"Ss. Kliment Ohridski "Faculty of Technical Sciences - Bitola

ELABORATE ON

second cycle of academic studies study program "Mechatronics"

developed within TEMPUS project:

TEMPUS IV Project:
158644 - DE - JPCR

Development of Regional Interdisciplinary Mechatronic Studies - DRIMS

Bitola, November 2011

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	Conference Macedonia (Skopje-Bitola, September 2002)	

INTRODUCTION

The development of study programs of first and second cycle in Mechatronics represents one of the objectives of the Tempus project"Development of regional interdisciplinary studies for Mechatronics"(Development of Regional Interdisciplinary Mechatronic Studies - DRIMS) approved for funding by the European Commission within the Tempus program with no contract. 158644-TEMPUS -2009-DE-JPCR. The time frame for the project is from January 2010 until January 2013 or its implementation is in progress.

Partners in the project implementation are the following institutions:

1. Aachen University of Applied Sciences, Department of Mechanical Engineering and Mechatronics, Aachen, DE (Project Coordinator)
2. Vienna University of Technology, Institute of Mechanics and Mechatronics, Vienna, AT;
3. Technical University Sofia, Faculty of Mechanical Engineering, Sofia, BG;
4. University of Bergamo, Department of Design and Technologies, Dalmine BG, IT;
5. Ss. Cyril and Methodius University in Skopje, Faculty of Mechanical Engineering, Skopje, MK;
6. University "St. Kliment Ohridski "in Bitola, Faculty of Technical Sciences, Bitola, MK;
7. University of Prishtina, Faculty of Mechanical Engineering, Prishtina, 1244
8. University of Montenegro, Faculty of Mechanical Engineering, Podgorica, ME
9. APS-European Centre for Mechatronics, Aachen, DE
10. Partners from industry: SPESIMA GmbH, Sofia, BG, BRAKO, Veles, MK; IRING, Skoje, MK; MONTAVAR Metalac doo, Podgorica, ME, Was-impex doo Podgorica, ME

Within this project is planned to realize these goals:

1. Develop regional interdisciplinary studies Mechatronics of first and second cycle, in accordance with the Bologna Declaration, the consistent application of the European Credit Transfer System, taking into account the actual needs of the industry.
2. To execute modernization and improvement of the existing human and material resources and creating new, through the purchase of modern equipment and equip laboratories, preparation of common materials that will be used in lectures and exercises, and application of new learning methods for the study of Mechatronics, with particular emphasis on gaining practical knowledge.

3. Creation of a network linking the subjects of higher education and industry, in order to establish a sustainable system of cooperation on domestic and international plan between industry and education.
4. To develop courses for lifelong learning (LLL) for small and medium enterprises in the Western Balkans in order to contribute to increasing the competitiveness of the industry in these countries.

Within the project, in Macedonia, Montenegro and Kosovo was conducted survey and research on market needs of personnel in the fields of mechatronics. The results clearly show that industrial entities have a strong interest of executives who have interdisciplinary knowledge in the field of mechanical engineering, electronics and computer equipment, ie the mechatronics.

Also performed a detailed analysis of the content of curricula in the Mechatronics 5 universities, in order to obtain conclusions about the structure and composition of the joint regional, interdisciplinary studies in Mechatronics. Most of the findings are incorporated in the preparation of curricula presented in this Report.

1. Map of the higher education institution

Name of higher education fixed	"Ss. Kliment Ohridski "- Bitola Technical Faculty - Bitola
seat	St. "Lola Ribar bb." Bitola
Type of higher education fixed	Higher education institution - Faculty
Data on founder	Assembly of the Republic of Macedonia
Data last accreditation	April, 2009
Study and research Areas that have been obtained accreditation	-Mashinstvo -Elektroenergetski systems -Soobrakjajno - Transportation Engineering -Grafichko Engineering -Informatics and computer equipment -Industrial management
Units within the higher education institution	At the University "Ss. Clement Ohridski "in Bitola 12 units (11 faculties and 1 Institute)
Study programs realized in unit extension of activity with introduction of new study programs	Academic study programs - 7 Expert studies - 4 Academic study programs of first and second cycle - mechanical engineering - Engineering for Environmental and working environment - Traffic - Transportation Engineering - power systems - graphic Engineering - Computers and computer equipment - industrial management Expert studies of first cycle - Energy (three years) - Energy and Environmental Protection environment (three years) - Road sevice (three years) - Electrical Engineering, Power Engineering and electronics (three years) Specialist studies of second cycle in Expertise accidents in road traffic
Data space allocated for performing and teaching research	Technical Faculty - Bitola has usable area of 5.583,44 m^2, and that: • amphitheater 1 227,00 m2 • lecture 19 1613,42m2 • laboratories 9 598,24 m2 • kompj. classrooms 5 310,00 m2 • multimedia center 1 150,00 m2 • workshops 4 2464 m2

