



Development and Implementation of MDTV Curricula (DIMTV)

Work Package 2.3

Deliverable 2.3.2 - Developing Animation Module

Deliverable 2.3.3 - Developing Production/Post-production Module

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1. Introduction

In the scope of Work Package 2.3, the partner institutions have prepared several learning modules to innovate their curricula and follow the trends and demand in the labor market. Since the partner institutions have prepared to learn modules such as animation, production, and post-production, image processing, etc., which are interrelated, we are presenting these in a joint document, combining Deliverables 2.3.2. and 2.3.3.

The presentation of learning modules is organized in individual partner sections.



2. Development of learning modules per partner institution

2.1 Epoka University

Epoka University is a private Higher Education Institution in Albania that has a bachelor and master degree in “*Electronics and digital communication engineering*” and “*Computer Engineering*”. To meet expectations requirements of the labor market in Albania for higher qualified experts in the field of Multimedia and Digital Television, Epoka University has introduced an image processing module for bachelor and master, in both two study programs, following Erasmus+ project “*Development and Implementation of Multimedia and Digital Television Curricula (DIMTV)*”.

Through this project, Epoka University has innovated its actual master and bachelor curricula by developing and implementing specialized modules.

2.1.1 Development of content production/post-production and content processing modules

The Department of Computer Engineering has developed and offered 2 new courses for Fall Semester 2019-2020 and 1 course for Spring Semester: Course **ECE 468 Computer Vision** given for Master of Science (MSc) and Professional Master (PM) in Computer Engineering and Master of Science in Electronics and Communication Engineering for first-year graduated students. The number of students enrolled was 18 and for the 14 weeks program, the materials were delivered to the students. Course **CEN 578 Machine Learning** was offered for MSc and PM in Computer Engineering only. The number of students enrolled was 29. They are planning to increase this number for the next year by offering the course also to MSc Electronics and Communication Engineering and adapting the course for the bachelor program both Electronics and Computer Engineering. Course **CEN 543 Digital Image Processing** was offered for first-year MSc and PM Computer Engineering students in Spring Semester. The number of students enrolled is 16. Next year they are planning to offer this course for undergraduate study programs.

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They are planning to offer other courses in 2020/2021, which were not offered this year.

Details of all new courses are presented in Table 1 below:

Table 1 Courses planned to be offered in 2020-2021

Course/Module		ECTS	Course description
1	Computer Vision	7.5	The course emphasizes research topics that underlie the advanced visual effects that are becoming increasingly common in commercials, music videos, and movies. Topics include classical computer vision algorithms and exciting recent developments that form the basis for future effects (such as natural image matting, multi-image compositing, image retargeting, and view synthesis). We also discuss the technologies behind motion capture and three-dimensional data acquisition. Analysis of behind-the-scenes videos and in-depth interviews with visual effects tie the mathematical concepts to real-world filmmaking.
2	Digital Image Processing	7.5	Digital images, sampling, and quantization of images, arithmetic operations, grayscale manipulations, distance measures, image compression techniques, connectivity, image transforms, enhancement, restoration, segmentation, representation, and description.
3	Advanced Digital Signal Processing	7.5	Strengthening the discussion of statistical concepts while at the same time emphasizing the unity of ideas of optimum signal processing. The first part of the course is dealing with forwarding and backward prediction, develops further the geometrical point of view of random variables and linear estimation, and provides a preliminary introduction to a large number of methods that have become important tools in signal processing; namely, Levinson's and Schur's algorithms, fast matrix factorizations, Gram-Schmidt orthogonalization, lattice realizations of linear predictors and Wiener filters, and fast RLS algorithms. The second part discusses the properties of maximum likelihood estimators and gives a derivation of the Cramer-Rao bound using correlation canceling methods.

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4	Pattern Recognition	7.5	This course gives the foundation of pattern recognition algorithms and machines, including statistical and structural methods. Data structures for pattern representation, feature discovery and selection, classification vs. description, parametric and non-parametric classification, supervised and unsupervised learning, use of contextual evidence, clustering, recognition with strings, and small sample-size problems
5	Machine Learning	7.5	This course on Machine Learning will explain how to build systems that learn and adapt using real-world applications (such as robotics and brain wave signal understanding). Some of the topics to be covered include reinforcement learning, neural networks, genetic algorithms and genetic programming, parametric learning (density estimation), clustering, and so forth. The course will be project-oriented, with emphasis placed on writing software implementations of learning algorithms applied to real-world problems.
6	Internet of Things and Multimedia Technologies	7.5	The course Internet of Things and Multimedia Technologies covers the layers, protocols, packets, services, performance parameters of a packet network as well as applications such as web, Peer-to-peer, sensor networks, and multimedia.
7	Information Security	7.5	This course will address the concept of security, importance, and elements of protection by studying algorithms, cryptography, security management, and network and computer security, etc.

