THE STUDY PROGRAM OF
AUDIO & VIDEO TECHNOLOGIES

BASIC STUDIES

BELGRADE, MMXII
<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
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<tr>
<td>TEMPUS project coordinator</td>
<td>Ana Savić, PhD</td>
</tr>
<tr>
<td>Publishing Director</td>
<td>Dragoljub Martinović, PhD</td>
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<td>Editorial Board</td>
<td>Dragoljub Martinović, PhD</td>
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<td>Jadranka Ajčević, MSc</td>
</tr>
<tr>
<td>Design and Prepress</td>
<td>Vladimir Cerić, MA</td>
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<td>Circulation</td>
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<td>Publisher</td>
<td>School of Electrical Engineering and Computer Science</td>
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THE STUDY PROGRAM
AUDIO AND VIDEO TECHNOLOGIES

BASIC STUDIES
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School of Electrical Engineering and Computer Science Applied Studies in Belgrade (VIŠER), including its study program Audio and video technologies, 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. 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.

This publication is aiming to present new innovated study program of Audio and video technologies. This program, part of TEMPUS project, contains courses for teaching digital television and multimedia fields.

The main features of VIŠER 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 three 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.
There is a need for professional staff training, for improving knowledge and occupations necessary in the dynamic development of technique and technology in the field of sound, pictures and media, with a constant modification to the changes. Study program Audio and video technologies at School of Electrical Engineering and Computer Science is a unique study program of the vocational studies with the above mention orientation existing in the region.

Education of students enrolled in the Audio and video technologies study program should satisfy needs arising from general development in this field on the manpower market.

The target of the study program Audio and video technologies is completely in accordance to the undertaking and objectives of the higher education institution where the program is being provided; therefore it is consistent with the application of European and global standards aiming to organizing high quality studies. Study program Audio and video technologies forms skilled electrical and IT engineers for audio and video technologies, which will be able to be topped up from technologies used in the field of sound and pictures, in other words training practical work in the field and further skilled training. After graduation from the study program Audio and video technologies, wide spectra of vacations is offered, “all television related”, Internet and studio operations and similar.

During the last five years the program has been improved and adjusted to the development in mentioned fields and remained in line with the Bologna declaration corresponding to the higher education requests.

In accordance with Higher Education legislative of the Republic of Serbia School of Electrical Engineering and Computer Science gained official accreditation in 2012 for new and innovated study program Audio and video technologies.
Audio and video technologies study programs have clearly defined the following purposes:

- education of students for recognizable and defined professions related to the production in the field of sound and picture;
- providing competencies for working on the tasks of production and post production of the sound and picture;
- availability of skills and knowledge in at least three related professions (audio and video technology, IT, arts, management) and tendencies towards team work.

Education of creative multimedia engineers comprehends constant follow up of techniques development as well as dynamic market development meaning multimedia industry.

Objective of the audio and video technology study programs completely compliant to the mission and objectives of the School of Electrical Engineering and Computer Science therefore is it coherent in application of European standards in order to organize high quality studies.
Objectives of the study program, to:
• translate knowledge and skills in the field of audio and video technique;
• integrate basic technical, IT and artistic knowledge in accordance to the needs of manufacturing, educational and service vocations in the field of audio and video techniques;
• qualify for the works in the public and private sector
• qualify for the team work and work in the multicultural environment;
• qualify for further training in the field.

Vocational electrical and IT engineer for audio and video technologies should be trained to apply and follow top-up tasks related to the production and post production of sound and picture, design and usage of audio and video system.

Structure of the study program

Title of study program:
Audio and video technologies.

Type of the study:
Vocational studies lasting three years (six semesters – 180 ECTS).
Professional title: Vocational electrical and IT engineer.

Conditions for enrolment: Completed high school and passed entry exam.

Courses:
- 2 mandatory
- 32 optional
- Professional Practice + Final Project

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 and preparation of the final project. All courses last one semester. All courses are equal by its scope (75 hours per semester) hours and each course gain 6 ECTS. Professional Practice gains 4 ECTS, and Final Project 8 ECTS. All courses have defined pre-conditions. Through mandatory courses student gains basic knowledge related to the mathematics and electrical engineering, and by further selection of the courses tends to video technique, audio technique, graphics and animation, whereas multimedia approach is not excluded. School provides tuition base: schoolrooms and rooms for auditory tuition, dedicated laboratories for the study program (audio studio,
STUDY PROGRAM

TV studio, studio for animation and picture editing, and multimedia laboratories), as well as PC laboratories linked to broadband and the library.

Audio and video technology 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.

Competency of the graduated engineers of study program Audio and Video Technologies

Student gains general and course related specific capabilities by mastering audio and video technologies study program to:

• **follow up and apply innovations in the field of expertise** by gaining knowledge in the field of production and postproduction of the sound and picture, as well as in the field of applying technologies in 2D and 3D computes animation;

• **develop skills and capabilities in usage of the knowledge** by qualifying for projecting, as well as design of audio and video system;

• **use informational-communicational technology** in mastering knowledge in applicable field (usage of knowledge in processing audio and video signal and principles of digital systems in projecting, usage and maintenance of media and telecommunication systems, knowing how to use computes technology and devices, with general and applicable software, normative, regulations and standards in working with audio and video signals, as well as in the field of computer animation);

• **to design and organize working processes, organize production controls of the audio and video devices**, as well as media material (audio and video inscriptions), contribute to operative decisions on the scope adjustability for implementation and follow up of the operations related to the media technical support;

• have a capability to compose and present working results (audio and video inscription, multimedia presentation);

• **importance and strategy of environment**, as well mandatory
inclusion of environmental protection in facility construction, above all working on designing noise protection in business and residential facilities and noise monitoring in working and living environment.

Audio and video technology studies graduates should cover wide spectra of vocations on the tasks related to the television, radio, Internet, animation, studio works and similar. Some of the tasks to be performed by audio and video study program vocational electrical and IT engineers are:

- **audio professions**: radio and TV sound engineer, movie sound engineer, theatre and conference halls sound engineer, sound engineer in multimedia projects, acoustics designer for reproduction of speech and music, designer for noise protection in business and residential facilities, executor in monitoring and noise measurement for environmental protection;
- **video professions**: technical leadership, cameraman, electronic editor, graphic effects designer, picture designer – camera controls, cameraman, audio and video technique assistant, multimedia networks assistant;
- **graphics and animation**: graphic designer, animator, computer animator, video graph, multimedia designer, web designer.
STUDY PROGRAM
Audio and video vocational studies program possess space and equipment for performing educational process: amphitheaters and classrooms; general dedicated laboratories with contemporary working surrounding, program tools; specialized laboratories.

Specialized laboratories of the Audio and video technologies study program 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.
**INFRASTRUCTURE**

Multimedia digital HD television studio will be completed using 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.
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 Audio and video technologies and Multimedia Technologies and Digital Television 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.
Audio and video study program is based on the contemporary knowledge and achievements of theory and practice in the fields of audio, video and media, it is formed in compliance with related study programs organizing on the Bachelor level, worldwide.

Basic preferences of the program are:
- Basic vocational studies lasting for 3 years;
- There are 2 mandatory and 32 optional courses (26 to be selected).

Curricula contain 34 courses distributed per school years in following manner:

<table>
<thead>
<tr>
<th>Year</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>12 courses 2 mandatory + 10 optional courses</td>
</tr>
<tr>
<td></td>
<td>8 to be selected</td>
</tr>
<tr>
<td>2nd</td>
<td>12 courses all optional</td>
</tr>
<tr>
<td></td>
<td>10 to be selected</td>
</tr>
<tr>
<td>3rd</td>
<td>10 courses all optional</td>
</tr>
<tr>
<td></td>
<td>8 to be selected</td>
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</tbody>
</table>

Professional Practice and Final project are mandatory.