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	• Library reading room enclosure		13,95 m2
	• cabinets	34	545,10 m2
	• administration	7	201,52 m2
	• hall meetings	1	58,91 m2
	• space general. active.	1	30,00 m2
	• warehouses	1	53,50 m2
	• boiler room	1	46,52 m2
	• tel. cent. and room for maintenance	1	233,22 m2
	• halls, stairsand toilets	1	1686,72m2
Data equipment performing and teaching research	Computer and merno-regulciona equipment used in educational and scientific research process is organized into 8 5 laboratories and computer classrooms. First thermotechnical laboratory Second Laboratory machine materials Third Laboratory of Electrical Energy Systems 4th Laboratory for motor vehicles 5th Laboratory of Electrical 6th Laboratory of Electronics and Electricity. 7th measurements Laboratory for multimedia 8th mechatronic laboratory First computer Lab 304 Second computer Lab 305 Third computer Lab 307 4th computer Lab 408 5th computer Lab 413 In the study provides a detailed list of equipment to be used in the study program.		
Number of students who obtained accreditation	1050 (first cycle) + 285 (second cycle)		
Number of students (first enrolled)	661 (first cycle) + 107 (second cycle)		
Number of persons in the educational-scientific, scientific and teaching positions	53 teachers of which: □ 28 full professors □ 10 associate professors □ 15 docents		
Number of people in staff positions	Assistants and 14 1 junior assistant		
Internal mechanisms security and control quality of studies	□ Development of curricula □ Realization of the teaching process □ Student Assessment		

	□ Making undergraduate and master's thesis □ Evaluate the quality of teaching by students with questionnaires at the end of each semester for each subject □ Evaluate the quality of the study program by university students □ Other procedures concerning resources and logistics of the teaching process
Data last conducted external evaluation fixed	

2. General descriptors of qualifications for each cycle under the Decree on the national framework of higher education qualifications

2.1. Knowledge and understanding

- Demonstrates knowledge and understanding of the field of mechatronics which builds on the first cycle, applying appropriate methodologies to solve complex problems, both systematic, and creative way, it provides a basis or opportunity for originality in developing and/or applying autonomous ideas in a research context.
- Ability to use an expanded and deepened knowledge.
- Showing a high level of professional competence in the fields of mechanical engineering, Electronics and Automation, regulation and management of technological processes, Computer Science and Informatics
- Possesses knowledge of one or more subject areas, in given scientific fields, based on the most renowned international research in the field of mechatronics.

2.2. Applying knowledge and understanding

- Ability to critically, independently and creatively solve problems with some originality in new or unfamiliar environments within multidisciplinary context, related to Mechatronics.

2.3. Making judgment

- The ability to synthesize and integrate knowledge.
- Ability to deal with complex issues, systematically and creatively, sound judgments even in incomplete and limited information, but that include personal, social and ethical responsibilities in the application of knowledge and assessment.
- Ability to assess and selection of scientific theories, methodologies, tools and general skills in the subject areas, and establish a new analysis and solutions on a scientific basis

2.4. Communication skills

- Ability to communicate their conclusions and recommendations with the argumentation and rationale underpinning these, both specialist, and by unskilled persons, clearly and unambiguously.
- Taking considerable responsibility for collective results; running and initiating activities.

2.5. Learning skills

- Ability to identify personal need for further knowledge and ability for independent and autonomous activity in acquiring new knowledge and skills in the social framework.
- Ability to take responsibility for further professional development and improvement.

