M. Markov

Course Status: Elective

Number of ECTS: 8

Prerequisites: Knowledge of computer networks and protocols

Course Objectives: Obtaining of knowledge about packet telephone technologies i.e. about the transmission of telephone speech signal, signalling, numbering (addressing) and user services in packet networks. Basic skill about public and private (corporative) packet networks.

Course Outcomes: Creating the technical requirements and design of telephone network in the private packet network. Choosing of standards for compression and transmission of audio and video signal by IP network.

Course Content:

Theoretical instruction:

1. Basics of telephone technics. Classic telephone technics. Telephone network and its parts. Switching. Signalling. Numbering plan. Traffic. Availability.
2. Telephone signal. Human speech and its properties. Non-compressed, pseudo compressed and compressed telephone signal. Bitrates of telephone signals.
3. Compressor types. Wave and parametric compressors. Compressors of packet overhead.
4. Basics of packet technics. Digital processing of speech signal. Packetization and packetization time.
5. Packet technics. X.25. Frame Relay. ATM. IP.
6. Internet as the agregation of all packet technics.
7. Internet protocols important for VoIP, 1: IP. TCP. UDP. ARP. DNS. RTP. SCTP.
8. VoIP signalling in public networks. H.323. SIP.
9. VoIP signalling in corporative networks.
10. Interworking classic and packet telephone network.
11. Media gateways, signalling gateways, address gateways.
12. Quality of packetized telephone signal, E-model.
13. Implementation of standards for transmission and compression of audio and video signals by IP and wireless IP networks: H.26X, MPEG-1, MPEG-2 and MPEG-4.
14. Video-telephone and conference transmission over Internet.

Practical instruction (Problem solving sessions/Lab work/Practical training):

Simple calculation of needed: bitrates, traffic requirements, availability. Calculation of speech signal delay and speech signal quality. Basic skills about signalling message structure and connection setup. Possible solutions for corporative VoIP networks. Design of one corporative telephone network. Design of multimedia interactive projects in TV studio. Exercises with different video sets and algorithms for compression and transmission sound and picture over Internet.

Textbooks and References:

1. Ž. Markov, Modern telephone technics, 2005, in Serbian.
2. Ž. Markov, Exercises on IP telephony, 2005, in Serbian.
3. V. Vasiljević, Computer networks, 2008, in Serbian.
4. M. Petrović, Basics of TV technics, Exercises, 2008 , in Serbian.

Number of active lessons: 105				**Other classes:**
Lectures: 4	**Exercises:** 3	**Other:**	**Research study:**	

Instruction methods: Lectures, Practical work, Consultations.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities		Written exam	80
Practical work	20	Oral exam	
Colloquium(s)			
Seminar(s)			

SYLLABUS

Study Program: MTDTV

Type and Level of Studies: Second level of higher education, Specialised professional studies

Course Title: Media Sound Recording and Production

Instructor(s): Sonja V. Krstić, PhD

Course Status: Elective

Number of ECTS: 8

Prerequisites: none

Course Objectives: Acquiring knowledge on Media Sound Recording and Production.

Course Outcomes: Enabling for Independent Media Sound Recording and Production.

Course Content:

Theoretical instruction:

1. Sound Recording and Production. Introduction.
2. Clasical Music Sound Recording and Production (Musical Instruments)
3. Clasical Music Sound Recording and Production (Ansambles)
4. Jazz and Blues Music Sound Recording and Production
5. Rock and Pop Music Sound Recording and Production
6. Folk Music Sound Recording and Production
7. Folm Sound Recording and Production
8. TV Sound Recording and Production (TV Broadcast, TV Advertisment, TV Spot)
9. Radio Sound Recording and Production (Radio Drama, Jingle, Advertisment)
10. Stage Performance Sound Recording and Production (Theatre)
11. Stage Performance Sound Recording and Production (Musical)
12. Stage Performance Sound Recording and Production (Opera)
13. Stage Performance Sound Recording and Production (Ballet)
14. Conclusion.