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


- Audio courses: Electroacoustics, Audio Electronics, Recording Studios Equipment, MIDI and Sound Synthesis, Musical Instruments, Room Acoustics, Sound Recording, Sound System Engineering, Sound Design, Music Production;

- Video and Television courses: Fundamentals of TV, TV Systems
and Video Technologies; Electrical Lighting Design, Image Recording, TV cameras, Digital TV, Video Production, Studio and Field TV Production;


Audio and video technology curricula is established so that students gain basic knowledge in the field of mathematics and electrical engineering through mandatory courses, and with further selection of courses the student will be orientated to one specific field:
- audio technique;
- video technique;
- animation and graphics;
multimedia approach is not excluded.

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.

Suggested curricula of Audio and video technologies study program is being innovated in accordance to the previously accredited Audio and video technologies study program (2007) in compliance to the development of the above mentioned fields in the last five years:

- Newly implemented courses (9%);
- Innovated courses (91%).

Courses have been innovated mostly comparing to the content of lectures and practise. Laboratory experiments have been alternated according to the software development and on the basis of the present market needs. Changes in the literature are related to the application of the most contemporary foreign literature, as well s new applications (workbooks, manuals and similar) published by subjected lecturers and assistants. At the same time, contemporary methods are applied so that students can adopt and master teaching materials in the highest level, enabling students to maximally used possibility of passing the exams thorough pre-exams duties.
<table>
<thead>
<tr>
<th>No.</th>
<th>Course</th>
<th>Y</th>
<th>S</th>
<th>Lt</th>
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</tbody>
</table>

Y - Year, S - Semester, Lt - Lectures, P - Practice, Lb - Laboratory work, ECTS - European Credit Transfer System
**Study Program:** AVT

**Type and Level of Studies:** Basic applied studies, First level of higher education

**Course Title:** Mathematics in Engineering

**Instructor(s):** Professor Ana Savic, PhD

**Course Status:** Compulsory

**Number of ECTS:** 6

**Prerequisites:** none

**Course Objectives:** Master matrix, systems of equations, statements, functions, and integrals to allow monitoring of professional electrical engineering subjects and extending the mathematical knowledge.

**Course Outcomes:** Students will be able to solve complex mathematical tasks related to the application of modern mathematical methods in the Electrical Engineering field.

**Course Content:**

*Theoretical instruction:*
1. The concept of matrix, characteristics and operations.
2. The concept of determinants and characteristics. Methods for calculation.
3. Inverse matrix.
5. A number of series, basic characteristics and limits.
6. Functions: basic properties and limits.
7. Derivative of functions.
10. Examination of functions characteristics and drawing graphics.
11. Indefinite integrals.
12. Definite integrals.
13. Calculating arc length using integration.
14. Calculating volumes and areas using integration.

*Practical instruction (Problem solving sessions/Lab work/Practical training):*
Practical classes follow a teaching program and go through the exercises in computer laboratory using software packages Octave and Maxima.

**Textbooks and References:**

**Number of active lessons:** 75

| Lectures: 30 | Exercises: 30 | Other: 15 | Research study: |

**Instruction methods:** Lectures, calculation exercises, laboratory exercises, consultations, term papers, defense laboratory exercises and written exam, oral exam.

**Grading (maximum number of points: 100)**

<table>
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<tr>
<th>Preliminary activities</th>
<th>Points</th>
<th>Final Exam</th>
<th>Points</th>
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<tbody>
<tr>
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<td>Written exam</td>
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<td>Practical work</td>
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<td>Oral exam</td>
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<td>Colloquium(s)</td>
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<td>Seminar(s)</td>
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SYLLABUS

Study Program: AVT, ASUV, ELITE, EPO, NET, NRT, RT

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Electrical Engineering

Instructor(s): Sonja N. Krstić PhD, Jadranka M. Ajčević

Course Status: Compulsory, Elective

Number of ECTS: 6

Prerequisites: none

Course Objectives: Acquisition of basic knowledge in electrotechnics field

Course Outcomes: Knowledge of operation and characteristics of generators, resistors, coils and capacitors in the networks with a time constant and periodic currents

Course Content:

Theoretical instruction:
1. Electrostatics: Coulomb’s law, electric field vector, the electric potential.
2. Electrostatics: Potential difference and voltage, capacitors and capacitance.
3. Electrical networks with a time constant currents: Electric current, electric circuits, resistance, resistors and conductors.
4. Electrical networks with a time constant currents: Electrical work and power, sources of electric current; Kirchhoff’s laws.
5. Electrical networks with a time constant currents: Solving electrical networks; electrical networks theorems: superposition theorem
6. Electrical networks with a time constant currents: Thévenin’s theorem
7. Electromagnetism: Magnetic field, magnetic field of current contours in the vacuum
8. Electromagnetism: Magnetic properties of materials, electromagnetic induction
9. Electromagnetism: Inductive elements and inductance
10. Electrical networks with periodic currents: Electrical network with periodic currents, R (resistive) elements (serial and parallel connection of resistors)
11. Electrical networks with periodic currents: L (inductive) and C (capacitive) elements (serial and parallel connection); power and power factor
12. Electrical networks with periodic currents: Basic notions during the change of the working regime in electrical networks

Practical instruction (Problem solving sessions/Lab work/Practical training):
1. Introduction to the software package Electronics Workbench (EWB), The basic elements, the sources of power supply, indicators and instruments in EWB;
2. Ohm’s law;
3. Kirchhoff’s laws;
4. Thévenin’s theorem;
5. Resistor in the circuit of alternating current (AC circuit);
6. Capacitor in AC circuit;
7. Electromagnetic coil in AC circuit;
8. Serial RLC circuit;
9. Parallel RLC circuit;

Textbooks and References:
2. S. Krstić, I. Đukić, Zbirka zadataka iz elektrotehnike - Elektrostatička - Vremenski nepromenljive električne struje; Zbirka zadataka iz elektrotehnike - Elektromagnetizam - vremenski promenljive električne struje, VETŠ, Beograd

Number of active lessons: 75

Other classes:
Lectures: 30  Exercises: 30  Other: 15  Research study: 15

Instruction methods:

Grading (maximum number of points: 100)

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**Study Program:** AVT, NRT

**Type and Level of Studies:** Basic applied studies, First level of higher education

**Course Title:** Fundamentals of IT

**Instructor(s):** Ph.D Slobodanka S. Djenic

**Course Status:** Optional

**Number of ECTS:** 6

**Prerequisites:** none

**Course Objectives:** The lectures should make the students able to develop and use modern systems (for: collecting, processing and transporting informations) using actual programming tools.

**Course Outcomes:** Students are able to understand development and use of actual information technologies.

**Course Content:**

- **Theoretical instruction:**
  1. Introductory lecture
  2. IT Fundamentals
  3. Computing Systems
  4. Informations and Hardware
  5. Informations and Software
  6. Informations and Operating Systems
  7. Information Systems
  8. Computer Networking and Informations Security
  9. Communications and Learning via the Internet
  10. Course summary and self-evaluation

- **Practical instruction (Problem solving sessions/Lab work/Practical training):**
  1. Learning Management Systems
  2. Operating Systems
  3. Command-line Interfaces
  4. Linux Office Tools
  5. Windows Office Tools
  6. Database Tools
  7. Cryptography Tools
  8. Internet based Tools
  9. Communications and Learning via the Internet
  10. Websites: Wikis and Bloogs

**Textbooks and References:**


**Number of active lessons:** 75

**Instruction methods:** Lectures, laboratory exercises, consultations, colloquium, final exam.

**Grading (maximum number of points: 100)**

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**Study Program:** AVT

**Type and Level of Studies:** Basic applied studies, First level of higher education

**Course Title:** Electroacoustic

**Instructor(s):** Professor Radmila Vukić, PhD

**Course Status:** Compulsory

**Number of ECTS:** 6

**Prerequisites:** none

**Course Objectives:** Students master basics of acoustic and electroacoustic transducers.

**Course Outcomes:** Students will be trained to independently solve the basic problems of physical, room and physiological acoustics.