3. Specific descriptors of qualifications that determine learning outcomes for individual study program under the Decree on the national framework of higher education qualifications

3.1. Knowledge and understanding

- Shows a profound knowledge and understanding of the laws of the areas of Mechatronics that the student has chosen to develop special expertise, such as: simulation of mechatronic systems, intelligent sensor-actuator systems, systems in the automotive industry, embedded and Real Time Control systems, robots, mikroelektromehanichki systems - MEMS intelligent manufacturing computer support systems, control vibration.
- Systematically and creatively explains and discusses current research and development, concepts, principles and theories relating to the chosen field of specialization in the field of mechatronics.
- Keep up with the latest developments in selected areas of mechatronics, which provides a basis for originality in developing and applying autonomous ideas in a research context.

3.2. Applying knowledge and understanding

- examines, analyze, develops, optimize and manage the process of developing various mechatronic systems, specific to various industries, with special emphasis on modern concepts with input intelligently manage and control real-time systems mehatronichkite, using the findings from microelectronics, and hardware in the loop concepts, and the part that the student has chosen to develop special research.
- Independently and creatively proposes solutions to problems with some originality and consistent application of interdisciplinary and multidisciplinary approach.
- Apply innovative methods to solve, unknown or incompletely defined problems, koristejkjinapredno mathematical, scientific,
  Information and knowledge engineering.

3.3. Making judgment

- Synthesize and integrate knowledge in areas related to Mechatronics the area that the student has chosen to develop special expertise: simulation of mechatronic systems, intelligent sensor-actuator systems,

systems in the automotive industry, embedded and Real Time Control systems, robots, mikroelektromehanichki systems - MEMS intelligent manufacturing computer support systems, control vibration.

- Critically evaluate information, adopt proper assessment and inferences, even on the basis of incomplete or limited information, using current information and communication technology
- Explores the application of new and emerging technologies , innovation and positive experiences in Mechatronics

3.4. Communication skills

- Clearly and unambiguously present the conclusions, facts and research results, before professional audiences, and shows the ability to adjust the style and form of expression before unskilled audience.
- Effectively participate in multidisciplinary teams, as team leader or expert.
- Assumes significant responsibility for both individual and collective results, initiate and lead activities in the field of Mechatronics which improves.

3.5. Learning skills

- Identify personal need for further education and independent action for self gain new knowledge and skills, in the wider social context.
- Ability to take responsibility for continuous individual learning in a private setting in the field of Mechatronics in which the student has chosen to develop special expertise.

4. Decision on adoption of the study program of Teaching and Scientific Council of Faculty of Technical Sciences - Bitola.

The session of the Academic- Scientific Council of the Faculty of Technical Sciences - Bitola, held on 13.12.2011 years., It was reviewed and, with decision No.. 02-1069 / 13 adopted a proposal for introducing a study program in Mechatronics second cycle studies. The decision was given in favor.

5. Decision on adoption of the study program by the Senate of the University "Ss. Kliment Ohridski "- Bitola

At the meeting of the University Senate "St.. Clement of Ohrid"- Bitola held on 28.12.2011 years., by decision No. No.. 07-1723 / 4-2 It was approved study program in Mechatronics second cycle studies. The decision was given in favor.

6. Scientific research area, field and field, a part of the study program

According to the International Standard Classification of Education - ISCD and the International Classification Fraskatieva, study program in the field of Mechatronics belongs in the area of technical and technological sciences.

In accordance with the interdisciplinary and multidisciplinary character mechatronics is defined as synergistic integration of fields: Engineering, Electronics and Automation, regulation and management of technological processes, Computer Science and Informatics.

7. Type of study program (academic or professional studies)

This study program enables students to perform activities in the industry, engineering, in science and higher education, in business, and society at large, and through the development and application of acquired scientific knowledge and achievements. According to the said contribution, study program has the character of academic studies.

8. Education level (first or second cycle)

The study program is the second cycle of academic studies modeled 3 + 2.

9. Purpose and justification for the study program

Technical Faculty in Bitola continuously monitor changes in the environment and its activities are adapted to the requirements arising from these changes. Faced with the challenge to offer current, modern and quality curricula, which also represents a strategic goal, this higher education institution for decades to successfully meet the challenges of the new economy, thereby significantly contributes to the development of the University "St.. Clement of Ohrid"- Bitola.

The purpose of this study program is to train future staff with basic scientific knowledge and practical experience in the areas that are part of mechatronics: mechanical Engineering, Electrical and Electronics, regulation and management systems, and informatics. The strong integration of mechanical and electrical components in various products requires professionals who think in a different way, a new, integrated philosophy in developing new products in various branches of industry.