Considering the Albanian market, the number of students enrolled in these courses and programs is relatively good. However, at Epoka they are planning to promote the courses using different strategies like 1) Preparing brochures and promotional spots 2) Using mass media 3) Involving graduate students to give free seminars to promote the courses 4) Involve as much as possible the students to assist the teaching staff and to create highly qualified students and a collaborative environment.

To further improve the reputation of this module/courses/study program, they are ensuring that the professors offering the courses should have an international experience to share with the students and have proven experience in the field. The achievements of the master students at Epoka University are relatively high and they intend to keep this trend also for these new courses.

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2.2 UAMD University

Aleksandër Moisiu University, Durrës is the only public institution of higher education that offers studies at the Bachelor level in the field of multimedia technologies and digital television. This Bachelor study program was opened in 2012 as a result of the TEMPUS RICUM project. The "*Multimedia and Digital Television*" program is unique in Albania and the only one that can provide human resources to fulfill market needs and will influence the increase of the number of experts and professionals in this field and also increase the quality of production media.

Currently, there is a significant need for specialists in the field of Multimedia and Digital Television in both media institutions in Albania and the region. The number of television stations (public and private) and broadcasting services has increased in recent years, so it is not possible to achieve the professional support required due to the lack of experts in this field. The lack of professionals can also be seen today in the qualities of audio and video techniques, as well as the multimedia services provided. For this reason, one of the possible solutions is to increase the number of experts and professionals in the field of multimedia through study programs in the first and second cycles.

As mentioned above, another important reason is the need for specialized students with specific profiles in the field of multimedia and digital television. According to the employment standards required by many institutions or enterprises in Albania, it is necessary and a criterion to have a diploma of the second cycle of studies. At the same time, students graduating from the first cycle in the profile "*Multimedia and Digital Television*", seek to continue their studies in the second cycle in the profile with more specialized knowledge. Based on market labor needs, the Department of Information Technology considered it necessary to open a Professional Master's program in the Multimedia and Digital Television profile.

Based on these reasons, the Faculty of Information Technology, Department of Information Technology following Erasmus+ project Development and Implementation of Multimedia and Digital Television Curricula (DIMTV) started the procedures in the academic year 2017-2018, to open the Professional Master program in collaboration with seven other national institutions and international partners.

Based on market needs, the Professional Master is intended to be realized with three specific directions such as:

- 3D Animation
- Image Processing
- Production and post-production

The curricula of PM in MDTV have the same courses in the first semester to gain the generally needed information for the three modules and in the second semester, students will have specialization elective courses according to the module that students will choose.

2.2.1 Development of Production/post-production module

The Production and Post-Production module was offered in collaboration with the University of Ljubljana, as an expert partner in this field of study.

The structure of the study program includes:

- i. General courses (basics)/category A;
- ii. Professional courses (characterizing) /category B;
- iii. Similar/integrating training courses with characterizing disciplines/category C;
- iv. Elective training courses/category D;
- v. Final Exam/Project/category E

Table 2 Courses for the Production and Post-production module

Course/Module		Category	ECTS	Semester
1	Mathematics for Multimedia	A	6	I
2	Advanced Technologies in Multimedia	B	6	I
3	Multimedia Laboratory	B	6	I
4	Seminar in Multimedia	B	6	I
5	Project Management	D	6	I
6	Film and Media Production	B	6	II
7	Visual Effects	C	6	II
	Color Correction and Color Editing			
8	Audio Editing and Mastering	C	6	II
	3D Sound in Multimedia			
9	Multimedia Content Compression, Synchronization and Delivery	C	6	II
	Advanced Video Editing			
10	Final Exam/Project	E	6	II

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For the first time, the Professional Master in MDTV started in the academic year 2018-2019 and enrolled 17 students. The low number of enrolled students in the first year of PM opening was due to lack of time and promotion and because most of the students who finished the Bachelor degree had started working or had finished the second cycle of study in other fields not related to MDTV. In the academic year, 2018 - 2019 only the Production and Post-Production modules could be offered.

Marketing strategies for the MDTV study program can be realized through students, in addition to the strategies of AMU. Mostly the marketing promotion strategy is focused on:

- the preparation of promotional spots and graphic brochures and flyers.
- promoting values related to MDTV such as objectives, and infrastructure will target the audience and society.
- creating competitive traditions for students and wider involvement during studies.
- inclusion in the mass media (radio, television, newspapers, and magazines). Student recruitment campaigns, success stories, academic experiences, competitions or student work should be published with multimedia materials in the form of advertisements.