**Course Content:**

**Theoretical instruction:**
1. Introductory class. Basic terms of acoustics.
3. The intensity of sound. Simple and complex sound. At the same time several radiation sources. Sound attenuation.
5. Basic terms of physiological acoustics. Sense of hearing. Outer, middle and inner ear.
6. A sense of sound intensity and height. The sound intensity and height and timbre. Audible area of the ear. Decibels, fons and sons.
9. The intensity of sound in the room. Sound absorbers. The geometric shape of the room.
10. Analogy.
11. The basic terms of electroacoustic. Microphones.

**Practical instruction (Problem solving sessions/Lab work/Practical training):**
1. Measuring sensitivity of the ear.
3. Examination of the distribution of sound pressure in the room.
4. Measurement of the reverberation time

**Textbooks and References:**

**Number of active lessons:** 75

**Other classes:**

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

**Grading (maximum number of points: 100)**

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**Study Program:** AVT, RT

**Type and Level of Studies:** Basic applied studies, First level of higher education

**Course Title:** Mass Media

**Instructor(s):** Lelica J. Kostic, PhD

**Course Status:** Elective

**Number of ECTS:** 6

**Prerequisites:** none

**Course Objectives:** Is to introduce student to Mass media studies.

**Course Outcomes:** Gaining knowledge required for working, presenting and participating in Mass media.

**Course Content:**

*Theoretical instruction:*

*Practical instruction (Problem solving sessions/Lab work/Practical training):*
Accompanies the lectures.

**Textbooks and References:**

**Number of active lessons:** 75

**Instruction methods:**

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**Study Program:** AVT, NCT, CT

**Type and Level of Studies:** Basic applied studies, First level of higher education.

**Course Title:** Digital Multymedia 1

**Instructor(s):** Dragoljub B. Martinović, PhD

**Course Status:** Electable

**Number of ECTS:** 6

**Prerequisites:** Knowing the basic concepts of digital signal representation and the use of computer

**Course Objectives:** Introduction to the principles of digital multimedia. Acquisition of practical knowledge in the use of software designing multimedia contents including text, graphics and animation.

**Course Outcomes:** Skills to students of graphic elements using Photoshop tool Flash-animation, as well as to all the multimedia elements into Web or a Web site using Dreamweaver.

**Course Content:**

**Theoretical instruction:**
1. ICT Fundamentals and media classification
2. Signal Digitalisation
3. Language and letter, symbols, characters and fonts
4. Acoustic base: sound, noise, speech and music
5. Language and oral communication
6. Audio signal acquisition systems
7. Audio signal transmission systems
8. Audio signal reproduction systems
9. Light and image perception
10. Bitmaps Graphic
11. Vector Graphic
12. Video signal acquisition systems
13. Video signal transmission systems
14. Hypertext, hipper media, Web technologies and multimedia programing
15. Multimedia Applications and Systems

**Practical instruction (Problem solving sessions/Lab work/Practical training):**
Laboratory exercises includes exercises from the three software tools: Adobe Photoshop for graphics, Adobe Dreamweaver for the development of Web and combine all the components of multimedia, and Adobe Flash for the development of animation and embedding interactivity.

**Textbooks and References:**

**Number of active lessons:** 75

**Instruction methods:**

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Study Program: AVT, NRT, NET, EPO, RT
Type and Level of Studies: Basic applied studies, First level of higher education
Course Title: Electronics
Instructor(s): Slavica Marinković, PhD, Radmila Vukić, PhD
Course Status: Elective
Number of ECTS: 6
Prerequisites: Familiarity with basic principles of electrical circuit theory and higher mathematics.
Course Objectives: Understanding of basic components of electronic devices, basic analog and digital circuits and their application.
Course Outcomes: Students will acquire knowledge about fundamental characteristics and application of electronic components, basic analog electronic circuits, power supplies and logic circuits.

Course Content:
Theoretical instruction:
1. Introductory lecture (electronics engineer professional profile, organization and course syllabus, relation to other courses).
2. Electronics, importance, fields of applications, history and development of electronics.
3. Atomic structure of matter, basic characteristics of conductors, semiconductors and insulators.
5. Integrator and differentiator circuits, electronic circuit components: transformers, relays, quartz crystal
6. PN junction, diodes.
7. Bipolar junction transistors.
8. Field effect transistors (JFET, MOSFET).
10. Operational amplifier: basic circuits with operational amplifiers.
12. Logic circuits: operation principles and basic characteristics.
13. Basic combinational and sequential circuits.
15. Knowledge test.

Practical instruction (Problem solving sessions/Lab work/Practical training):
Instruments and laboratory equipment, Linear circuits with passive components, Semiconductor diodes and basic diode circuits, Transistors and basic circuits with bipolar junction transistors, Operational amplifier, Logic circuits, D flip-flop

Textbooks and References:

Number of active lessons: 75
Other classes:
Lectures: 30  Exercises: 15  Other: 30  Research study:

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

Grading (maximum number of points: 100)
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Study Program: AVT

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Fundamentals of TV

Instructor(s): Jadranka Ajčević

Course Status: Elective

Number of ECTS: 6

Prerequisites: none

Course Objectives: to introduce the basic principles and postulates underlying the functioning of the television

Course Outcomes: to identify the structure and form of analog and digital video signals, and devices to work with different levels of quality in television systems.

Course Content:

Theoretical instruction:

1. Light and visual system.
2. The science of color. The basic principles of colorimetry.
3. Analysis, synthesis and image synchronization.
4. The sensors for the analysis and synthesis of images.
7. The formation and transmission of analog video signals. Composite and component analog video signals.
8. Analog television systems (PAL, NTSC and SECAM).
12. Analog and digital transmission of television signals.

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

Textbooks and References:
1. M. Petrovic – lectures in the form of PowerPoint presentations;

Number of active lessons: 75

Instruction methods:

Grading (maximum number of points: 100)

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Other classes:

Lectures: 30  Exercises: 45  Other:  Research study:
Study Program: AVT, NRT

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Computer Graphics

Instructor(s): Professor Dusan Starcevic, PhD

Course Status: Elective

Number of ECTS: 6

Prerequisites: none

Course Objectives: The program aims to familiarize students with basic theoretical knowledge and practical approaches in the scientific field of computer graphics. The program takes place during one semester of teaching through lectures and exercises.

Course Outcomes: Students will be able to effectively use chosen commercial software systems in the field of computer graphics and follow the technological advances.

Course Content:

Theoretical instruction:
2. Graphics Hardware,
3. Output – Only Technology,
4. Input Technology,
5. Interaction and Logical Devices.
6. Fundamentals of Interactive Graphics Programming,
11. Scan-Converting Polygons.
14. Graphical User Interfaces(GUI).

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


Textbooks and References:

Number of active lessons: 75

Instruction methods: Lectures, laboratory exercises, consultations, colloquiums, knowledge tests, final exam.

Grading (maximum number of points: 100)

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Study Program: AVT

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Audio electronics

Instructor(s): Dragan Drinčić

Course Status: Elective/compulsory

Number of ECTS: 6

Prerequisites: Basics of Electroacoustics, Basics of Audio Techniques

Course Objectives: To give student the knowledge of concepts and principles concerning audio equipment and component

Course Outcomes: To be able to fully understand working principles of audio equipment and component.

Course Content:

Theoretical instruction:
1. Introduction to audio electronics.
3. Operational amplifiers.
4. Audio switching and connecting components.
5. Basic circuits for measuring and indicating the level of audio signals.
7. Loudspeakers and loudspeaker crossovers.
8. Small signal audio amplifiers (microphone, correction, line).
9. Audio transformers (microphone, line, autotransformers).
11. Rectifiers and power supplies.
12. Audio signal generators and noise sources.
15. Audio circuits basic measurements.

