



NEW STUDY PROGRAMME

- *MULTIMEDIA TECHNOLOGIES* -

Specialist professional studies, second level of higher education



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Date:	22.09.2016
Work package:	
Dissemination level:	

Project acronym:	DBBT
Project full title:	DIGITAL BROADCASTING AND BROADBAND TECHNOLOGIES
Project No:	561688-EPP-1-2015-1-XK-EPPKA2-CBHE-JP
Grant Agreement number:	2015-3763
Coordinator institution:	University in Kosovska Mitrovica
Coordinator:	Prof. Dr. Sinisa Ilic, UNIVERSITY OF MITROVICA Faculty of Technical Sciences
Beneficiaries:	Higher Technical Professional School In Zvečan Univerzitet U Banjoj Luci Univerzitet U Bihaću School Of Electrical Engineering And Computer Science Univerzitet Singidunum VSB-Technical University Of Ostrava Univerza V Ljubljani Universidad Politécnica De Madrid Tartu Ulikool TV Mreza Jp Emisiona Tehnika I Veze Alternativna Televizija



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1. THE SUGGESTION OF A NEW STUDY PROGRAMME AT THE SPECIALIST PROFESSIONAL STUDIES BASED ON THE NEEDS AND THE AFFINITIES OF THE STUDENTS

Opening of the new study programme at the specialist professional studies in the modern area of Multimedia technologies is planned at the Higher Technical Professional School in Zvečan. The purpose of this study programme is to raise the general level of information technology capacity of the society as a whole by producing information technology workforce with the applicable knowledge in the area of multimedia and digital television.

The suggestion of a new study programme at the specialist professional studies stems from the labour market demand for educated professional workforce that could potentially be employed in broadcasting houses with digital HD programme emission and houses which deal with multimedia production in all its forms, as well as from the needs and the affinities of the students which we have established using a questionnaire which was conducted among the students.

The questionnaire consists out of two groups of questions. The first group of questions refers to student related questions, while the second group of questions emphasizes the content which would be studied at this particular study programme as well as aspects of practical work and experience acquisition.

61 students of the Higher Technical Professional School in Zvečan participated in the sample. Results are presented in table 1

Table 1. General student related data

The study programme module	The year of studies			The total number of students per study programme
	I	II	III	
Management of Electrical Engineering	1	0	0	1
Energetics	1	3	2	6
Production Management	4	3	2	9
Information Technology Engineering	4	1	5	10
Other study programmes	15	13	7	35
The total number of students per the year of study	25	20	16	61

As we can see from the table 1, 1 student from the Management of Electrical Engineering study programme participated in the sample, 6 students from the Energetics study programme participated, 9 students from the Production Management study programme participated, 10 students from the Information Technology Engineering study programme participated and the total number of 35 students from all other study programmes participated.

Within the second group of questions students were asked to evaluate the extent to which they were interested for a specific area on a scale from 1 to 5 (1- not at all interested, 2-

not interested or disinterested, 3- partially interested, 4- interested, 5- completely interested). The results of the questionnaire conducted are presented in the following text.

The results of the answers related to the first question: **Would you like to learn how to work with the audio and video equipment in the multimedia HDTV studio** presented in diagram 1.

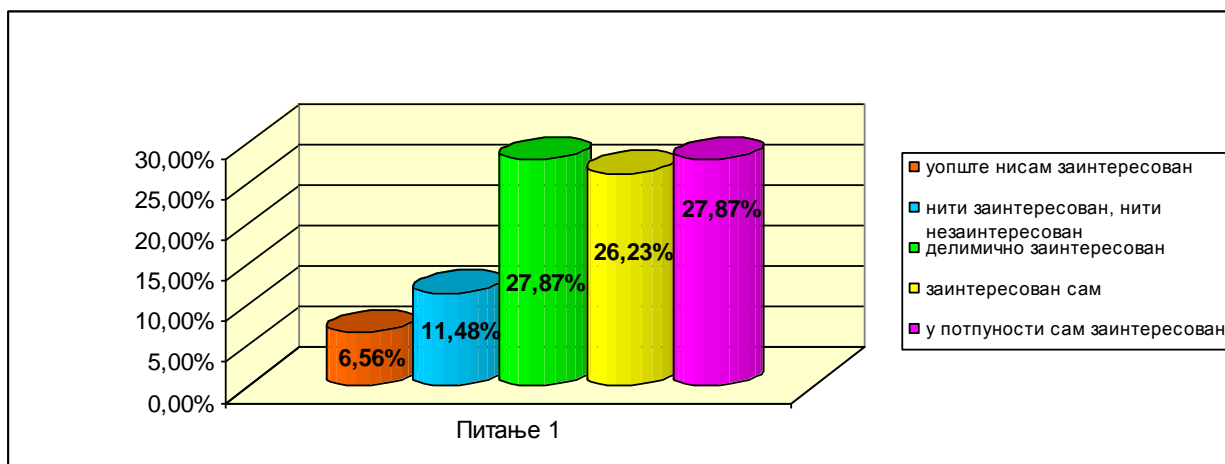


Diagram 1 shows 27,87% of the students to be completely interested, 26,23% interested, 27,87% partially interested for the opening of a new programme. A small number of students which are neither interested or disinterested 11,48%, and those who are not at all interested 6,56%.

The results of the answers related to the second question: **Are you interested in participating in a project which is immediately applicable in practice?** Presented in diagram 2.

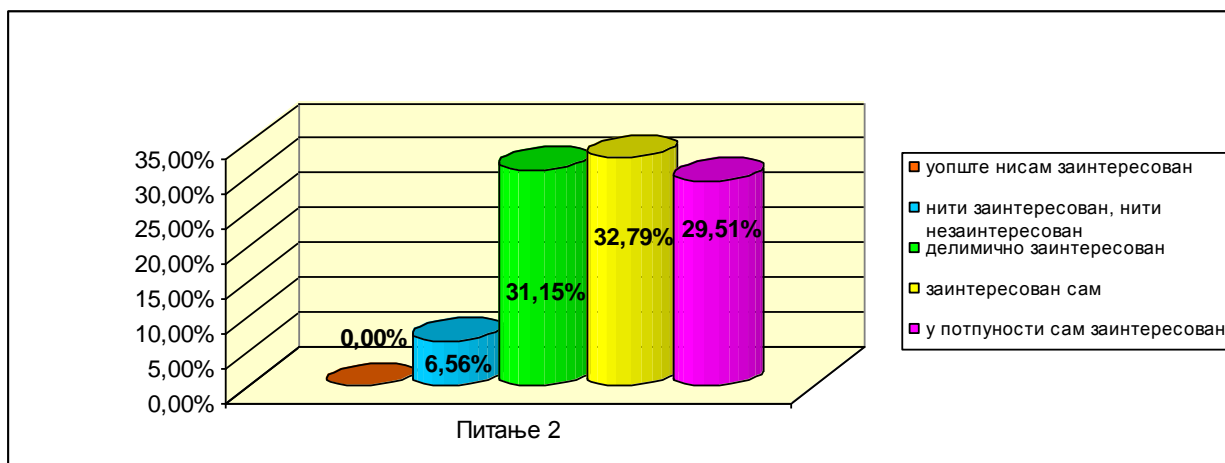
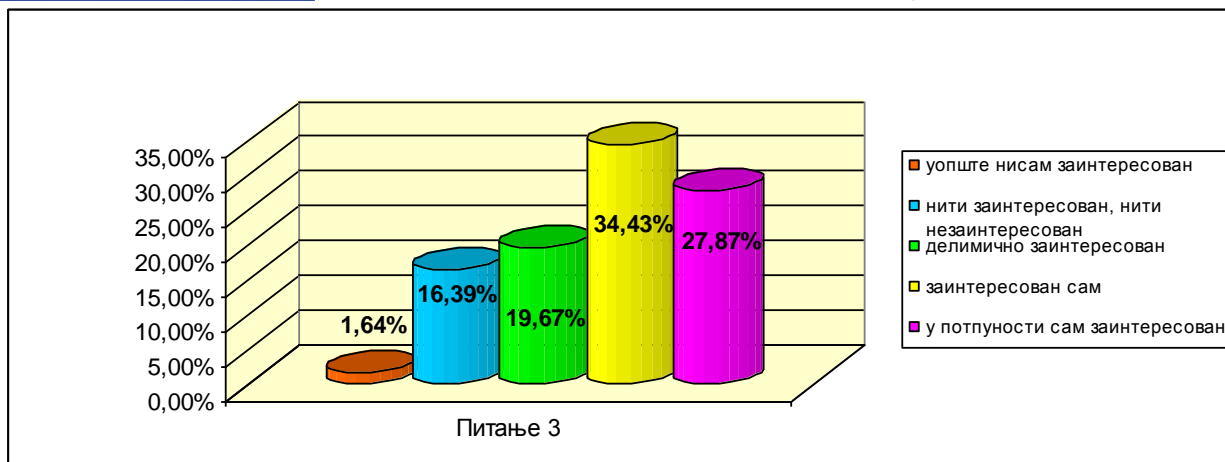