Practical instruction (Problem solving sessions/Lab work/Practical training):
Creating Media Sound Recording and Production Project.
Laboratory work follows Lectures.

Textbooks and References:

1. Internal Materials and Publications of Faculty of Drama, Belgrade
2. Owsinski B.: The Recording Engineer`s handbook, Course Technology, 2009.
3. Moretti D.: Producing and Mixing Contemporary Jazz, Berklee Press, 2003.
4. Katz B.: Mastering Audio – the Art and the Science, Focal Press, 2002.
5. Alten S.: Audio in Media, Wadsworth, 2005.
6. Bartlett B, Bartlett J.: Practical Recording Techniques, Focal Press, 2008.
7. Bregitzer L.: Mastering Music – Secrets of Recording, Focal Press 2007.

Number of active lessons: 105				**Other classes:**
Lectures: 60	**Exercises:** 45	**Other:**	**Research study:**	

Instruction methods: Lectures, Practical work, Consultations, Colloquiums.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities	10	Written exam	30
Practical work	30	Oral exam	
Colloquium(s)	30		
Seminar(s)			

SYLLABUS

Study Program: MTDTV

Type and Level of Studies: Second level of higher education, Specialised professional studies

Course Title: Marketing Research

Instructor(s): Živorda M. Vasić, PhD

Course Status: Elective

Number of ECTS: 8

Prerequisites: none

Course Objectives: The goal of this course is to acquire basic knowledge about the management of marketing function, and media performance.

Course Outcomes: After completion of the course students will be able to plan, monitor and control the process of marketing and media representation company, products, services or other promotional activities.

Course Content:

Theoretical instruction:

1. Defining the role and tasks of the marketing function in business systems
2. Analysis of marketing opportunities. Manage marketing information and measurement of demand.
3. Developing a marketing strategy.
4. Shaping the Market. Management of integrated marketing communications, advertising and public relations, direct and online marketing.
5. Selection and management of marketing channels. What are and what they serve and marketing intermediaries.
6. Decisions about managing the channel. Selection, motivation, participants from the channel. Modifying channel arrangements.
7. The dynamics of the channel. Vertical, horizontal and multi-channel marketing systems. Cooperation, conflict and competition in the channel, the types and causes of conflict. Conflict resolution, legal and ethical issues.
8. Management of the program announcement. Manage sales promotions and public relations.
9. Sales Promotion. The purpose of sales promotion, major decisions about improving sales.
10. Public Relations. Major decisions in the improvement of public relations.
11. The main channels of direct marketing. Marketing direct mail, catalog marketing, telemarketing, television and other major media marketing to direct response, kiosk marketing and online channels.
12. Marketing 21, century - online marketing. Benefits and online marketing channels.
13. Implementation of integrated marketing.
14. Public and ethical issues in the implementation of direct marketing.
15. Manage your marketing efforts. Organization, implementation, evaluation and control

Practical instruction (Problem solving sessions/Lab work/Practical training):

At the exercises are discussed in specific practices of the matter covered by the program of lectures.

Textbooks and References:

1. Philip Kotler: Marketing Management, Data Status, Belgrade, 2006.
2. Vinka Filipovic, Milica Kostic: Marketing Management, FON, Belgrade, 2009.

Number of active lessons: 105				**Other classes:**
Lectures: 60	**Exercises:** 45	**Other:**	**Research study:**	

Instruction methods: Lectures, Practical work, Consultations, Colloquiums.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities	5	Written exam	
Practical work		Oral exam	30
Colloquium(s)	50		
Seminar(s)	15		

SYLLABUS

Study Program: MTDTV

Type and Level of Studies: Second level of higher education, Specialised professional studies

Course Title: Applied Acoustics

Instructor(s): Sonja V. Krstić, PhD

Course Status: Elective

Number of ECTS: 8

Prerequisites: Basics of Acoustics and Musical Acoustics, Basics of Audio Technics

Course Objectives: Introduce students to the characteristic fields of acoustics, which are not studied in the basic studies and methods of their use in various types of human activities.