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

Textbooks and References:

Number of active lessons: 75

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

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Study Program: AVT

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: English Language

Instructor(s): Vesna Jokanovic

Course Status: Elective

Number of ECTS: 6

Prerequisites: none

Course Objectives: is to train students to be able to communicate in English using general or professional terms.

Course Outcomes: In the end of semester students will be able to communicate in English and to use professional literature.

Course Content:

Theoretical instruction:
1. Everyday uses of computers. Types of computers
2. Parts of computer. Keyboard and mouse
3. Interview: Student. Input devices
4. Output devices. English tenses – active form
5. Storage devices. Graphical user interface
6. Interview: Computing support assistant. English tenses – continuous form
7. Networks. Communications
8. The Internet 1: E-mail and newsgroups. The passive voice
10. World processing. Databases and spreadsheets
11. Graphics and multimedia. Indirect speech
13. Future trends. Sequence of tenses
14. Interview: IT Manager. Issues in computing
15. Careers in computing. Interview: Systems manager

Practical instruction (Problem solving sessions/Lab work/Practical training):
Reading, writing, pronunciation and listening according to class subject.

Textbooks and References:
3. Different English language grammars, journals, Internet texts etc.

Number of active lessons: 75

Other classes:
Lectures: 30  Exercises: 30  Other: 15  Research study: 15

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

Grading (maximum number of points: 100)

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Study Program: AVT, EPO, NET, NRT

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Application Software

Instructor(s): Radmila Vukić, PhD

Course Status: Elective

Number of ECTS: 6

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 programmes for word processing, presentation and cross calculations, using a basic Internet service, and to combine the implementation of various programs

Course Content:

Theoretical instruction:
1. Introductory lecture (the organization and content of the course) Application software, Microsoft Office, Open Office.
2. Basic word processing techniques.
3. Entering and editing text, formatting text, characters, paragraphs and pages.
4. Advanced word processing techniques. Embedding objects in text.
5. Tables; Equation.
6. Processing longer texts; Styles.
7. Spreadsheets. Basic concepts.
8. Edit cell content, editing a worksheet; principle.
10. Functions, basic application techniques.
12. Presentations. Basic rules to create and display presentations, making slide.
14. Internet services. Search, e-mail, discussion lists, publishing presentations on the Internet.
15. Combined use of different programs.

Practical instruction (Problem solving sessions/Lab work/Practical training):
Practical classes follow a program of lectures.

Textbooks and References:
2. ECDL literature - Modules 3, 4, 6 and 7
3. Online preparation: www.ecdltest.rs

Number of active lessons: 75

Other classes:
Lections: 30
Exercises: Other: 45
Research study:

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

Grading (maximum number of points: 100)

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**Study Program:** AVT  
**Type and Level of Studies:** Basic applied studies, First level of higher education  
**Course Title:** TV Systems and Video Technologies  
**Instructor(s):** Mile Petrovic, PhD  
**Course Status:** Elective  
**Number of ECTS:** 6  
**Prerequisites:** Knowledge of basic concepts of television picture  
**Course Objectives:** to introduce the technology and equipment used in television, as well as practical design and implementation of analog and digital TV systems.  
**Course Outcomes:** to enable engineers to work in the TV studio, and manager - of Engineers for the design, implementation, maintenance and purchase of TV equipment.

**Course Content:**  
**Theoretical instruction:**  
1. Introduction..Analogni and digital TV systems.  
2. Standards in analogue and digital television.  
3. Understanding the technology and equipment used in TV systems: servers, cameras, magnetoscopes, monitors, mixers, A / V distribution, speakers, microphones ...  
4. Synchronization of analog and digital devices in the TV system. The timing device in the TV system.  
5. Design of analog TV systems.  
6. Design of digital TV systems.  
7. Design of hybrid TV system.  
8. Design of analog and digital TV systems via the Internet.  
9. TV in car (SD and HD).  
10. Realization of TV system with devices of different formats.  
11. Monitoring systems in the TV (CRT, LCD, plasma, LED, multiviewer-and measurement equipment).  
12. Hardware and software for automatic broadcasting of TV programs.  
13. Video (Playout) servers.

**Practical instruction (Problem solving sessions/Lab work/Practical training):**  
Design and implementation of an analog video system. Design and realization of analog audio systems. Realization of an analog video / audio system. Design and implementation of a hybrid TV system (analog + digital equipment). Design and implementation of digital TV systems. The TV system with playout servers - the practical work. Computer-broadcast TV program. Exercise on TV: RTS and FIRST.

**Textbooks and References:**  
1. M. Petrović: Practicum for Laborat. Exercises, High School of Computer Science, Belg. 2010  

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

**Grading (maximum number of points: 100):**

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**Study Program:** AVT  
**Type and Level of Studies:** Basic applied studies, First level of higher education  
**Course Title:** Recording Studios Equipment  
**Instructor(s):** Dragan Drincic  
**Course Status:** Elective/compulsory  
**Number of ECTS:** 6  
**Prerequisites:** Basics of Electro acoustics, Basics of Audio Technics

**Course Objectives:** To give student the knowledge of concepts and principles concerning studio systems and equipment  
**Course Outcomes:** To be able to fully understand and work in the proper studio environment

### Course Content:

**Theoretical instruction:**
1. Basic characteristics and subdivision of audio equipment.  
4. Digital audio mixers.  
5. Audio signal flow.  
6. Filters and equalizers.  
7. Dynamic signal processors.  
8. Signal delay processors and artificial reverberation equipment.  
9. Analog signal recording equipment.  
10. Digital audio recording equipment.  
11. Audio signal metering.  
13. Audio equipment connections and adjustment.  
15. Basic control room and studio parameters.

**Practical instruction (Problem solving sessions/Lab work/Practical training):**
1. Analog audio mixers - Understanding the functions and convenient operation;  
2. Digital audio mixers - Understanding the functions and convenient operation;  
3. Audio processors - practical work and setting;  
4. Artificial reverberation processors - practical work and setting,  
5. Studio and control room equipment connection;  
6. Audio signal monitoring, measuring and level adjusting.

### Textbooks and References:
2. F. A. Everest, Critical Listening Skills for audio Professionals, Course Technology.  

### Number of active lessons: 75  
**Other classes:**
- Lectures: 30  
- Exercises: 15  
- Other: 30  
- Research study: 30

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

### Grading (maximum number of points: 100)

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<th>Preliminary activities</th>
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</table>
**Study Program:** AVT

**Type and Level of Studies:** Basic applied studies, First level of higher education

**Course Title:** Image recording

**Instructor(s):** Jordan R. Isailović, PhD

**Course Status:** Elective

**Number of ECTS:** 6

**Prerequisites:** none

**Course Objectives:** Combining the knowledge and techniques for digital image recording and processing with esthetic principles of digital photography.

**Course Outcomes:** Students will learn techniques of recording and editing digital images.

**Course Content:**

**Theoretical instruction:**
2. Characteristics of a digital photo camera: lens construction, types of lenses
5. Composition in photography
6. Architecture and landscape photography: problems of perspective distortion
7. Sensor construction in digital photo cameras. Sensor sensitivity and the problem of ‘noise’ in digital photography
9. Dynamic range and tonal quality in digital photography
10. Digital images formats, RAW format
11. HDR digital image, techniques for shooting and creating HDR photography
12. Portfolio – defining the individual students' style for series of photographs: choosing a theme and lenses.

**Practical instruction (Problem solving sessions/Lab work/Practical training):**
Recording and editing the digital images in Adobe Photoshop, Photomatix.