Diagram 2 shows 29,51% of the students to be completely interested, 32,79% interested and 32,79% partially interested for the opening of a new programme. The number of students which are neither interested or disinterested of 6,56% is a curiosity, while there are no students who are not at all interested 0,00%.

The results of the answers related to the third question: **Would you like to learn how to film a TV content, how the film material is edited, visual effects created, TV formats produced.** Presented in Diagram 3.



The Diagram 3 shows 27,87% of the students to be completely interested, 34,43% interested and 19,67% partially interested for the opening of a new programme. A small number of students which are neither interested or disinterested 16,39% and an insignificant number of 1,64% not at all interested.

The results of the answers to the fourth question: **Are you interested in how to produce earth and satellite radio and HDTV signal transfer, through text, audio and visual explanations and through adequate software and laboratory exercises?** Presented in diagram 4.

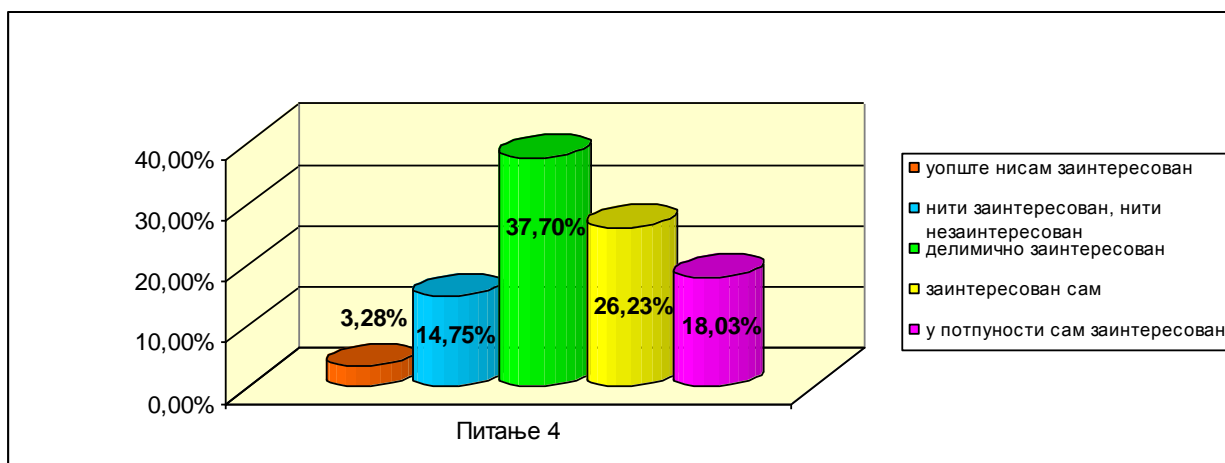


Diagram 1 shows 37,70% of the students to be partially interested, 18,03% completely interested and 26,23% interested in the opening of a new study programme. A small number of students which are neither interested or disinterested 14,75% and an insignificant number of 3,28% not at all interested.

The results of the answers related to the fifth question: **Are you interested in how the TV functions, through explanations and laboratory demonstrations.** presented in diagram 5.

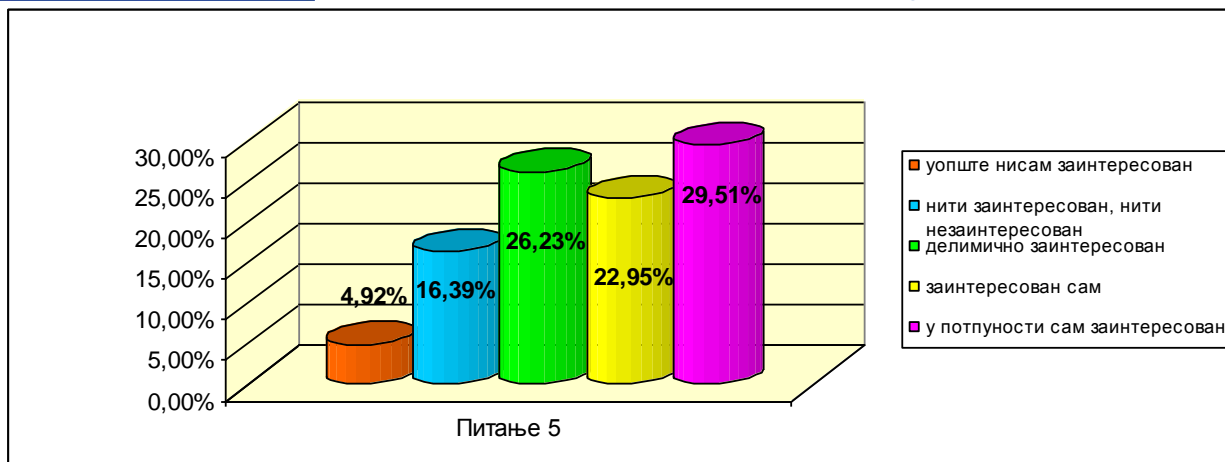


Diagram 5 shows 29,51% of the students to be completely interested, 22,95% interested and 26,23% partially interested in the opening of a new study programme. A small number of students is neither interested or disinterested 16,39% and an insignificant number of 4,92% not at all interested.

The results of the answers related to the sixth question: **Are you interested in specialist professional studies where practical application of tools in producing a TV content is learned?** presented in diagram 6.

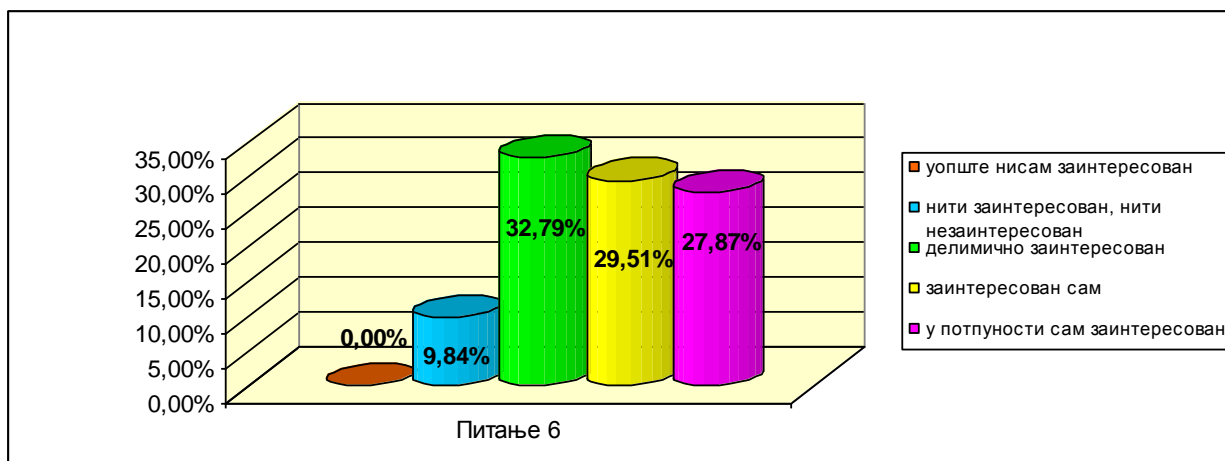


Diagram 6 shows 27,87% of the students to be completely interested, 29,51% interested and 32,79% partially interested in the opening of a new study programme. The insignificant number of students is neither interested or disinterested 9,84% , there are no students who are not at all interested 0,00%.