Improving the reputation of this study program will be achieved through the continuous maintenance of high standards of education, qualified students, the most professional academic staff, and online presence. In terms of communication, the study program aims at extensive online promotion and social media. The aim is also to implement live streaming as another digital marketing strategy utilizing Facebook, Instagram, Twitter, and YouTube by creating a radio-television channel dedicated to students.

2.2.2 Development of 3D Animation module

The 3D Animation module was developed and offered in collaboration with the University of Ljubljana, as an expert partner in this field of study.

The structure of the study program includes:

- i. General courses (basics)/category A;
- ii. Professional courses (characterizing) /category B;
- iii. Similar/integrating training courses with characterizing disciplines/category C;
- iv. Elective training courses/category D;
- v. Final Exam/Project/category E

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Table 3 Courses for the 3D Animation module

Course/Module		Category	ECTS	Semester
1	Mathematics for Multimedia	A	6	I
2	Advanced Technologies in Multimedia	B	6	I
3	Multimedia Laboratory	B	6	I
4	Seminar in Multimedia	B	6	I
5	Project Management	D	6	I
6	Animation of Elements	B	6	II
7	Advanced 2D Animation	C	6	II
	Stop Motion			
8	Advanced 3D Animation	C	6	II
	Film Animation			
9	Character Animation	C	6	II
	Visual Effects			
10	Final Exam/Project	E	6	II

For the academic year 2019-2020, 15 students were enrolled, and this time based on student preferences the department offered the 3D Animation Module. There is still a low number of students to this new program, however, till now the program has shown to be successful.



2.3 University of Prishtina (UP)

At the University of Prishtina UP they are not planning to offer stand-alone study programs, developed in the scope of the DiMTV project, but instead, the goal is to modernize, revise and update the existing study programs by developing and integrating certain modules from the MDTV field. In the first phase of the project a SWOT analysis was made for study programs offered by the Faculty of Electrical and Computer Engineering in the MDTV field and identified the following weaknesses and opportunities:

Weaknesses: All existing MDTV related courses were offered as elective courses; No specific laboratory existed for such courses imposing share of labs with other courses; Not updated content especially for professional courses; Not enough cooperation with respective industry; No specific simulation tools/software for MDTV courses; and

Opportunities: Networking with other universities with expertise in MDTV; Developing new MDTV courses/specializations for bachelor and master level study programs; Boosting student interest for ICT/ MDTV related courses via promotional activities, etc.

Together with project partners, the UP has worked intensively to address the above-mentioned issues, in accordance and compliance with project proposal activities.

2.3.1 Development of 3D Animation and other modules

The Faculty of Electrical and Computer Engineering/UP has worked in two directions in the sense of developing new courses and modules:

- 1. Modernization and update of MDTV courses that belong to existing accredited study programs.** The UP has updated and re-structured courses in the MDTV domain, with the courses being offered to students starting from the academic year 2018-2019.

Courses are offered in currently accredited study programs, with an impact of enriching teaching and learning infrastructure by providing laboratory components to these courses, enriching course teaching methodologies, providing software tools for course delivery, updating teaching materials, re-structuring course syllabuses, updating course content, etc.



The number of students that have benefited from DiMTV project updated courses:

- 100 students for the academic year 2018-2019
- more than 100 students till the end of the academic year 2019-2020
- 8 academic staff benefiting from training
- 5 courses were updated, among them compulsory and elective courses

2.3.2 Development of new study programs with MDTV courses/specializations on bachelor and master level

The Faculty of Electrical and Computer Engineering at UP has developed and prepared new study programs: a bachelor and master study program from the ICT domain. The newly developed MDTV-related courses have been included in this study program as both compulsory and elective courses (*Digital signal processing, Multimedia production, and post-production, 3D Animation*). The Faculty of electrical and computer engineering has prepared a self-evaluation report and other necessary documentation for application for accreditation. The application for accreditation has been sent to the National Agency and the expected evaluation and site visit by international experts was set to June 2020. However, due to the COVID-19 pandemic, this will probably be delayed as in Kosovo the evaluation is done by international experts.

The number of expected students to be enrolled in new study programs are 80 students at the Bachelor level and 30 students at the Master level. The master-level courses will be offered in an English-friendly mode. The syllabuses have been drafted and approved by the Faculty Council and University Senate.