**Textbooks and References:**

**Number of active lessons:** 75

| Lectures: 30 | Exercises: 30 | Other: 15 | Research study: |

**Instruction methods:**

Grading (maximum number of points: 100)

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**Study Program:** AVT

**Type and Level of Studies:** Basic applied studies, First level of higher education

**Course Title:** MIDI and Sound Synthesis

**Instructor(s):** Ljiljana Stanimirović, PhD

**Course Status:** Elective

**Number of ECTS:** 6

**Prerequisites:** DSP Course

**Course Objectives:** Working in the field of Digital Signal Analysis and Processing and Sound Synthesis, it’s important to know basic algorithms and procedures of digital and analog signal processing, basic concepts of MIDI protocols and device communication in different audio and video applications, machines, devices, gadgets, etc.

**Course Outcomes:** Better understanding of digital signals, digital and analog signal processing and systems, basic concepts of DSP technologies and MIDI concept.

**Course Content:**

*Theoretical instruction:*
1. MIDI protocol: History and development.
2. MIDI: messages structure.
3. General MIDI, MIDI time code.
4. Synchronization via MIDI protocol.
5. Introduction to sound synthesis.
6. Additive synthesis.
7. Subtractive synthesis.
8. FM synthesis 1
9. FM synthesis 2.
10. Wavetable synthesis.

*Practical instruction (Problem solving sessions/Lab work/Practical training):*
1. Demonstrations in different software – modules.
2. MIDI and DSP equipment and devices.

**Textbooks and References:**

**Number of active lessons:** 75

**Instruction methods:** Lectures, laboratory exercises, consultations, colloquiums, final exam.

**Grading (maximum number of points: 100)**

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</table>
Study Program: EPO, NET, NRT, RT

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Fundamentals of Management

Instructor(s): Živorad M. Vasic, PhD

Course Status: Elective

Number of ECTS: 6

Prerequisites: None

Course Objectives: The goal of this course is to acquire basic knowledge of business management systems.

Course Outcomes: After completion of the course students will be able to manage affairs in the existing company functions such as production, marketing, finance and others.

Course Content:

Theoretical instruction:
1. Introduction to management theory and definition of management.
2. The development of management theory.
4. Functional areas of management. Managing research and development, marketing.
5. Management, production management, human resources and finance.
6. Planning process. Types of plans and the content of individual plans.
7. The process of organizing. The principles of organization, definition and development of organizational structures
8. The process of personnel. Determining the need, finding, selecting and receiving personnel.
9. The process of leadership. Direction and coordination, and communication, decision-making managers.
10. The process control. Phase control, the principles of control, process control in the company.
11. The decision making process. Defining the decision-making on enterprise development, methods.
12. Information system for management of the company. Information and Information Systems.
13. Manager. The role, duties and selection of managers, selection, education and training of managers, leadership.
14. Project Management. The organization, planning, monitoring and supervision of project.

Practical instruction (Problem solving sessions/Lab work/Practical training):
Auditory exercises follow the lectures, where students solve real problems and analizraju case studies in the field of planning and decision making

Textbooks and References:

Number of active lessons: 75
Other classes:
Lectures: 30 | Exercises: 45 | Other: | Research study:

Instruction methods:

Grading (maximum number of points: 100)

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**Study Program:** NET

**Type and Level of Studies:** Basic applied studies, First level of higher education

**Course Title:** Electrical Lighting Design

**Instructor(s):** Ivana Vlajić-Naumovska

**Course Status:** Elective

**Number of ECTS:** 6

**Prerequisites:** Knowledge of basic concepts in electrical engineering.

**Course Objectives:** Introduce students to the design and execution of electrical lighting.

**Course Outcomes:** Students will be able to design and execute of electrical lighting.

**Course Content:**

**Theoretical instruction:**
1. Introductory lecture (the organization and content of the course). Technical regulations for the execution of the electrical lighting. Standards. Technical recommendations.
3. Photometric sizes and units.
4. Electrical light sources. Classification and the principles of operation.
8. Calculation of indoor lighting. Integration of daylight and artificial light.
12. Lighting of roads.
13. Tunnel lighting.
15. Computer design of the electrical lighting.

**Practical instruction (Problem solving sessions/Lab work/Practical training):**
Practical training program follows the lecture.

**Textbooks and References:**
1. Technical regulations JUS, SRPS, IEC, from section of the EI
3. M. Kostić, Guide through the world of lighting technology, Faculty of Electrical Engineering University of Belgrade, 2000. (in Serbian)
4. M. Kostić, Lighting of roads, Faculty of Electrical Engineering University of Belgrade, 2006. (in Serbian)

**Number of active lessons:** 75

**Instruction methods:** Interactive teaching methods work in lectures, exercises and consultations with the aim of encouraging student initiative. Numerical exercises are typical examples according to lessons.

**Grading (maximum number of points: 100)**

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Study Program: AVT

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Musical Instruments

Instructor(s): Sonja V. Krstić, PhD

Course Status: Elective

Number of ECTS: 6

Prerequisites: none

Course Objectives: Students are educated to be able to read orchestral sheets and to achieve basic knowledge about musical instruments.

Course Outcomes: Students will be able to attend courses of Audio recording, Audio wiring and Musical production successfully.

Course Content:

Theoretical instruction:
1. Introduction. Notes, keys, note frequencies.
2. Intervals. Just and equal temperament scales.
3. Major scale. The circle of fifths.
4. Minor scale. Some other scales.
8. String instruments. Tonal and directional characteristics.
9. Woodwind and brass instruments. Tonal and directional characteristics.
11. Percussion instruments.
14. Chamber orchestra, philharmonic orchestra and other ensembles.

Practical instruction (Problem solving sessions/Lab work/Practical training):
Practical training program follows the lecture.

Textbooks and References:

Number of active lessons: 75

Other classes:

Lectures: 45  Exercises: 30  Other:  Research study:

Instruction methods: Lectures, laboratory exercises, consultations, written exam.

Grading (maximum number of points: 100)

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</table>
**Study Program:** AVT  
**Type and Level of Studies:** Basic applied studies, First level of higher education  
**Course Title:** Room Acoustics  
**Instructor(s):** Dragan Drincic  
**Course Status:** Elective/Compulsory  
**Number of ECTS:** 6  
**Prerequisites:** Basics of Electro acoustics, Basics of Audio Technics.  
**Course Objectives:** To give student the knowledge of concepts and theories concerning the acoustical properties of buildings, building elements and materials, noise prevention and abatement and of rules, standards, and legislation concerning noise.  
**Course Outcomes:** To be able to solve problems and implement solutions and rules concerning acoustical properties of buildings, building elements and materials, noise prevention and abatement.  

**Course Content:**  
**Theoretical instruction:**  
1. Basic definitions and terms.  
2. Spectral sound analysis.  
3. Noise - characteristics, measurement and reduction.  
4. Sound transmission through partitions.  
5. Sound mufflers.  
6. Sound field in enclosed spaces (volume of room, reverberation time).  
7. Sound absorbers.  
8. Sound diffusers.  
9. Room impulse response.  
10. Design of rooms for speech and music.  
11. Recording studio and control room design.  
13. Rooms for acoustical measurements (reverberation rooms and anechoic rooms).  
14. Room acoustic measurements.  

**Practical instruction (Problem solving sessions/Lab work/Practical training):**  
1. Equipment and measuring signals.  
2. Noise level and spectrum.  
3. Transmission loss of partitions.  
4. The measurement bandwidth of floors and ceilings.  
5. Transmission loss of facades.  
6. Reverberation time - calculation and measurement.  
7. Distribution of sound pressure levels in rooms at low frequencies.  
8. Frequency characteristics of the source in the room.  
9. Acoustic distortions due to comb-filtering.  
10. Room impulse response - measurement and analysis.  
11. Measurement of acoustical characteristics of rooms using the software package EASERA.  
12. Simulation of room acoustics.  