A great advantage of the Technical Faculty in Bitola is the fact that there are already mechanical and electrical department, and Department of Computer Science and Informatics,

so the available staff fully cover the proposed curriculum.

These analyzes are derived from surveys and research conducted on industrial entities in the first phase of this project, presented at DRIMS workshop in Ohrid (July 2010 year) showed that the industry is highly interested in this staff has interdisciplinary knowledge and skills. Despite ochekuvaiot interest in employing such staff in the development of new products, Poll result the conclusion that industrial entities are exceptionally interested in the use of such personnel and the maintenance of expensive and sophisticated equipment, no less important. All these findings only confirm the justification and the real need to introduce study program in Mechatronics.

10. Age and duration of semesters of study program and credits that the student acquires

The study program for the first cycle lasts 2 years or 4 semesters. For successful completion of first cycle studies students should acquire 120 ECTS credits.

11. Method of financing

The second cycle of studies in mechatronics will be funded from tuition to students who will enroll in the study program.

12. Terms of enrollment

In accordance with the Law on Higher Education and the competition.The second cycle studies may enroll students with completed first cycle of studies in technical sciences, and that:

- Graduates of Engineering, Electrical, electronics, Informatics have completed four or more year undergraduate degree, to whom a special procedure committee, They are recognized certain number of credits in accordance with legal regulations.
- All students who have completed the first cycle (3 years180 loans) specializing Informatics and Computer Technologies.
- All other interested students who have completed four or more year undergraduate studies in technical sciences.

13. Information on continuing education

After completion of the second cycle of academic studies, the student can continue his education at the third cycle studies.

14. Determined ratio between compulsory and optional subjects, with a list of compulsory subjects, list of electives and defined way of selecting objects

The subjects in the second cycle of academic studies university study program in mechatronics are categorized into three main groups, accordance with the amendments to the Law on Higher Education (etc..in., No.. 17 from 11.02.2011) and that: required items, electives that students independently chosen from all subjects at the University unit and elective courses that students independently choose from the list free electives, proposed by each unit of University special.

Table 1. Fixed ratio between compulsory and optional subjects

type	number of items	credits	rate
required items	6	52	43%
Electives - TFB	3-4	22	47%
team project		4	
Master thesis		30	
Electives - trend	2	12	10%
	Total:	**120**	**100%**

The second cycle covers a total 6 required items, that the student has provided 52 loans. The number of electives that students independently chosen from all courses, represented the University unit, is 3 to 4 that the student has provided 22 loans, while the number of elective courses that students independently choose from the list free electives, proposed by each unit of University special, is 2 and they provide the student has a minimum 12 loans. There is also a team project that brings 4 loans

Table 2. List of compulsory courses

code	Title case	Kadar who will participate in realization of teaching	ECTS loans
ME401	Advanced Engineering Mathematics	Prof. Dr. Linda Stojanovska Vonr. Prof. Dr. Magdalena HK Jos. Assoc. Dr. Sonja Mancevska	10
ME402	Selected chapters of Mechatronics	OK. prof. Dr. Alexander Markoski Assoc. Dr. Gordana Janevska	10
ME403	Modeling and simulation mechatronic systems	Assoc. Dr. Gordana Janevska Assoc. Dr. Mitko Kostov	8
ME404	Intelligent sensor-actuator systems	Assoc. Dr. Mile Petkovski OK. prof. Dr. Alexander Markoski	8
ME405	automotive mechatronic systems	OK. prof. Dr. Vesna Angelevska OK. prof. Dr. Pece Mitrevski	8
ME501	Embedded systems management Real Time	Vonr. prof. Dr. Ilija Jolevski Assoc. Dr. Mile Petkovski	8

In accordance with current regulations student has the right to independently choose 30% the objects represented in the unit. Table Third is a list of electives that directly deepen students' knowledge of mechatronics, in Table 4th given items that are of wider interest for the study program.