The results of the answers related to the seventh question: **Are you interested to learn and acquire practical experience in sound processing in laboratories** presented in diagram 7.

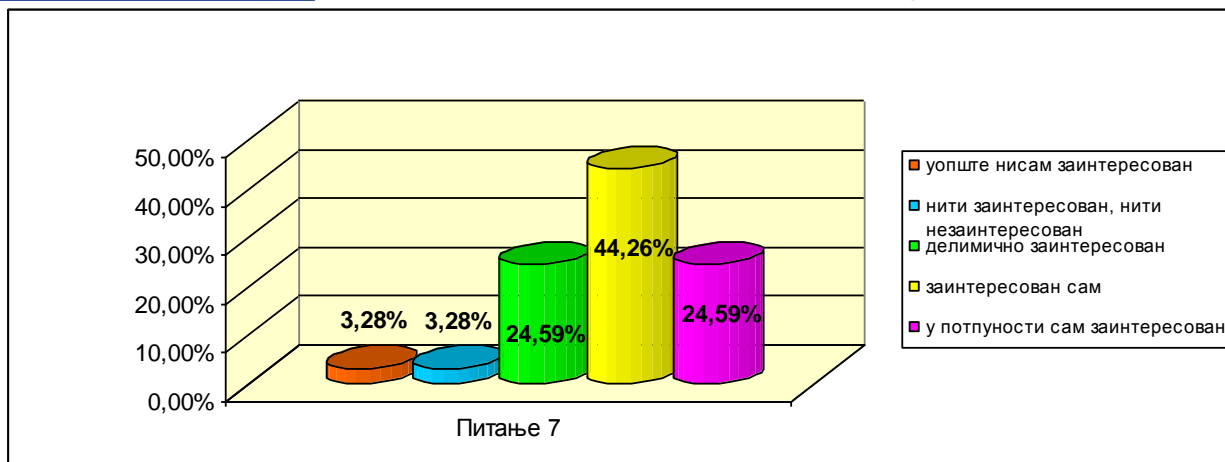


Diagram 7 shows 44,26% of the students to be interested, 24,59% completely interested and an equal number of 24,59% partially interested for the opening of a new study programme. An interesting number of students is neither interested or disinterested 3,28% as well as of those who are not at all interested 3,28%.

The results of the answers related to the eight question: **Would you like to learn and acquire practical experience in image and video content processing.** Presented in diagram 8.

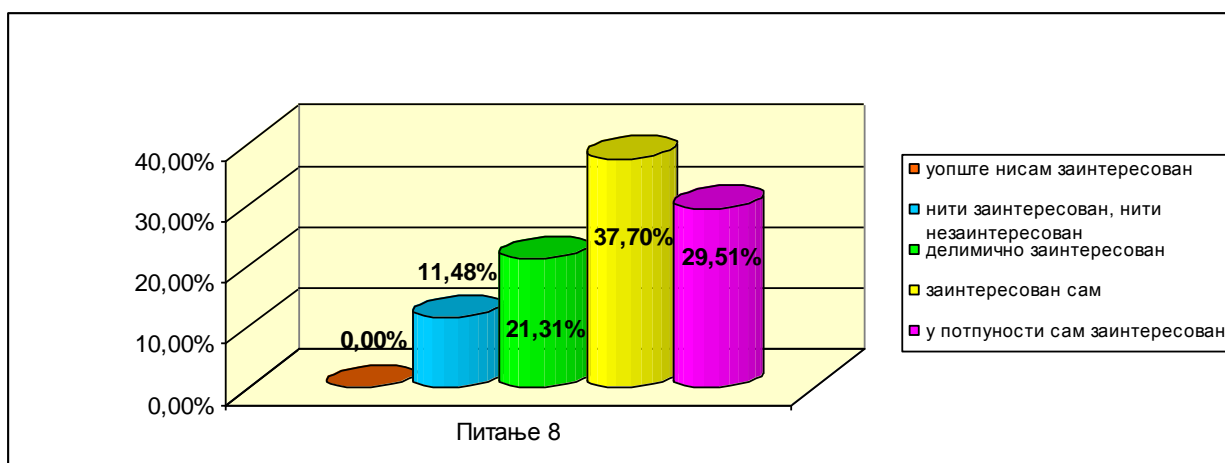


Diagram 8 shows 29,51% of the students to be completely interested, 37,70% interested and 21,31% partially interested in the opening of a new study programme. A small number of students is neither interested or disinterested 11,48%, while there are no students who are not at all interested 0,00%.

The results of the answers to the ninth question : **Are you interested in learning how to measure the strength and the quality of the emitted signal and admission signal** presented in diagram 9.

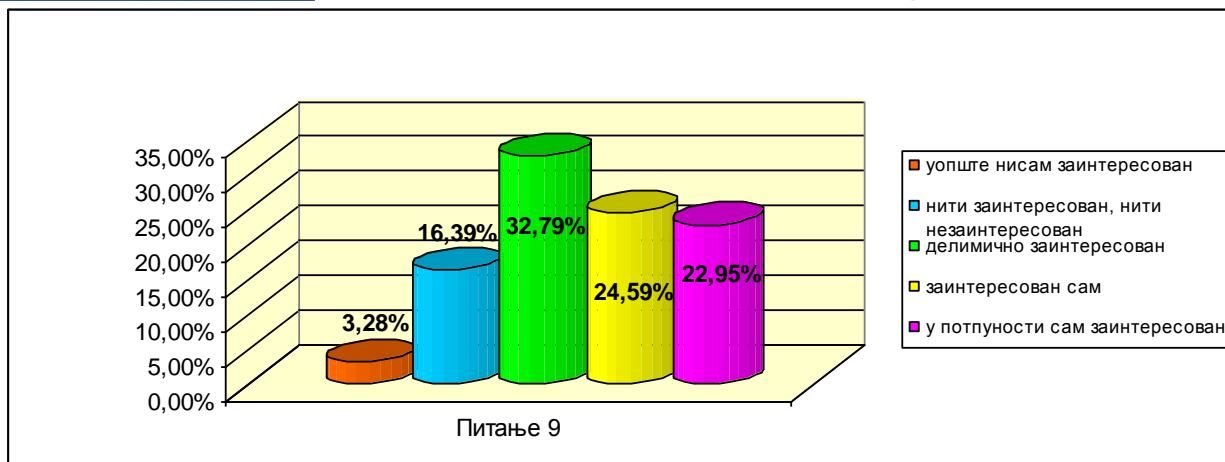


Diagram 9 shows 22,95% of the students to be completely interested, 24,59% interested and 32,79% partially interested in the opening of a new study programme. A small number of students is neither interested or disinterested 16,39% and an insignificant number of 3,28% is not at all interested..

The results of the answers related to the tenth question: **Are you interested in performing professional practice or writing your thesis in a firm which specializes in the area of the specialist professional study programme that you have completed** presented in diagram 10.