**Textbooks and References:**  

**Number of active lessons:** 75  
**Other classes:**  
Lectures: 30  
Exercises: 15  
Other: 30  
Research study:  

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

**Grading (maximum number of points: 100)**  

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Study Program: AVT

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: TV Cameras

Instructor(s): Jadranka M. Ajčević

Course Status: Elective

Number of ECTS: 6

Prerequisites: Picture Filming Techniques

Course Objectives: Acquiring knowledge of the TV cameras, as well as mastering the recording techniques with TV cameras

Course Outcomes: Training for the work with a TV camera.

Course Content:

Theoretical instruction:
1. General block diagram of TV camera, functional description of sub-assemblies of TV camera
2. Optical system of TV camera: objective, system for color separation, filters.
3. Optoelectronic system of TV camera, CCD sensors.
4. Signal processing system for TV camera. Control system for TV cameras, power supply.
5. Additional equipment: viewfinder, audio equipment, stands and supports
6. Camcorders (functional description, sub-assemblies, division, file formats).
8. Lighting (type, the division, setting up lighting).
9. The composition of images (the basic elements of image, scene composition).
10. TV cameraman, basic characteristics, work rules and obligations of TV cameraman.
11. TV studio camera (functional description, sub-assemblies, the division).
12. Special TV cameras, TV cameras in security systems, IP television cameras.
13. Special TV cameras, thermovision, TV cameras in medicine.

Practical instruction (Problem solving sessions/Lab work/Practical training):
1. Introduction to the TV camera sub-assemblies
2. Introduction to the operational functions of the TV cameras
3. Optical part of the TV cameras, automatic light regulation
4. Adjusting the white and black level
5. Camera power supply: battery types and battery handling
6. Diagnose the status of TV cameras and servicing of TV cameras
7. Lighting: devices for lighting, filters, setup lightning
8. The basic elements of television language, rules of recording
9. Independent recording in studio and on the field
10. Analysis of recorded TV material

Textbooks and References:

Number of active lessons: 75

Instruction methods:

Gradning (maximum number of points: 100)

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**Study Program:** AVT  
**Type and Level of Studies:** Basic applied studies, First level of higher education  
**Course Title:** Digital TV  
**Instructor(s):** Jadranka Ajčević  
**Course Status:** Elective  
**Number of ECTS:** 6  
**Prerequisites:** Fundamentals of television  
**Course Objectives:** Introduction to the principles, technology and devices used in digital television.  
**Course Outcomes:** Training for engineer tasks in the field of digital television.  

### Course Content:  
**Theoretical instruction:**  
1. The introductory lecture. Digital television systems in Europe and worldwide.  
2. The structure of digital television systems (SDTV, EDTV and HDTV).  
5. Compression of images with movement. Standards: H.261, H.264, MPEG-1, MPEG-2, MPEG-4 and MPEG-7  
8. 3D and HD television systems.  
10. Transmission and reception of digital signals via satellite.  
12. The distribution of digital signals via optical, coaxial and HFC networks.  
13. Internet protocols. Transfer digital video signals over the Internet (IPTV).  
14. Digital TV receivers  

**Practical instruction (Problem solving sessions/Lab work/Practical training):**  
1. Introduction to digital HD television studio.  
3. Digital interfaces.  
4. Configure the TV system with digital image sources.  
5. Influence of different types and levels of compression on image quality.  
6. The exercises in the software package Adobe Premiere Pro.  

**Textbooks and References:**  

**Number of active lessons:** 75  
**Other classes:**  
- Lectures: 30  
- Exercises: 45  
- Other: Research study  

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

**Grading (maximum number of points: 100)**  

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**Study Program:** AVT

**Type and Level of Studies:** Basic applied studies, First level of higher education

**Course Title:** Sound Recording

**Instructor(s):** Dragan Drincic

**Course Status:** Elective

**Number of ECTS:** 6

**Prerequisites:** Basics of Electro acoustics, Basics of Audio Technics

**Course Objectives:** Introducing audio recording equipment and systems, and audio recording technics.

**Course Outcomes:** Upon the completion of the course students should be able to be a successful audio recording operators.

**Course Content:**

**Theoretical instruction:**
1. Basic principles of sound recording.
4. Introduction to Stereo Microphone Technique.
6. Introduction to Surround Microphone Technique.
7. Microphone selection and placement for voice recording.
8. Introduction to musical instruments.
10. Microphone selection and placement for audio effects and environmental sound recording.
11. Microphone selection and placement for picture sound recording (Film and TV).
12. Microphone selection and placement for recording and emitting live programs (Theatre, Sport events, Concerts.).

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

**Textbooks and References:**

**Number of active lessons:** 75

**Other classes:**

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

**Grading (maximum number of points: 100)**

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**Study Program:** AVT  
**Type and Level of Studies:** Basic applied studies, First level of higher education  
**Course Title:** Animation Basics  
**Instructor(s):** Snežana Trstenjak  
**Course Status:** Elective  
**Number of ECTS:** 6  
**Prerequisites:** none  
**Course Objectives:** Mastering basic and practical knowledge in areas of film and TV animation, Internet and digital animated presentation.  
**Course Outcomes:** Students will be able to individually or in team work on two-dimensional animated forms from cartoons to experimental and collaged forms. Practic work is based on drawing and photographic technologies and programs such as CTP, Macromedia Flash, Photoshop and Premier.

**Course Content:**

**Theoretical instruction:**
1. Introduction, retinal persistence, terms, terminology, technology historical overview and development of classical film animation.  
2. Technology of classic animation from idea to projection copy. Finding possibilities, benefits and restrictions in using different softwares in making animated forms  
3. Screenplay and storyboard. Sequential graphic arts  
4. Stop frame technologies. Space technologies of animated film  
5. Condition of media, basic color mods (RGB, HSV, CMYK), input/output video devices. Object transformation (translation, rotation and scaling)  
6. Cartoon computer technologies, from poses to card recording. Raster and vector graphic systems. Keyframe animation  
7. Static and dynamic composition, framing, moving and timing. Camera animation. Digital picture and its values  
8. Technical animation. Animated graphic product design. Psychodynamics of color and interaction between colors, color palettes, text use  
10. Implementation of speech - from phonogram to phase vocalization  
11. Animation for television, network and CD forms  
12. Grammar, recording and directing of animated films, film planning, angles  
13. Picture and audio editing of animated film  
14. Animation for special effects, computer animation, keyframe animation, 3D coordinate system and its inner transformations  
15. Animator in professional environment, individual and team production

**Practical instruction (Problem solving sessions/Lab work/Practical training):**
Drawing practice, reducing characters to primary, individual drawings, practice of stop-frame animation. Group practice of making animated forms, phonogram making and vocalization. Making animated forms by using different computer programs. Picture and audio editing of animated film.

**Textbooks and References:**
1. B. Dovinković, Mala škola crtanog filma, Zagreb 1983.  

**Grading (maximum number of points: 100)**

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**Number of active lessons:** 75  
**Other classes:**

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**Instruction methods:** Lectures, with video projection, practical with projections and corrections.
Study Program: AVT

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Computer Animation 1

Instructor(s): Snežana Trstenjak

Course Status: Elective

Number of ECTS: 6

Prerequisites: none

Course Objectives: Overcoming practical knowledge in areas of 3D modeling and computer animation.

Course Outcomes: Students will be able to individually or in team work realize complex projects in area of intermediate technical level of computer animation.