Course Outcomes: After passing the exam, the students will be able to understand and apply methods and principles from different parts of acoustics to resolve certain practical problems.

Course Content:

Theoretical instruction:

1. Comparative analysis of the musical and technical terminology
2. Frequency range, tonal and directional characteristics of musical instruments 1
3. Frequency range, tonal and directional characteristics of musical instruments 2
4. Frequency range, tonal and directional characteristics of musical instruments 3
5. Hearing and Psychoacoustic principles
6. Examples of practical psychoacoustics in sound practice
7. DML loadspeakers and sound field synthesis
8. Monitoring of noise and zoning
9. Sound barriers and their application
10. Isolation of vibration
11. Propagation of sound in water
12. Underwater electroacoustic transducers
13. Basic principles of active noise and vibration control
14. Examples of applications of active noise and vibration control

Practical instruction (Problem solving sessions/Lab work/Practical training):
Practical training is aligned with theoretical instructions.

Textbooks and References:

1. M. Simonović, D. Kalić, P. Pravica, Buka, Niš 1982
2. L. L. Beranek, Noise and vibration control, McGraw-Hill, 1971
3. P.H. Parkin, H.R.Hamfriz, Akustika i buka zgrade, Građevinska knjiga, Zagreb, 1978
4. D.M. Howard, J.A.S. Angus, Acoustics and Psychoacoustics, Focal Press, 2009.
5. F.E. Toole, Sound Reproduction, Focal Press, 2008..
6. C. H. Hansen, Understending Active Noise Reduction, Taylor and Francis, 2006.
7. Meyer J.: Acoustics and The Performance of Music, Verlag Das Musikinstrument, Frankfurt, 1978..
8. S. Krstić: Akustika muzičkih instrumenata, VIŠER, Beograd, 2009.

Number of active lessons: 105				**Other classes:**
Lectures: 60	**Exercises:** 45	**Other:**	**Research study:**	

Instruction methods: Lectures, Practical work, Consultations, Colloquiums.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities	20	Written exam	40
Practical work	30	Oral exam	
Colloquium(s)	10		
Seminar(s)			

SYLLABUS

Study Program: MTDTV

Type and Level of Studies: Second level of higher education, Specialised professional studies

Course Title: TV Production

Instructor(s): Jordan R. Isailović, PhD

Course Status: Elective

Number of ECTS: 8

Prerequisites: Knowledge of basic television picture concepts.

Course Objectives: Course objective: Introduction to the principles, technology and equipment used in television production and post-production.

Course Outcomes: Training for the jobs of engineer-specialist in television production and post-production and for working with equipment used in television production and post-production.

Course Content:

Theoretical instruction:

1. The introductory lecture. The structure and organization of work.
2. Television production and post-production systems in SD and HD format
3. Virtual studio. Sensors for camera monitoring in the virtual studio. Program realization in the virtual studio.
4. Interactivity. Match moving programs.
5. Digital image compositing.
6. Information technologies in television production and post-production.
7. Video servers. Memory cards.
8. Automatic television program broadcasting.
9. The process of ingest in television production and post-production and asset management.
10. Data exchange between the operational units in television systems.
11. Software tools for image and sound editing.
12. Using video effects in television production.
13. Video phone and video conferencing picture and sound transmission.
14. Internet coupling equipment. Transmission of video signals over the Internet.
15. Television systems and Internet technologies integration.

Practical instruction (Problem solving sessions/Lab work/Practical training):

Practical exercises accompanying the lectures with the realization of specific tasks in digital HD television studio. During the semester, students are divided into groups in order to make specific mini project in HD television studio.

Textbooks and References:

1. M. Petrovic, „ Lectures in the form of PowerPoint presentations".
2. J. Arnold, M. Frater, and M. Pickering, „Digital Television", Technology and Standards, 2007.
3. G. Lekakos, K.Chorianopoulos and G. Doukidis, „ Interactive digital television", technologies and applications, 2008.
4. M. Moshkovitz, „The Virtual Studio Technology and Techniques", Focal Press, 2010.
5. R. Musburger , "Single-Camera Video Production", Focal Press, 2010.