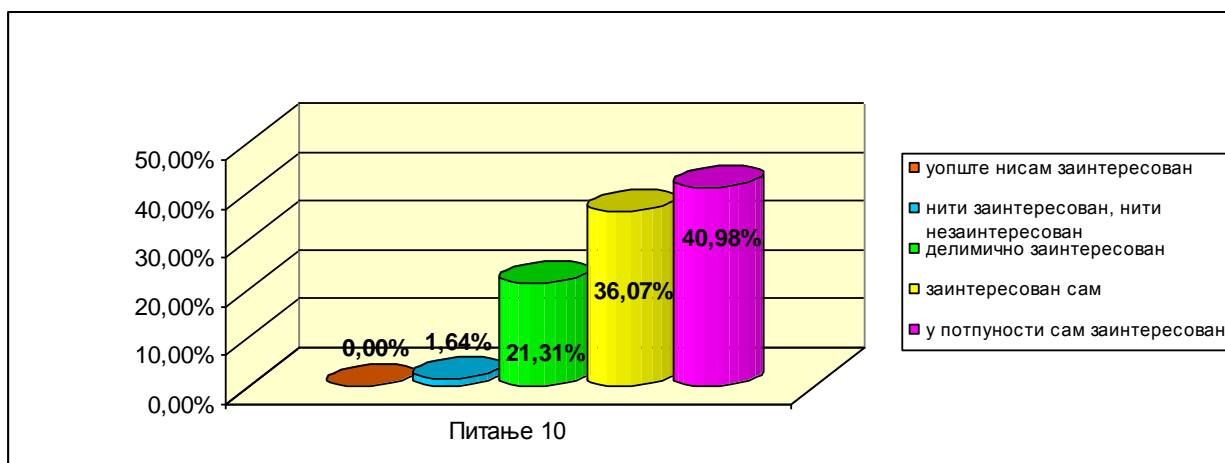


Diagram 10 shows 40,98% of the students to be completely interested, 36,07% interested and 21,31% partially interested in the opening of a new study programme. An insignificant number of students is neither interested or disinterested 1,64%, while there are no students who are not at all interested 0,00%.

The results of the conducted research at the Higher Technical Professional School in Zvečan unequivocally show that the students are interested in the suggested content of a new study programme: MULTIMEDIA TECHNOLOGIES. In accordance with the research results derived a suggestion of a new curriculum at the specialist professional studies of the above mentioned study programme composed according to the needs and the affinities of the students, has been made.

1.1. THE AIMS OF A STUDY PROGRAMME

The basic aims of the Multimedia technology specialist study programme are:

- to develop creative abilities and enable the students of the specialist professional studies to master practical skills in the area of multimedia technology
- to integrate basic technical, information technology and artistic knowledge in accordance with the needs of production, educational and service function in the area of multimedia.
- ascertain decent general as well as professional education in the area of multimedia technologies,
- enable students to work in both the corporate organizations and the public sector,
- prepare students for the team work and the work in the multicultural environment,
- produce a professional engineer- specialist, who will be able to apply and follow the high technologies which exist nowadays in the area of multimedia.
- develop critical and self-critical opinion in the media approach and analysis, your own abilities and that of your competition with the aim to successfully perform the business function
- build up a conscience regarding professional ethics in the media industry with the aim of achieving a long term success.

1.2. THE GOAL OF A STUDY PROGRAMME

The basic goals of the Multimedia technology specialist professional programme are:

- the development of the thorough knowledge in the specialist area of multimedia technologies and understanding all the implementation phases.
- identifying problems in the area of multimedia technologies
- efficient functioning in the multidisciplinary environment,
- understanding legal, ethical and social implications that you can come across on the multimedia technology projects,
- keeping up with the current development of the modern multimedia technology system,
- developing the life study abilities,
- efficient multimedia communication,
- developing the feeling of professionalism and the team work spirit,

1.3. GRADUATE STUDENT COMPETENCIES

The student acquires general and course specific abilities:

- The ability to draft and present work results (audio and video recording, multimedia presentation)
- Developing and expanding the knowledge and the skills in using and applying the existing technologies in the area of multimedia technologies.
- The ability to use animation; graphic design, animator, computer animator, videographer, multimedia designer, web designer.



2. THE CURRICULUM OF THE MULTIMEDIA TECHNOLOGY SPECIALIST PROFESSIONAL STUDIES

The structure of a study programme is in accordance with the Accreditation Standards of study programmes for the first and the second level of the high education, and in accordance with the Bologna declaration and the high education law.

	<i>I semester</i>		ECTS
1.1	Multimedia systems	o	6
1.2	Measuring in telecommunications	o	6
1.3.1	Computer animation	I/1	6
1.3.2	WEB programming	I/1	
1.4	Electric lighting design	o	6
1.5	Human-computer interaction	o	6
	<i>II semester</i>		30
2.1	Image and sound digital editing	o	5
2.2.1	Audio and video production	I/1	5
2.2.2	Internet and wireless sensor networks	I/1	
2.3.1	Entrepreneurship and innovations	I/2	5
2.3.2	Research marketing	I/2	
2.5	Professional practice	o	5
2.6	Final thesis	o	10
			30

2.1. THE COURSE CONTENT

Specification of the course				
Study program		Multimedia technologies		
Area(modul)				
Type and level of studies		Specialist professional studies		
Course title		Multimedia systems		
Lecturer		Др Зорица С Божићевић		
Ass. lecturer				
Lecturer for additional classes				
ECTS	6	Status of the object (mandatory / optional)		обавезан
Requirements				
Aims		Introduction to principles, technologies and devices used in production of multimedia projects. Mastering procedures and softwares for processing and compressing multimedia signal. Implementation of standards for transferring and compressing multimedia signal.		
Learning outcomes		Capacitation for operating basic and advanced versions of software for processing multimedia signal,constructing multimedia content in the form of WEB pages, DVD's, video tutorials and understanding communication techniques used for transfer and distribution of multimedia signal.		
Module content				
Theoretical classes		Introduction to multimedia. Area of application.Multimedia hardware technologies. Platforms. Peripherals. Interfaces. Computer memory and data storage devices. Input devices. Output devices. Architecture of multimedia systems.Multimedia devices for processing video and audio signals. Formats for recording text, graphics, sound, still and moving images. Communication in multimedia technologies. Multimedia software technologies. Basic tools. Application of tools: Adobe Photoshop, Adobe Premier, Adobe After Effects, Cubase and Macromedia Flash. Synchronization of sound and image. Multimedia signal processing and compression procedures. JPEG compression. H261 and H263 standard. DV standard. MPEG1 and MPEG2 standard. MP3 standard. Multimedia signal distribution. Multimedia signal distribution across internet. Web and NET technologies.Multimedia system design.		
Practical classes(classes,study research)		Lab exercises: Transferring audio/video material of different format on the computer. Sound software operation. Speech, noise and atmosphere recording. Sound editing. Image software operation. Image editing. Correction of recorded video material and application of special effects. Incorporating sound and image software. Combining motion graphics with live audio/video material. Combining live images with 3D softwares. Construction of interactive multimedia projects. Conversion of video material fromAVI formats to diverse MPEG and H.261, H.263 formats.		
References				
	1	Јевтић, М., Мултимедијалне комуникације, Академска мисао, Београд, 2014.		
	2	Станковић, С., Оровић, И., Мултимедијални системи, Електротехнички факултет, Подгорица, 2011.		
	3	Halsall, F., Multimedia communications, Adison-Wesley, 2011.		
	4	Steinmetz, R., Nahrstedt, Multimedia Systems, Springer, 2014.		
Number of hours per week during the semester				
Lectures	Practical classes	Add classes	Research work	Other classes
3	1	0		
Teaching methods		Classes are auditory- held in classrooms using computer equipment.Seminary papers are submitted and defended and independent work in lab classes is intended. Knowledge acquisition is tested through colloquiums during the semester and group project task presentation.		
Evaluation of knowledge (max number of poinyts 100)				
Pre-exam obligations		points	Final exam	points
Student engagement		10	Written exam	20
Practical lab-class		30	Oral exam	20
Colloquium(s)		20		