Course Content:

Theoretical instruction:
1. Introduction, terms, terminology of computer animation. Condition of media, basic color mods (RGB, HSV, CMYK), input/output video devices. Polygonal representation of 3D objects, basic modeling, model construction from primary shapes
2. Maya driver interface, organization of algorithmic nodes, improving working environment, additional modules, 3D system of coordination and its inner transformations, transformations (rotation, translation, scaling), view transformations, clip planes
3. NURBS modeling, curves and surfaces, materialisation technology. Scene modeling, materialisation of complex contents, texture mapping, texture bump
4. Computer animation technologies, motion, timing, extreme technology, keyframe animation
5. Virtual space and time, complex dynamic form organization, connecting technologies and moving dependency, deformation. Lighting 1 – digital light sources and material attributes (building, setting, control and managing), light and lighting basics, lighting artifacts
7. Rendering 1 – picture finalization technology, Maya’s rendering algorithms, control and managing of process of finalization, raytrace rendering basics, anti-aliasing
8. Rendering 2 – artistic aspects of rendering, types of rendering (photorealistic and plastic-idealistic rendering), output formats, network rendering
9. Advanced technologies of computer animation 1 – procedural animation, dynamics, simulation. Advanced technologies of computer animation 2 – articulated structures animation, inverse cinematics, skeleton and skinning technology

Practical instruction (Problem solving sessions/Lab work/Practical training):
Maya workspace, basic operation and work modules. Modeling and materialization – polygonal and NURBS technologies
Computer technologies of animation, extreme technologies (keyframe animation), pose and motion, path, conditioned movement, deformations. Light, camera and rendering

Textbooks and References:

Number of active lessons: 75

Other classes:

Lectures: 45  Exercises: 30  Other: 30  Research study:

Instruction methods: Lectures, calculation exercises, laboratory exercises, consultations, term papers, defense laboratory exercises and written exam, oral exam.

Grading (maximum number of points: 100)

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</table>
**Study Program:** AVT

**Type and Level of Studies:** Basic applied studies, First level of higher education

**Course Title:** Video Production

**Instructor(s):** Dragan S. Dimićić

**Course Status:** Elective

**Number of ECTS:** 6

**Prerequisites:** Television Cameras, Digital Television

**Course Objectives:** This course teaches technical processes of video production for training and recognition of interdependent technical and artistic aspects in production of audiovisual forms.

**Course Outcomes:** Students will be trained to efficiently understand technical and artistic aspects of video production, with the ability to work in video production team.

**Course Content:**

*Theoretical instruction:*
1. Forms of video expression.
3. Movies and television grammar (1st part).
5. Movie and television genres.
6. Introduction to video analyses.
7. Video production crew.
8. Introduction to video technologies.
9. Preproduction and previzualization of audiovisual forms.
12. Postproduction of audiovisual forms.
13. Sound in video production.

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

**Textbooks and References:**

**Number of active lessons:** 75

**Other classes:**

**Instruction methods:** Lectures, Practical Training

**Grading (maximum number of points: 100)**

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Study Program: AVT

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Sound System Engineering

Instructor(s): Dragan Drincic

Course Status: Elective

Number of ECTS: 6

Prerequisites: Basics of Electro acoustics, Basics of Audio Technics

Course Objectives: To give the student a comprehension of the engineering and use of audio systems.

Course Outcomes: To be able to solve problems and work with audio systems.

Course Content:

Theoretical instruction:
1. Audio system's architecture. Definitions
2. Microphones in sound systems (types, directivity, sensitivity)
3. Loudspeakers in sound systems (directivity, coverage, direct radiator loudspeakers, line sources, horns)
4. Outdoors sound systems (Inverse square law. EAD, PAG, NAG, Electrical power)
5. Indoors sound systems (Critical distance, Acceptable S/N, EAD, NAG, PAG, FSM, NOM, Electrical power)
7. Sound systems equipment (Preamplifiers and Mixers, Sound processors, Attenuators, Crossovers, Power amps.)
8. Central and distributed sound systems (Loudspeaker clusters, Line arrays, Ceiling Loudspeaker systems)
9. Sound system equalization and stage monitoring.
10. Audio systems connecting devices (cables, jack fields and connectors)
11. Sound system powering, grounding and interconnection
13. Multimedia presentation systems and Electronic acoustical enhancement systems
14. Software tools for sound system engineering.

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

Textbooks and References:
1. Х. Ш. Куртовић, Озвучавање, Техничка књига, Београд 1982.

Number of active lessons: 75

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

Grading (maximum number of points: 100)

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Study Program: AVT

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Field and Studio TV Production

Instructor(s): Jadranka Ajčević

Course Status: Elective

Number of ECTS: 6

Prerequisites: Knowledge of basic concepts of image and analog and digital television signals.

Course Objectives: The introduction to the study process and outside the study TV production technology and equipment used in the study and outside the study TV production.

Course Outcomes: Is to enable engineers to work in the TV studio, and to work with devices that are used in the study and outside the study TV production.

Course Content:

Theoretical instruction:
1. The introductory lecture. Technologies used in the study and outside the study TV production.
2. Second Storage Media video (video servers, tape drives). Record and playback video signals of different formats.
3. TV studio. Light sources and lighting systems (heat, SRGB and LED).
4. Video Mixers and video effects.
5. Electronic graphics in television.
6. Communication systems in TV.
7. Capture life in the studio with a blue or green background (chrome – effect) directly to the computer processing and postproduction special effects.
8. Recording from two or more TV cameras in the system using a variety of effects on the video mixer.
10. Simulation of direct broadcast - recording three TV cameras using digital effects to video mixer, text and graphic files from your computer and hybrids for the sound of the audio mixer.
12. Computer editing.

Practical instruction (Problem solving sessions/Lab work/Practical training):
Practical exercises accompanying the lectures with the implementation of specific tasks in digital HD TV studio. Students during the semester divided into groups made concrete mini project in HD TV studio.

Textbooks and References:
1. M. Petrovic, lectures in the form of PowerPoint presentations.
2. M. Petrovic, Practicum for labs, the High School of Computer Science, Belgrade, 2010.

Number of active lessons: 75

Instruction methods: Lectures, consultations, laboratory exercises and practical tasks in the multimedia HD TV studio.

Grading (maximum number of points: 100)

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</table>
Study Program: AVT

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Marketing

Instructor(s): Dušan Bogdanović

Course Status: Elective

Number of ECTS: 6

Prerequisites: none

Course Objectives: Gaining knowledge about marketing and its application.

Course Outcomes: Acquiring knowledge about marketing and its application.

Course Content:

Theoretical instruction:
2. The behavior of consumers. The hierarchy of needs. The decision making process.
7. Direct marketing. Direct marketing and other media.
10. Internet Marketing: Internet marketing plan.
11. SEO website optimization and web analytics.
12. Email a function of Internet marketing.
13. Blog in the function of Internet marketing.
14. Social networks as a channel of communication Internet marketing.
15. Text advertising on the web.

Practical instruction (Problem solving sessions/Lab work/Practical training):
The exercises are held in the computer lab, according to the program objects. For exercise to gain the skills and knowledge in marketing activities.

Textbooks and References:
1. Dr Mladen Vićentić, Marketing, udžbenik, VIPOS Valjevo, 2011.

Number of active lessons: 75

Instruction methods: Lectures, Exercises, Consultation(s), Colloquium(s), Seminar(s), Final Exam.

Grading (maximum number of points: 100)

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</table>
**Study Program:** AVT  
**Type and Level of Studies:** Basic applied studies, First level of higher education  
**Course Title:** Sound Design  
**Instructor(s):** Zoran Maksimovic, PhD  
**Course Status:** Elective  
**Number of ECTS:** 6  
**Prerequisites:** none  
**Course Objectives:** Obtaining knowledge in the field of sound design, learning theory fundamentals as well as necessary practical tools and techniques.  
**Course Outcomes:** Qualifying a student for jobs related to sound design.