Intending to improve study efficiency UP is strengthening its cooperation with the MDTV industry by signing a Memorandum of Understanding (MoU) between the faculty and Radio TV broadcasters. One of the points regulated with MoU is ensuring to students the professional practice (internship in the MDTV field). Additionally, they are sending students for an internship to RTV premises and have started a joint mentoring of student internship in cooperation between academy-industry and are recognizing ECTS for project supported internship. In numbers: 5 students have finished with success the internship in 2018 and each of them was awarded 6 ECTS credits. They are also promoting the MDTV field of study to the high school students at 7 different towns of Kosovo and promoting the MDTV career opportunities at Information Day organized by the University.

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The master and bachelor curriculum for ICT with MDTV courses, developed with the support of the Erasmus+ DiMTV project is presented in the tables below:

Master Level

Semester 1

Course		Teaching hours	ECTS
1	Software defined radio	3+0+1	6
2	Advanced Communication Networks	3+0+1	6
3	Information theory and Coding	3+0+1	6
4	Applied digital signal processing	3+0+1	6
5	Wireless Communications 1	3+0+1	6

Semester 2

Course		Teaching Hours	ECTS
1	Network Planning and Optimization	3+0+1	6
2	Wireless Communications II	3+0+1	6
Elective courses (1)			
3	Wireless Communications – Lab	2+0+2	5
4	Multimedia Communications- Lab s	2+0+2	5
5	Advanced programming for ICT	2+0+2	5
6	Image processing and Computer Vision	2+0+2	5
7	3D Animation	2+0+2	5
Elective course (2)			
8	Advanced project management in ICT	2+0+1	4
9	Methodology of scientific research in ICT	2+0+1	4
10	Regulation and standardization in ICT	2+0+1	4
11	Internet of Things	2+0+1	4

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Semester 3

Course		Teaching hours	ECTS
1.	Information security	3+0+1	6
Elective course (3):			
1	Cognitive radio	3+0+1	6
2	Vehicular Communications	3+0+1	6
3	Advanced topics in Multimedia Communications	3+0+1	6
4	Selected topics in networking and communications	3+0+1	6
5	mm Wave Communications	3+0+1	6
6	Satellite Communications	3+0+1	6
7	Microwave systems	3+0+1	6
8	Advanced Optical Communications	3+0+1	6
9	Innovation and Technology Transfer	3+0+1	6

Semester 4

	Course		ECTS
1	Master thesis		30



2.4 University for Business and Technology (UBT)

UBT incorporated the courses related to multimedia into their study programs at their Faculties and study programs (Media communication, Digital art, and media, Computer science and engineering, Mechatronics management). They are divided into two categories: Obligatory or Elective. The tables below show which subjects were included, their category, ECTS, and the study level. It is also shown which ones are mandatory and which elective.

Media Communication

Name	Category	ECTS	BSc.	MSc.
Advanced Technologies in Multimedia	A	6		ELC
Project Management	D	6		OBL
Visual Effects	C	6	OBL	
Color Correction and Color Editing				
Audio Editing and Mastering	C	6	OBL	
Audio 3D in Multimedia				
Multimedia Content Compression, Synchronization and Delivery	C	6	OBL	
Advanced Video Editing				
Final Exam/Project	E	6	OBL	

Digital Art and Media

Name	Category	ECTS	BSc.	MSc.
Visual Effects	C	6	OBL	
Color Correction and Color Editing				
Advanced 2D Animation	C	6	OBL	
Film Animation				
Character Animation	C	6	OBL	
Visual Effects				
Final Exam/Project	E	6	OBL	

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Computer Science and Engineering

Name	Category	ECTS	BSc.	MSc.
Mathematics for Multimedia	A	6	OBL	
Project Management	D	6	OBL	ELC
Advanced Technologies in Multimedia	B	6		OBL
Multimedia Laboratory	B	6		ELC
Animation of Elements	B	6	OBL	
Advanced 2D Animation	C	6		ELC
Stop Motion				
Advanced 3D Animation	C	6		ELC
Film Animation				
Advanced Technologies in Multimedia	B	6		OBL
Digital Signal Processing	B	6		ELC
Biometric Systems	C	6		OBL
Virtual Reality				
Computer Vision	C	6	OBL	OBL
Signals and Systems				
Final Exam/Project	E	6		OBL

Mechatronics Management

Name	Category	ECTS	BSc.	MSc.
Mathematics for Multimedia	A	6	OBL	
Project Management	D	6	OBL	
Digital Signal Processing	B	6		OBL
Computer Vision	C	6	OBL Specializ. Electrical and Electronics Engineering	
Signals and Systems				
Machine Learning and Applications	C	6	OBL Specializ. Intelligent Systems and Robotics	
Computational Geometry				
Final Exam/Project	E	6		OBL

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