Specification of the course				
Study programme		Multimedia technologies		
Area(modul)				
Type and level od studies		Specialist professional studies		
Course title		WEB programming		
Lecturer				
Ass. lecturer		Голубовић Б. Зоран		
Ass lecturer for additional classes				
ECTS		6	Status of the object (mandatory / optional)	изборни
Requirements				
Aims		The purpose of this course is educating and enabling students to work with theoretical postulates.WEB technologies and its application. WEB technologies with the aim to develop complete and functional projects.Client and server programming. Introduction to multilayer WEB applications and different purpose WEB services. Data base implementation of WEB applications.		
Learning outcomes		Students are enabled to develop and implement client and server scripts as dynamic WEB applications connected to the data base. Knowledge acquisition in the area of WEB programming and WEB server operation. Upon completion of the course student acquire integrated theoretical and applied knowledge in the area of modern WEB technologies.		
Module content				
Theoretical classes		Уклањање грешака. Публиковање динамичких апликација. Communication protocols. NTTP protocol – request/answer. Client-server architecture, Static and dynamic content. XHTML hyper text markuplanguages. Basic concepts. Basic rules and syntax of XHTML languages. CSS technologies. XHTML+CSS.XML language. Basic concepts. XML document structure. Client programming. JavaScript, ActiveX, Java applet. Server programming. Basic tools for the development of RHR programme. Programme development in RHR surrounding. Variables and constants. Programme current control. Functions. Data base operation. ASP, CGI, Java Servlet. Error removal.Publication of dynamic applications.		
Practical classes (classes,study,research)		Computer exercises. Client-server surrounding task construction. WEB server operation and independent creation of dynamic WEB pages using the data base.		
References				
1.		L. Welling, L. Thomson,PHP i MySQL Развој апликација за Web, Микро Књига, 2004.		
2.		Десимировић, Н., Ранђеловић, М., Web дизајн, РС књига Београд 2005		
3.		М.Брковић, Д.Милошевић, "Практикум за развој Web апликација", Технички факултет, Чачак, Универзитет у Крагујевцу, 2004		
4.		A. Moller, M. Schwartzbach, "An Introduction to XML i WEB Technologies", Addison Wesley, Person Education Limited, 2006		
Number of hours per week during the semester				
Lectures	Practical classes	Add classes	Research work	Other
3	3			
Teaching methods		Classes, presentations and practical work. One colloquium and a written test is intended.		
Evaluation of knowledge(max number of points100)				
Предиспитне обавезе		поена	Final exam	points
Student engagement		10	Written exam	40
Practical lab-class		20	Oal exam	10
Colloquium(s)		10		
Seminar paper(s)		10		



Specification of the course			
Study programme		Multimedia technologies	
Area (module)			
Type and level of studies		Specialist professional studies	
Course		Human-computer interaction	
Lecturer		Данијела М Зубац	
Ass.lecturer			
Ass lecturer for additional classes			
ECTS	6	Status of the object (mandatory / optional)	обавезни
Requirements			
Aims	Mastering possibilities in the area of human-computer interaction. Studying the basic principles of creating an interface between the humans and the computer. Introduction to diverse technologies for supporting human-computer interaction.		
Learning outcomes	Students are expected to master diverse techniques for the development of an interface between the humans and the computer. Students should be able to develop different aspects of communication between the humans and the computer depending on the surrounding where the application is being used.		
Module content			
Theoretical classes	<p>I part - HCI development and problems. Interaction development directed at the user and his active participation. Interaction and interface concepts. Interface as human agent regarding the artificial surrounding . Interface design discussion from the aspect of: user, programmer and designer. Interface examples. Applicability concept. Cognitive, social and emotional aspects of interface design between the humans and the computer.</p> <p>II part- User interface design. GUI-Web user interface. The importance of a well planned design. Design process. Familiarity with the user profiles. Organization of interface graphic presentation. The system of menus and windows. Menu types and features. Windows types and features.Interface administrative tools. GUI administrative tools. Text in the interface. Feedback and Help. Accessibility. Icon creation. Colour in interface.</p> <p>III part – Web design. Web location design procedure. Web user characteristics and applicability. Location architecture and navigation systems.Web page design elements. Page type and organization. Text and color use.</p>		
Practical classes (classes,study,research)	Auditory exercises- exercises are directed at solving tasks whose purpose is curriculum revision, solving concrete tasks in the area of interface modelling and web design.		
References			
	1	Дијана Каруовић, Драгица Радосав, Интеракција човек - рачунар, Универзитет у Новом Саду, Технички факултет "Михајло Пупин", Зрењанин, 2011.	
	2	М Бањанин, „Комуникациони инжењеринг”, Саобраћајно технички факултет, Добој, 2007	
	3	Alan Dix: Human-computer Interaction, Prentice-Hall, 2004.	
Number of hours per week during the semester			
Lectures	Practical classes	Add classes	Research work
3	3		Other classes
Teaching methods	Classes are conducted in amphetheaters equipped with video projectors. Students are introduced to available software tools. Interfaces of diverse complexity and minimal functionality, whose quality is assessed and implemented during lab classes.		
Evaluation of knowledge (max number of points100)			
Pre-exam obligations	points	Final exam	points
Student engagement	10	Written exam	40
Practical lab-class	10		
Colloquium(s)	20		
Seminar paper(s) and projects	20		



Specification of the course				
Study programme		Multimedia technologies		
Area(module)				
Type and level of studies		Specialist professional studies		
Course		Electric lighting design		
Lecturer				
Ass lecturer		Др Драгољуб Матић		
Ass lecturer for additional classes				
ECTS		6	Status of the object (mandatory / optional)	обавезни
Requirements				
Aims		Introducing students to tecniques of designing and conducting electric lighting		
Learning outcomes		Students will be enabled to design and conduct electric lighting.		
Module content				
Theoretical classes		<i>Theoretical classes:</i> <ol style="list-style-type: none"> 1. Introductory class (course organization and content). Technical regulations for conducting electric lighting. Standards and recommendations. 2. Light as a physical and sense phenomenon. 3. Electric source of light. Division and functioning principles. 4. Light bulbs. Classification, sections and photometric data. 5. LED lighting. Physical principles and technologies. 6. Interior lighting quality factors. 7. Interior lighting photometric calculations. 8. Scene lighting. Lighting for studio filming. 9. Industrial premises lighting.Necessary and emergency lighting. 10. Road surface. Road lighting. 11. Tunnel lighting. 12. Reflector lighting. 13. Sport halls lighting. 14. Electric lighting design using computers. 15. Electric lighting monitoring systems, softwares and devices. 		
Practical classes		Practical classes are in accordance with lectures		
References				
1.		М. Костић, <i>Водич кроз свет технике осветљења</i> , Minel-Schreder, Београд, 2000.		
2.		М. Костић, <i>Осветљење путева</i> , Minel-Schreder, Београд, 2006.		
3.		И. Влајић-Наумовска, Н. Кнежевић, <i>Електричне инсталације и осветљење-приручник за лабораторијске вежбе</i> , Висока школа електротехнике и рачунарства, Београд, 2009.		
Number of hours per week during the semester				
Lectures	Practical classes	Add classes	Research work	Other classes
3	2			
Teaching methods		Interactive participation during classes,lab classes,consultations with the aim to encourage student independent initiative.Colloquiums as the control measure of regularity in acquiring knowledge. Written exam.		
Evaluation of knowledge (max number of points100)				
Pre exam obligations		points	Final exam	points
Student engagement		10	Written exam	40
Practical lab-class		20	Oral exam	10
Colloquium(s)		10		
Seminar paper(s)		10		