**Course Content:**

**Theoretical instruction:**
1. Sound processing equipment used for sound design  
2. Use of computers in the process of creating stereo image  
3. Syncing audio and video signals  
4. Sound editing  
5. Using MIDI protocol for creating stereo image  
6. Multichannel formats for sound reproduction  
7. Mixing in 2-channel stereo  
8. Mixing in 5.1 stereo  

**Practical instruction (Problem solving sessions/Lab work/Practical training):**
1. Creating a short radio commercial  
2. Designing sound for short video in 2-channel stereo  
3. Designing sound for short video in 5.1 stereo

**Textbooks and References:**
2. Nizbet A, Snimanje zvuka, FDU  

**Number of active lessons:** 75  
**Other classes:**

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<th>Lectures: 30</th>
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**Instruction methods:** Lectures, problem solving sessions, laboratory exercises, assignments, consultations, colloquiums, knowledge tests, final exam.

**Grading (maximum number of points: 100)**

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Study Program: AVT

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Music Production

Instructor(s): Đorđe Petrović

Course Status: Elective

Number of ECTS: 6

Prerequisites: Sound Recording, Sound Design

Course Objectives: Mastering the practical and theoretical knowledge necessary to produce music.

Course Outcomes: The training for work in music production.

Course Content:

Theoretical instruction:
1. Organization of work in the studio to produce music.
2. The role of music producer in the process of creating music clip.
3. The use of stereo mic techniques in recording music.
4. The use of close-miking techniques in the multi-channel recording music.
5. Specifics of the recording of acoustic musical instruments.
7. Specifics of recording electronic musical instruments.
9. Handlind dynamic of audio tracks during mixing process.
10. Special effects in music production.

Practical instruction (Problem solving sessions/Lab work/Practical training):
1. Multichannel recording of percussion instruments and drums. Organization of the recording, the division of work and communication with a musician.
2. Recording of electric instruments. Organization of the recording, the division of work and communication with a musician.
3. Recording strings. Organization of the recording, the division of work and communication with a musician.
4. Recording wind instruments. Organization of the recording, the division of work and communication with a musician.
5. Recording main and supporting vocals. Organization of the recording, the division of work and communication with a musician.
6. Outside the studio recording music.
7. Mixing music in studio environment.

Textbooks and References:
1. Nizbet A, Snimanje zvuka, FDU
2. Petrović Đ, Snimanje zvuka i tonska režija, skripte FMU

Number of active lessons: 75

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

Grading (maximum number of points: 100)

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</table>
Study Program: AVT

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Multimedia Production

Instructor(s): Jadranka Ajčević

Course Status: Elective

Number of ECTS: 6

Prerequisites: Basic knowledge of television technology and audio/video software

Course Objectives: Integration and implementation of skills and knowledge of audio and video editing, graphics, animation and special effects for creation of multimedia projects.

Course Outcomes: Students will develop skills for a realization of the creative multimedia projects, such as motion graphics, short videos with special effects and interactive presentations.

Course Content:

Theoretical instruction:
2. Processes of creating and designing multimedia. Phases of project.
5. Multimedia and television: advertising.
7. Motion graphics design
8. Images and colors in multimedia
9. Animation as part of multimedia
10. Interactivity
11. Exhibiting, archiving and distributing multimedia
12. Students’ discussions and analysis of multimedia projects

Practical instruction (Problem solving sessions/Lab work/Practical training):
Practical training in Final Cut Studio applications as well as Adobe After Effects, for the creation of multimedia projects (video and audio editing, advanced techniques, special effects, title design, motion graphic design, interactive DVD production).

Textbooks and References:

Number of active lessons: 75

Instruction methods: Lectures, Practical Training

Grading (maximum number of points: 100)

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Other classes:

Lectures: 30  Exercises: 45  Other: 0  Research study: 0
**Study Program:** AVT, NRT

**Type and Level of Studies:** Basic applied studies, First level of higher education

**Course Title:** Social Networks

**Instructor(s):** Slobodanka S. Đenić, PhD

**Course Status:** Elective

**Number of ECTS:** 6

**Prerequisites:** none

**Course Objectives:** Gaining theoretical and practical knowledge related to the field of social networking, networking, and participatory web, the technologies that are still in development.

**Course Outcomes:** Students are trained to use modern technology that is related with social networks and participatory Web (for designing applications and user interfaces) and to participate in the further development of these technologies.

**Course Content:**

**Theoretical instruction:**
1. First introductory lecture (organization and content of the course). Basic concepts.
2. Previous development of WWW. Web 2.0 and Web 3.0.
7. Social networking software.
8. Web 2.0 technologies. Interactive web: Ajax and APIs.
15. Web based social games.

**Practical instruction (Problem solving sessions/Lab work/Practical training):**
In the laboratory: following the lectures. The practical application of technologies to create social networks and mashups.

**Textbooks and References:**

**Number of active lessons:** 75

| Lectures: 30 | Exercises: 30 | Other: 15 | Research study: |

**Instruction methods:**

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</table>
Study Program: AVT

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Digital Design of Publications

Instructor(s): Dragoljub Martinović, PhD

Course Status: Elective

Number of ECTS: 6

Prerequisites: none

Course Objectives: Learning the elements of digital publishing and developing technical skills, that leads to successful creation of visual communication design.

Course Outcomes: Students will be able to digitally design different types of publications, combining appropriately visual elements and textual content.

Course Content:

Theoretical instruction:
1. Introduction to digital publishing. The basics of graphic design.
2. Form and content of graphic design: basic principles of composition.
3. Creative methodology, process of designing: planning, developing ideas
4. Typography
5. Illustration design
6. Integration of illustration and text
7. Book design: book structure, front, body and back matter
8. Book and magazine covers. Stylistic balance
9. Integration of the content and form
10. Design of advertisements, posters and billboards
11. Design of brochures and catalogues
12. Contemporary trends in digital publishing design

Practical instruction (Problem solving sessions/Lab work/Practical training):
Learning software for vector and raster graphics, combining vector and bitmap images, and their application in different publications (applications: Adobe Photoshop, Illustrator, InDesign).

Textbooks and References:
1. Miroslav Fruht, Milan Rakić, Ivica Rakić, Grafički dizajn - Kreacija za tržište, Zavod za udžbenike i nastavna sredstva, Beograd

Number of active lessons: 75

Lectures: 45  Exercises:  Other: 30  Research study:

Instruction methods:  

Grading (maximum number of points: 100)

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Study Program: AVT

Type and Level of Studies: Basic applied studies, First level of higher education

Course Title: Professional Practice

Instructor(s): Jadranka Ajcevic

Course Status: Compulsory

Number of ECTS: 4

Prerequisites: none

Course Objectives: Connect the knowledge acquired in class to the requirements of practical tasks.

Course Outcomes: Training for work in institutions and training for public oral presentation.

Course Content:

Theoretical instruction:

Practical work is carried out in appropriate professional factories, companies and public institutions, and organizations to carry out innovation activities, as well as the organization to provide infrastructural support Innovations.

Term paper defines a specific topic or task to professional practice (making certain device or program development or project management, development of technical - technological documentation, etc.) Mandatory contribution to the proper presentation of the paper.

Textbooks and References:

Number of active lessons: 75

Other classes:

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

Grading (maximum number of points: 100)

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**Study Program:** AVT, EPO, NET, NRT, RT, ELITE

**Type and Level of Studies:** Basic applied studies, First level of higher education

**Course Title:** Final Project

**Instructor(s):**

**Course Status:** Compulsory

**Number of ECTS:** 8

**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:** 75

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

**Grading (maximum number of points: 100)**

<table>
<thead>
<tr>
<th>Preliminary activities</th>
<th>Points</th>
<th>Final Exam</th>
<th>Points</th>
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<tbody>
<tr>
<td>Lectures activities</td>
<td>Written exam</td>
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<tr>
<td>Practical work</td>
<td>Oral exam</td>
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<td>Colloquium(s)</td>
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<td>Seminar(s)</td>
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The publication has been funded within the framework of the European Union Tempus programme which is funded by the Directorate General for Development and Co-operation - EuropeAid and the Directorate General for Enlargement.

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