Number of active lessons: 105				**Other classes:**
Lectures: 60	**Exercises:** 45	**Other:**	**Research study:**	

Instruction methods: Lectures, Practical work, Consultations, Colloquiums.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities	5	Written exam	40
Practical work	35	Oral exam	
Colloquium(s)	10		
Seminar(s)	10		

SYLLABUS

Study Program: MTDTV

Type and Level of Studies: Second level of higher education, Specialised professional studies

Course Title: Multimedia Postproduction

Instructor(s): Jordan R. Isailović, PhD

Course Status: Elective

Number of ECTS: 8

Prerequisites: none

Course Objectives: The goal of the course is to introduce the complex concepts of creating multimedia projects.

Course Outcomes: Students are trained to produce multimedia projects that comply to esthetic and practical criteria professionally set in the domain of computer generated imaging.

Course Content:

Theoretical instruction:

1. Key concepts of interactive multimedia: hypertext, hypermedia, interactivity, virtual reality
2. The language of new media and its contextualization
3. Interface design
4. Narrative in multimedia projects, non-linear narrative
5. Dramaturgy in multimedia
6. Computer games
7. Multimedia in public spaces
8. Image compositing
9. Motion Graphics
10. Virtual reality
11. Digital portfolio (demo reel)

Practical instruction (Problem solving sessions/Lab work/Practical training):

The course incorporates design principles and strategies in the creation of multimedia, as well as practical software tutorials. Students will work on their projects with the mentor. The focus is on planning, designing and production of works that combine images, sound, video, 2D and 3D animation. Students will learn advanced methods, principles and techniques of producing user oriented static and dynamic interface.

Textbooks and References:

1. Jon Krasner, Motion Graphic Design: Applied History and Aesthetics, Elsevier, Oxford, 2008.
2. Gerard Kim, Designing Virtual Reality Systems: The Structured Approach, Springer, 2005.
3. Michael Rush, New Media in Art, Thames & Hudson, 2005.
4. Stephen P. Anderson, Seductive interactive design, New Riders Press, 2011.
5. Yael Braha, Bill Byrne, Creative Motion Graphic Titling for Film, Video, and the Web: Dynamic Motion Graphic Title Design, Focal press, 2010.

Number of active lessons: 105				**Other classes:**
Lectures: 60	**Exercises:** 45	**Other:**	**Research study:**	

Instruction methods: Lectures, Practical work, Consultations, Colloquiums.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities		Written exam	20
Practical work	40	Oral exam	20
Colloquium(s)	20		
Seminar(s)			

SYLLABUS

Study Program: MTDTV, NRT, ELITE

Type and Level of Studies: Second level of higher education, Specialised professional studies

Course Title: Satellite Communication Systems

Instructor(s): Hana Z. Stefanović

Course Status: Elective

Number of ECTS: 8

Prerequisites: basic knowledge in the field of communication systems and digital signal processing

Course Objectives: providing basic knowledge about principles of satelite based communications in general, as well as signal processing and standards covering communication systems using satellite links in particular with application to TV broadcasting, navigation, positioning etc.

Course Outcomes: developing skills in setting up and maintaining telecommunication satellite ground equipment. to provide assistance in preparing satellite-based communication projects.

Course Content:

Theoretical instruction:

1. Elements of a satellite communication system (general structure, examples).
2. Frequencies for microwave satellite communications and International regulations.
3. Orbiting and Geostationary satellites. Satellite constellations and services (multimedia conferencing, video telephony, distance learning). Direct Broadcast Satellite (DBS) systems.
4. Satellite antenna beamwidth and gain. Satellite footprint and service area. The multi-beam satellite operation.
5. Path loss and atmospheric absorption in satellite communication system. Receiver thermal noise.
6. Satellite link design. Determining a satellite link budget.
7. Modulation and multiplexing techniques in satellite communications. Inter-satellite links.
8. Space, time and frequency division multiple access in satellite communication systems.
9. VSAT systems and networks.
10. Satellite TV system. Direct Broadcast Satellite (DBS) providers.Satellite receiver (receiver block diagram, satellite decoders, LNB's and feedhorns, accessories and installation equipment). DVB-S2 standard.
11. Global Navigation Satellite System (GNSS). GPS, GLONASS, and Galileo constellations.
12. GPS receiver. Computing position in three dimensions and the time offset in the receiver clock.
13. GPS data (GPS navigation message and protocols. NMEA sentences, SiRF communication protocol)
14. Future development, applications and trends in satellite communications.