Specification of the course				
Study programme		Multimedia technologies		
Area(module)				
Type and level of studies		Specialist professional studies		
Course		Image and sound digital editing		
Lecturer		др Бојан Прлинчевић		
Ass. lecturer				
Ass.lecturer for additional classes				
ECTS		5	Status of the object (mandatory / optional)	обавезан
Requirements				
Aims		The purpose of this course is introducing students to modern processes in the area of picture and sound digital editing. Students will be able to learn how to apply modern techniques of image and sound editing through theoretical and practical work.		
Learning outcomes		The aim of this course is to enable students to understand modern principles and methods used in sound and image digital editing and the possibility to expand the knowledge regarding certain problems.		
Module content				
Theoretical classes		1. Introductory class. Digital image and sound concept2. Digital image formation. Image enhancement in the spatial domain. Image enhancement in the frequency domain. 4. Gray image quality enhancement Image restoration. 5. Colour image editing. 6. Image compression with and without loss 7. Image analysis (extracting edges, segmentation...). 8. Generating and perception of sound. 9. Audio signal processing: mixing, changes regarding amplification of sound. corrections, filtering, echo effects, compression/expansion, changing the tone pitch and sound colour . 10. Speech and music signal characteristics 11. Speech signal modelling12. Speech signal coding and transfer techniques.		
Practical classes (classes ,study,research)		Project construction. Application of programme packages for image and sound processing and practical lab exercises.		
References				
1	М. Поповић, "Дигитална обрада слике", Академска мисао, Београд, 2006 (ISBN:86-7466-272-2)			
2	R. Gonzalez, R. Woods, Digital Image Processing, Prentice Hall, 2002			
3	С. Јовичић, "Говора комуникација-физиологија, психоакустика и перцепција", Наука Београд, 1999			
4	B. Gold and N. Morgan, "Speech and audio Signal Proc.- Proc. And percepcion of Speech and Music", JW&S 2000.			
Number of hours per week during the semester				
Lectures	Practical classes	Add classes	Research work	Other classes
3	2	1		
Teaching methods		Classes are auditory- held in classrooms using computer equipment.Seminary papers are submitted and defended and independent work in lab classes is intended. Knowledge acquisition is tested through colloquiums during the semester and group project task presentation, written and oral exam testing.		
Evaluation of knowledge (max number of points100)				
Pre-exam obligations		points	Final exam	Points
Student engagement		10	Written exam	20
Practical lab-class		30	Oral exam	20
Colloquium(s)		20		



Specification of the course				
Study programme		Multimedia technologies		
Area(module)				
Type and level of studies		Specialist professional studies		
Course		Measuring in telecommunications		
Lecturer				
Ass. lecturer		Др Урош Јакшић		
Ass.lecturer for additional classes				
ECTS		6	Status of the object (mandatory / optional)	Обавезни
Requirements				
Aims		Introducing students to work principles and telecommunication lab device use. Enabling students for typical measuring in telecommunications in time and frequency domain. Enabling students to produce reports on the conducted measuring.		
Learning outcomes		Upon passing the exam students will be able to: connect and link lab devices in a correct way, conduct advanced measuring of telecommunication signals and systems, import measuring results to computers process measuring results and write a report, Check the correspondence between the measuring results and relevant regulations and standards.		
Module content				
Theoretical classes		Types and organization of telecommunication measuring. Telecommunication signal parameters. Measuring instruments. Passive components. Signal sources. Digital oscilloscope. Signal characterization in the time domain. Spectrum analyser. Signal characterization in the spectrum domain. Transfer system characterization. Network analyser. Noise measuring. Cable line measuring. Error place detection. Measuring results processing and presentation. Producing a report on conducted measuring. Linking lab instruments. Monitoring instruments using computers. Measuring results acquisition using computers. Virtual instrumentation. Telemetry.		
Practical classes(classes,study research)				
References				
1.		Петар Правица, Иван Багарић, “Метрологија електричних величина”, Наука, Београд, 1993.		
2.		Др Милан Бјелица, “Телекомуникациона мерења 1”, збирка задатака ЕТФ Београд, 2013.		
3.		C. Rauscher: Fundamentals of Spectrum Analysis. Rohde & Schwarz, 2006.		
4.		J.M. Hughes: Real-World Instrumentation with Python. O’Reilly Media, 2011.		
Number of hours per week during the semester				
Lectures	Lectures	Lectures	Lectures	Lectures
4	2	1		
Teaching methods		Verbal using: graphoscope, multimedia. Practical using computers and labs. Demonstrational method using examples.		
Evaluation of knowledge (max number of points100)				
Pre-exam obligations		Pre-exam obligations	Pre-exam obligations	Pre-exam obligations
Student engagement		10	Writin exemp	40
Practical lab-class		20	Oral exemp	10
Colloquium(s)		10		
Seminars		10		



Specification of the course				
Study programme		Multimedia technologies		
Area(module)				
Type and level of studies		Specialist professional studies		
Course		Audio and video production		
Lecturer		Mr Ружа С. Марковић		
Ass. lecturer				
Ass.lecturer for additional classes				
ECTS		5	Status of the object (mandatory / optional)	Изборни
Requirements				
Aims		The purpose of this course is to unite and implement knowledge which encompasses software for the sound, graphics, animation, non linear editing,special effects and visual creativity of the individual.		
Learning outcomes		The purpose of this course is to enable students to conduct complex multimedia projects, videos,clips and short films with special effects		
Module content				
Theoretical classes		Introductory class; The process of creation and design of multimedia content.Project phases; Multimedia elements: video-filming, editing and post-production; Multimedia elements: sound- technical and aesthetic principles of using sound in multimedia; Multimedia and televisiion: television advertisement; Multimedia elements: text fonts,typography, using text in multimedia; Title design (Motion Graphics); Image and colour in multimedia; Animation as the part of multimedia; Interactiveness in multimedia projects; Multimedia delivery and archive. Analysis and discussions on the theme of multimedia projects.		
Practical classes(classes,study research)		Practical classes encompass lab exercises with multiple software tools incorporated within the multimedia package Final Cut Studio: editing applications multimedia DVD project creation (Final Cut Pro, Compressor,DVD Studio Pro) as well as animation applications, special effects and Motion Graphics project production Adobe After Effects		
References				
1		Александар Кајевић, Мултимедијска продукција, ВИШЕР, 2015.		
2		Film Directing Shot by Shot, Visualizing from Concept to Screen - Steven D. Katz.pdf		
3		The Technique of film and Video Editing 4th ed. - K. Dancyger (Focal, 2007) BBS.pdf		
4		Trick Photography and Special Effects.pdf		
Number of hours per week during the semester				
Lectures	Lectures	Lectures	Lectures	Lectures
3	2			
Teaching methods		Classes are auditory- held in classrooms using computer equipment.Seminary papers are submitted and defended and independent work in lab classes is intended. Knowledge acquisition is tested through colloquiums during the semester and group project task presentation.		
Evaluation of knowledge (max number of points100)				
Pre-exam obligations		Pre-exam obligations	Pre-exam obligations	Pre-exam obligations
Student engagement		25	Written exemp	25
Practical lab-class		25	Practical exemp	25
Colloquium(s)			Oral exemp	



Specification of the course				
Study programme	Multimedia technologies			
Area(module)				
Type and level of studies	Specialist professional studies			
Course	Internet and wireless sensor networks			
Lecturer	Др Поповић Ј Зоран			
Ass. lecturer	Др Прлинчевић Бојан			
Ass.lecturer for additional classes				
ECTS	5	Status of the object (mandatory / optional)	изборни	
Requirements				
Aims	Introducing students to basic computer and wireless sensor networks in addition to acquiring integrated and multidisciplinary knowledge in this area through practical realization of multisensor integrated systems with the purpose of fire protection.			
Learning outcomes	Students should be able to acquire basic principles of internet and wireless sensor system organization;to recognize functionality of the modern sensors and their characteristics;to design systems for tracking and collecting data in fire protection intelligent systems using modern sensors, computer devices and software tools.			
Module content				
Theoretical classes	Basic knowledge regarding wireless sensor networks: limits and challenges, advantages, application, mutual cooperation in the area of information processing, key definitions. Physical level characteristics: localization, tracking scenario, defining problems. Multimedia approach characteristics: information transfer regarding condition, tracking several objects, sensor objects,comparison and metrics.Network level and routing: asumptions, MAC, S-MAC protocole, IEEE 802.15.4 standard and Bluetooth, ZigBee, 6LoWPAN, geographic and energetic advanced routing, attribute routing. Establishing infrastructure: topology, grouping, synchronization, localization and services. Sensor network platforms and tools: programming challenges, hardware and software platforms (TinyDB, nesC, TinyGALS). Application and the future of internet and wireless sensor networks.			
Practical classes(classes,study research)	Calculation exercises, practical placement of sensors, linking into a network, tracking and collecting data, software tool application and data processing.			
References				
	1	Зоран М. Урошевић: Увод у рачунарске телекомуникације и мреже; транспортни део, Технички факултет у Чачку 2004.		
	2	Jacob Fraden : Handbook of Modern Sensors: Physics, Designs, and Applications, Springer 2010.		
	3	Feng Zhao, Leonidas J. Guibas: Wireless Sensor Networks, Elsavier, 2004.		
	4	J.A. Stankovic: Secure Localization and Time Synchronization for Wireless Sensor and Ad Hoc networks, Springer 2007.		
	5	"Vestermanov ELEKTROTEHNIČKI PRIRUČNIK" - G.Brechmann, C.W.Dzieia, R.E.Hornemann, H.H.Hubscher, L.D.Jagla, N.J. Klau (priredili: gordana Spaić, Mirko Popović, Julija Stević, Vera Stojadinović)- GRAĐEVINSKA KNJIGA BEOGRAD 2000		
Number of hours per week during the semester				
Lectures	Lectures	Lectures	Lectures	Lectures
	3	2		
Teaching methods	Classes are auditory- held in classrooms using computer equipment.Seminary papers are submitted and defended and independent work in lab classes is intended. Knowledge acquisition is tested through colloquiums during the semester and group project task presentation.			
Evaluation of knowledge (max number of points100)				
Pre-exam obligations	Pre-exam obligations	Pre-exam obligations	Pre-exam obligations	
Student engagement	10	Written exemp	30	
Practical lab-class	20	Oral exemp	20	
Colloquium(s)	Colloquium(s)	10		
Seminars		10		