Practical instruction (Problem solving sessions/Lab work/Practical training):

MATLAB simulations and hardware experiments. Link parameter calculations, including real propagation models. Calculation of parameters needed to install satellite receiver dishes. Analyzing data received from a NMEA based GPS receiver on PC. Demonstration of using satellite receiver terminals (in TV studio in VISER).

Textbooks and References:

1. T. Pratt, C. Bostian, J. Allnut, Satellite Communications, 2nd Ed., John Wiley&Sons Inc., 2003.
2. W. Tranter, K. Shanmugan, T. Rappaport, K. Kosbar, Communication Systems Simulation with Wireless Applications, Prentice Hall, 2004.
3. D. Roddy, Satellite Communications, 4th Ed., McGraw-Hill, 2006.
4. B. Elbert, Introduction to Satellite Communications, 3rd Ed., Artec House, 2008.
5. E. Kaplan, C. Hegarty, Understanding GPS Principles and Applications, Artech House, 2006.

Number of active lessons: 105				**Other classes:**
Lectures: 60	**Exercises:** 45	**Other:**	**Research study:**	

Instruction methods: Lectures, Practical work, Consultations, Colloquiums.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities	10	Written exam	30
Practical work		Oral exam	
Colloquium(s)	30		
Seminar(s)	30		

SYLLABUS

Study Program: MTDTV

Type and Level of Studies: Second level of higher education, Specialised professional studies

Course Title: Wireless Communications Systems

Instructor(s): Verica M. Vasiljević, PhD

Course Status: Elective

Number of ECTS: 8

Prerequisites: Knowledge of computer networks technologies and protocols.

Course Objectives: Acquiring knowledge of wireless network architectures and protocols.

Course Outcomes: Enabling students to design configure and use wireless networks.

Course Content:

Theoretical instruction:

1. Introductory lesson. Program subjects, organization and content of the course. The relation to other courses. History and overview.
2. Basic spread spectrum modulation techniques (DSS, FHSS), orthogonal frequency-division multiplexing modulation (OFDM), multiple-input multiple-output (MIMO). Multiple access protocols (CSMA/CA)
3. Influence of different wireless technologies (Bluetooth, WiFi, WiMAX, and ZigBee).
4. Regulatory bodies, standards and cooperation organizations. (FCC, ETSI, IEEE802.11, WiFi Alliance, WiMAX Forum).
5. Wireless networking principles (radio waves propagation, RF amplification/attenuation, interference, fading, reflection, refraction, types of antennae)
6. Analysis of wireless networking technologies (SSID, WLAN_ID, interfaces, VLAN, 802.1q).
7. Wireless networking topologies (IBSS, BSS, ESS, point-to-point, point-to-multipoint, interconnected, bridging). Frame types and usage (association, control and management, data).
8. Security considerations in wireless networks.
9. Port access control protocol – 802.1x, EAP protocols, AAA protocols – RADIUS.
10. Public key infrastructure basics. WPA/WPA2 authentication and protection of wireless network traffic. EAP protocols for wireless networks.
11. Analysis and application of wireless broadband standards (IEEE 802.16 series).
12. WiMAX access networks: significance, architecture, characteristics, application.
13. Mobile multimedia communication networks.
14. Digital mobile networks evolution towards mobile broadband networks GSM, GPRS, EDGE
15. WCDMA, HSPA, HSPA, LTE.