Specification of the course			
Study programme	Multimedia technologies		
Area(module)			
Type and level of studies	Specialist professional studies		
Course	Computer animation		
Lecturer	Др Александар Ђорђевић		
Ass. lecturer			
Ass.lecturer for additional classes			
ECTS	6	Status of the object (mandatory / optional)	изборни
Requirements			
Aims	The purpose of this course is introduction to the work environment of <i>Maya 3D</i> programme, the rules of character animation, as well as acquiring basic tools of character animation using skeletons and deformers, planning and working on a process of constructing animated short form.		
Learning outcomes	Students will have an opportunity to learn about the basics of character animation, act and body language, acquire character animation of bipod 3D models, animate speech according to the sound matrix, and apply animation principles in a 3D tehnique.		
Module content			
Theoretical classes	<ol style="list-style-type: none"> 1. Introduction, concepts, terminology, computer animation technology. User interface in <i>Maya 3D</i> programme environment, <i>node</i> system organization, work environment, three dimensional coordinate system and transformations within it, basic transformations (translation, rotation, scaling), perspective change. 2. Computer animation technologies, terminology. Motion, timing, technology of extreme, <i>key frame</i> animation. 3. Terminology; extreme, phases, action axis, action line...<i>Graph editor</i>, animation with interpolation control between the <i>key frames</i>. 4. Path animation. Hierarchy creation. 5. Introduction to operation principles of controls for object animation, as well as deformers and its attributes. 6. Character rigging. 7. Object character, application of animation principles with the aim to put emphasis on animated objects. 8. Bipod characters, animation, design. 9. Basic animation characteristics; walk cycle; 10. Expressing character using animation. Pose, motion, time. Walk cycle of different characters comparative animation. 11. Idea, synopsis, scenario, storyboard, character design. Project preparation. Act and expression. <i>Cartoony</i> walk animation. 12. Specific situation character animation. 13. Working on a project 		
Practical classes(classes,study research)	Lectures are in accordance with theoretical classes.		
References			
	1 Alias/Wavefront, <i>The Art of Maya</i> , Syb, 2007.		
	2 G. Maestri, <i>Character animation 2 - Volume 2: Advanced Techniques</i> , New Riders, Indiana, 2002.		
	3 R. Williams, <i>The Animator`s survival kit</i> , Faber and Faber, New York, 1995.		
	4 Harold Whitaker, John Kalas, <i>Timing for animation</i> , Focal Press, 2002.		
	5 Mark T. Byrne, <i>The Art of Layout and Storyboarding</i> , A Mark T. Byrne Publication, Ireland, 1999.		
Number of hours per week during the semester			
Lectures	Lectures	Lectures	Lectures
3	2	2	
Teaching methods	Classes are auditory- held in classrooms using computer equipment.Seminary papers are submitted and defended and independent work in lab classes is intended. Knowledge acquisition is tested through colloquiums during the semester and group project task presentation.		
Evaluation of knowledge (max number of points100)			
Pre-exam obligations	Pre-exam obligations	Pre-exam obligations	Pre-exam obligations
Student engagement	10	Written exemp	30
Practical lab-class	20	Oral exemp	20
Colloquium(s)	10		
Seminars	10		



Specification of the course				
Study programme	Multimedia technologies			
Area(module)				
Type and level of studies	Specialist professional studies			
Course	Entrepreneurship and innovations			
Lecturer	др Сања С Марковић			
Ass. lecturer				
Ass.lecturer for additional classes				
ECTS	5	Status of the object (mandatory / optional)		изборни
Requirements				
Aims	Acquiring basic knowledge about paradigms, methods, techniques, the significance and the role of an entrepreneur in a modern economic development from the aspect of launching an independent business, as well as in the function of internal corporative entrepreneurship.			
Learning outcomes	Students will be enabled to independently assess business chances, their market valorization, assess individual entrepreneurial abilities, as well as model and implement entrepreneural strategies, all of which creates a precondition for a successful launching of an independent business and its management under the conditions of a market structure.			
Module content				
Theoretical classes	Entrepreneurship (the nature of entrepreneurship and definitions, innovation development, economic and social contribution of entrepreneurship, conceptual depiction of entrepreneurship); Concept of entrepreneurship ('big man'concept,the school of "psychological characters", entrepreneurship-the ability to spot chances, "leadership" entrepreneur school, "internal entrepreneurship"concept, Creativity-innovation(innovation entrepreneurship, innovation entrepreneur, entrepreneur atmosphere, individual within a team, innovation factors,creative individual); Types and development of an entrepreneur (big and small entrepreneurship, factors which encourage entrepreneurship, organization environment for internal and external entrepreneurship); Entrepreneurship and innovation (purposeful innovation, characteristics and skills of an entrepreneur, entrepreneur-innovator, a new product development-innovation); Management and entrepreneurship(entrepreneur strategies, entrepreneur choice of ideas,entrepreneur incubators, a business plan, communication, entrepreneur bon ton).			
Practical classes(classes,study research)	Auditory exercises- practical examples and exercises in the area of initiation and management of a business venture/projects- project presentation, seminary papers, solving a case study.			
References				
	1	З. Сајферт: Предузетништво, Универзитет у Новом Саду, Технички факултет "Михајло Пупин" Зрењанин, Зрењанин 2004.		
	2	Р. Друкер: Предузетништво, ФАБУС, Нови Сад 2008.		
	3	М.Јовановић, М. Живковић, А. Лонговић, Д. Велковић: Предузетништво, Мегатренд универзитет примењених наука, Београд, 2004.		
Number of hours per week during the semester				
Lectures	Lectures	Lectures	Lectures	Lectures
3	2			
Teaching methods	Lectures, lab classes, revision, consultations, concrete problem discussions in the area of entrepreneurship, presentations, seminary papers.			
Evaluation of knowledge (max number of points100)				
Pre-exam obligations	Pre-exam obligations	Pre-exam obligations		Pre-exam obligations
Student engagement	10	Written and oral exemp		60
Practical lab-class				
Colloquium(s)	20			
Seminars and projects	10			