Practical instruction (Problem solving sessions/Lab work/Practical training):

Wireless access point configuration, wireless client configuration. Choosing wireless channel, antennae type and wireless access point location. Creating CA certificate, issuing certificates for servers and clients. Configuring free Radius server. Configuring EAP-TLS and EAP-PEAP authentication

Textbooks and References:

1. V. Vasiljevic, Racunarske mreze, Visoka skola elektrotehnike i racunarstva, Beograd, 2008.
2. E. Dahlman, S. Prakvall, J. Skold, 4G: LTE/LTE-Advanced for Mobile Broadband, Elsevier, Elseiver, Burlington, MA, 2011.
3. M. Sauter, From GSM to LTE: An Introduction to Mobile Networks and Mobile Broadban, John Wiley&Sons, West Sussex, 2011.

Number of active lessons: 105				**Other classes:**
Lectures: 60	**Exercises:** 45	**Other:**	**Research study:**	

Instruction methods: Lectures, Practical work, Consultations, Colloquiums.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities	10	Written exam	30
Practical work	20	Oral exam	
Colloquium(s)	20		
Seminar(s)	20		

SYLLABUS

Study Program: MTDTV, SIKS, ELITE, NET

Type and Level of Studies: Second level of higher education, Specialised professional studies

Course Title: Final Work

Instructor(s):

Course Status: Compulsory

Number of ECTS: 12

Prerequisites: Knowledge of computer operating system, file management.

Course Objectives: Students training for using standard application software and including in the digital society.

Course Outcomes: Students will understand the principles of the use of application software and know how to use programs for word processing, presentation and cross calculations, using a basic Internet service, and to combine the implementation of various programs.

Course Content:

The aim of the final project solution and / or analysis and presentation of practical problems, which proves that the candidate has acquired the intended level of professional competence and maturity in a particular field of technology.

The process of drafting and defense of the final work is determined by rules on the procedure for the preparation and defense of the final work. The student has the right to begin production of the final work when he stays up to three does not pass the certification exam. The student selects one of the subjects who passed the exam, and the subject teacher to mentor. Mentor defines a topic and a final paper assignments, after which the candidate applies subject.

The student needs to complete the final paper for at least three weeks and a maximum of six months from the date of the application threads.

During the final paper the student has the required consultation with the supervisor.

Final paper should have a volume of 20 to 40 A4 pages, excluding annexes. The essential accessory is the final paper and presentation of final work on a recommended maximum of 20 films (slides). Technical processing of content and quality of the final paper should be in accordance with instructions for making the final technical work that is an integral part of the Regulations on the procedure for the preparation and defense of the final work.

Mentor with his signature on each copy of the final paper confirms the satisfactory quality of content and technical processing.

When you finish making the work, the student submits more scientific and educational application for approval of the final thesis defense, and the application submitted four copies of the final paper. Each copy of the final paper should be attached that contains the entire text of the final paper in electronic form.

Teaching - Academic Council determines the Commission for a public oral defense of the final paper, which consists of, president, mentor and at least one member from among the teachers VIŠER. The Commission may have additional members from among the teachers of higher education institutions or other prominent experts in the field dealt with the final paper.

Final thesis is defended orally before the Commission; student prepares a short presentation (15 minutes), which presents the basic assumptions of the problem and characteristics of the solution, then the panel can ask questions and evaluate the work as a whole.

Textbooks and References:

Number of active lessons: 105				**Other classes:**
Lectures:	**Exercises:**	**Other:**	**Research study:**	

Instruction methods: Lectures, problem solving sessions, laboratory exercises, assignments, consultations, colloquiums, knowledge tests, final exam.

Grading (maximum number of points: 100)

Preliminary activities	**Points**	**Final Exam**	**Points**
Lectures activities		Written exam	
Practical work		Oral exam	
Colloquium(s)			
Seminar(s)			

СТУДЕНТСКА
КЪЖИЦА
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ВИСОКА ШКОЛА ЕЛЕКТРОТЕХНИКЕ И РАЧУНАРСТВА

SCHOOL OF ELECTRICAL ENGINEERING
AND COMPUTER SCIENCE
OF APPLIED STUDIES

Digital Television and
Multimedia

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