Specification of the course				
Study programme		Multimedia technologies		
Area(module)				
Type and level of studies		Specialist professional studies		
Course		Research Marketing		
Lecturer		др Сања С. Марковић		
Ass. lecturer				
Ass.lecturer for additional classes				
ECTS		5	Status of the object (mandatory / optional)	
Requirements				
Aims		Acquiring basic knowledge about paradigms, methods, techniques, marketing strategies and development of abilities for creating flexible ways of reacting to the unsteady market conditions. Acquiring knowledge in the area of marketing management, especially viewed from the aspect of the basic postulates of the marketing concepts and applying those concepts in practice.		
Learning outcomes		Students will be enabled to independently engage in the process of creating marketing campaigns for the purpose of conquering the market. Students will use the acquired knowledge in the area of marketing to recognize different market and business phenomenon and when solving problems which stem from the market theory and practice.		
Module content				
Theoretical classes		The concept of marketing; Basic concepts of marketing; Marketing dimensions; Marketing as a business function; Marketing management; Micro and macro marketing; Marketing environment; Marketing mix; Promotional marketing,creating a promotional message; Competition; Marketing strategies; A new product strategies; Integrated marketing communication; marketing programme formulation, the product of the day, distribution promotion; Basic marketing strategies; Business operation internationalization; Specific aspects of marketing.		
Practical classes(classes,study research)		Auditory exercise- Case studies regarding the basics of marketing, marketing principles, market mechanism function, marketing mix instruments.		
References				
1		М. Милосављевић: Основи маркетинга, Економски факултет, Београд 2004.		
2		Ф. Котлер: Маркетинг менаџмент, Дата статус, Београд, 2006.		
3		Б. Ракић, Маркетинг, Мегатренд, Београд 2008.		
4				
5				
Number of hours per week during the semester				
Lectures	Lectures	Lectures	Lectures	Lectures
3	2			
Teachings methods		Classes are conducted in a form of lectures and auditory exercises. Theoretical basics and principles of marketing are presented during lectures and a more detailed insight of postulates using practical examples and student-teacher interaction during auditory exercise.		
Evaluation of knowledge (max number of points100)				
Pre-exam obligations		Pre-exam obligations	Pre-exam obligations	Pre-exam obligations
Student engagement		10	Written and oral exemp	60
Practical lab-class				
Colloquium(s)		20		
Seminars and projects		10		



Specification of the course				
Study programme		Multimedia technologies		
Area(module)				
Type and level of studies		Specialist professional studies		
Course		Professional practice		
Lecturer				
Ass. lecturer				
Ass.lecturer for additional classes				
ECTS	5	Status of the object (mandatory / optional)		обавезни
Requirements				
Aims	Acquiring knowledge regarding the function and organization of an enterprise and institutions dealing with work activities within the professional area for which the student is being educated and the possibility of applying the acquired knowledge in practice.			
Learning outcomes	Enabling students to apply the acquired theoretical and professional knowledge to solve concrete practical engineering problems within the chosen enterprise or an institution.Acquinting students with the work activities of a chosen enterprise or institution, work conduct, leadership, the position and the role of an engineer within the organizational structure. Developing students` abilities allowing them to engage in the work process upon the completion of education. Development of responsibility, professional approach to work and communication skills within a team. Complementing theoretical knowledge acquired during the course and practical understanding of problems studied within the course which the student attends.Benefitting from the experience of experts employed in the institution where the professional practice is being conducted with the aim to expand practical knowledge and motivate students. Acquiring a clear perspective regarding the possibility of applying in practice the acquired knowledge and skills included in the course.			
Module content				
Theoretical classes	The professional practice content is in accordance with the aims of the practice. It is formed for each candidate independently, in agreement with the management of an enterprise or institution where the professional practice is being conducted, and in accordance with the module curriculum of the course which the student is attending. Students are intended to perform professional practice at a TV network (TV Most, TV Mir, TV KM)			
Practical classes(classes,study research)				
References				
Number of hours per week during the semester				
Lectures	Lectures	Lectures	Lectures	Lectures
Teaching methods	Consultations and professional practice journal where the student describes the activities work that he has performed during the professional practice period.			
Evaluation of knowledge (max number of points100)				
Pre-exam obligations	Pre-exam obligations	Pre-exam obligations	Pre-exam obligations	
Student engagement	30	Written exemp	0	
Practical lab-class	30	Oral exemp	40	
Colloquium(s)	0			



Specification of the course			
Study programme	Multimedia technologies		
Area(module)			
Type and level of studies	Specialist professional studies		
Course	Final thesis		
Lecturer			
Ass. lecturer			
Ass.lecturer for additional classes			
ECTS	10	Status of the object (mandatory / optional)	Обавезан
Requirements	A passed course exam for which the student has chosen to write the thesis.		
Aims	The purpose of writing the final thesis is solving and/or analysing and presentation of the practical problem, by which the student proves to have acquired an intended degree of professional qualification and maturity in a specific area of technical engineering.		
Learning outcomes			
Module content	<p>Procedure regarding the writing and defending of the thesis is determined by the Rulebook which defines the manner and procedures of defending the thesis. The student achieves the right to start working on the thesis if he has three exams left to pass. The student chooses one of the courses he has passed, and the course lecturer as his mentor. Mentor defines the title of the thesis and problems to be dealt with within the thesis, upon which the student can submit the thesis. Student should complete the writing of the thesis in a period of at least three weeks, and maximum six months from the day of submitting the thesis. During the period of working on the thesis student is obliged to have consultations with the mentor. The final version of the thesis should have 20 to 40 pages on A4 page format, regardless of reference. Presentation of the thesis on recommended 10 to 20 slides is a compulsory addition to the final version of the thesis. Technical treatment and the content quality of the thesis should be in accordance with the Regulations regarding the technical treatment of thesis which is the integral part of Regulations on the manner and procedures of preparing and defending the thesis. The mentor confirms the content and technical treatment quality by signing each copy of the thesis. When the student completes the thesis, he submits a written request for defending the thesis to the professor council, and the four copies of the thesis together with the request. Each copy of the thesis should contain the entire text of the thesis in electronic form (CD) Professor council appoints a panel for the public oral defending of the thesis, which consists out of the president, the mentor, and at least one of the professors of Higher Technical Professional School in Zvečan. The panel can have additional members consisting out of the professors of other higher school institutions or eminent experts in the area presented in the thesis.</p>		
Teaching methods	The thesis is defended orally in front of the panel; the student is obliged to prepare a short presentation (15 min) within which he presents the basic problems and solutions; the members of the panel have a right to ask questions and evaluate the thesis as the whole.		
Evaluation of knowledge			



6. ENROLLMENT AND DURATION OF STUDIES

Enrollment of students will be performed in accordance with the Law, and based on the number of students determined by the Ministry of Education of the Republic of Serbia. Upon acquiring accreditation, enrollment of students is planned for the school year 2017/18.

According to the decision of the Ministry of Education of the Republic of Serbia there are two enrollment terms, June and September enrollment term.

The curriculum realization will be achieved within a single school year with the duration of two semesters, from 01.10 to 30.09 of the following year. It is conceptualized in such a way as to contain both compulsory and elective courses whose numerical value is presented in accordance with ECTS.

Study programme title: **Multimedia technologies**

Type of studies: **Specialist professional studies** in the duration of one year (two semesters 60 ECTS).

Professional title: **Professional engineer of electrical engineering and computer technology – specialist.**

CONCLUSION

Multimedia is a technological and scientific area which is developing at a fast pace in the last years. The fast pace development of multimedia requires the high level of professional knowledge and hence requests education of future experts in this area. The study programme of multimedia technologies will ascertain capacitation of skillful workforce for the wide range of information technology competences in the domain of application of modern equipment and software used in multimedia production and digital television. Hence the course content of this study programme is efficient, through which students will besides theoretical knowledge, (presented in accessible audio visual form), acquire a wide range of practical knowledge in laboratories, on real devices, with the software used in the studies. Laboratories will be opened on the premises of the Higher Technical Professional School in Zvečan which will serve for practical training of students and introduction to all the production elements and signal transfer.

By mastering **multimedia technologies** study programme, students will be enabled to use diverse general information technology knowledge, techniques, methods and procedures, which they have acquired in theory and in practice during the course of studies, to work in real information technology environment and for successful integration and harmony of all the elements involved in multimedia production.