Table 3. List of electives

code	Title case	Kadar who will participate in realization of teaching	ECTS loans
ME406	Selected chapters of Mechanical Engineering	OK. prof. Dr. Tale Geramitcioski, Vonr.prof. Dr. Vangelche Mitrevski	5
ME407	Selected chapters of Electrical and Electronics	vonr. prof. Dr. Vesna Cheshelkoska OK. Prof. Dr. Tsvetko Mitrovski	5
ME408	Selected chapters of Programming and ICT	vonr. prof. Dr. Ilija Jolevski OK. prof. Dr. Pece Mitrevski	5
ME409	Selected chapters of robotics	OK. prof. Dejan Trajkovski OK. prof. Dr. Alexander Markoski	8
ME410	Mikroelektromehanichki systems - MEMS	Assoc. Dr. Ratka Neshkovska OK. prof. Dr. Elizabeth Bahtovska	8
ME411	Intelligent Manufacturing Systems	OK. prof. Dr. Igor Nedelkovski OK. prof. Dr. Stojce Deskovski	8
ME412	computer Integrated production	OK. prof. Dr. Stojce Deskovski OK. prof. Dr. Stojanche Nysse	8
ME502	Systems work in real time and hardware in the loop	Assoc. Dr. Mile Petkovski Assoc. Dr. Gordana Janevska	8
ME503	Control vibration	OK. prof. Dr. Tale Geramitcioski, Assoc. Dr. Ljupco Trajchevski	8
ME504	microprocessors and microcontrollers	OK. prof. Dr. Tsvetko Mitrovski Assoc. Dr. Mile Petkovski	6
ME505	Digital Signal Processing	OK. prof. Dr. Cvetko Mitrovski Assoc. Dr. Mitko KOSTOV	6
ME506	Banks of digital filters	Assoc. Dr. Mitko Kostov OK. prof. Dr. Cvetko Mitrovski	6

Table 4. List of recommended optional subjects of broad interest to chill.program

	Title case
1.	software Engineering
2.	Distributed Computer Systems
3.	Wireless Sensor Networks
4.	ICT industry
5.	Digital image processing
6.	Multirezoluciska analysis and reconstruction of signals
7.	virtual Engineering - advanced course

Distribution of subjects per semester:

code	semester 1		fund	**ECTS**
ME401	Advanced Engineering Mathematics		4 + 4	10
ME402	Selected chapters of Mechatronics		4 + 4	10
ME40x	Optional block 1 of TFB (*)		4 + 4	5 + 5
	Total:			30

(*) For students with a Bachelor of Mechanical Engineering, Electrical Engineering or Computer Science is chosen combination of two subjects (5 + 5 credits) according to the table.

Optional block selected chapters (5 + 5) credits (*):	=	.EI	.info
3.1. Selected chapters of Mechanical Engineering		5	5
3.2. Selected chapters of Electrical and Electronics	5		5
3.3. Selected chapters of Programming and ICT	5	5	

code	semester 2		fund	**ECTS**
ME403	Modeling and simulation of mechatronic systems		3 + 3	8
ME404	Intelligent sensor-actuator systems		3 + 3	8
ME405	Automotive Mechatronic Systems		3 + 3	8
MExxx	Optional subject from a list of UKLO			6
	Total:			30

code	semester 3	fund	**ECTS**
ME501	Embedded systems and real-time control	3 + 3	8
MExxx	Optional block 2 of TFB (**)		12
	Optional subject from a list of UKLO		6
	team project		4
	Total:		30

(**) Students with completed first cycle Mechatronics should choose items at least 22 credits total. (Block 1 + Block 2)

All other students choose Block of Selected chapters (5 + 5), and should choose other electives (Block 2)with at least 12 credits in the aggregate.

code	semester 4	**ECTS**
	Thesis	27
	Defense of the thesis	3
	Total:	30

Within 3 semester students are grouped into teams whose goal is to develop a team project work defined by the teachers of the second cycle. The results of the project team shares the present, after successful completion of this-active students receive 4 loans.

Within 4semester the student is obliged to prepare and publicly defend master's thesis, which is measured by 30 loans.

The previous one can conclude that the structure of the study program, in terms of the representation of compulsory and optional subjects, in accordance with the Law on Higher Education and the amendments to the Higher Education Act, and Regulation Compatibility UKLO.

15. Data on the space provided for the implementation of the study program

technical Faculty - Bitola has a usable area of 5.583,44 m2, and that:

amphitheater - 1	227,00 m2
lecture - 19	1613,42 m2
laboratories - 9	598,24 m2
computing center - 3	310,00 m2
multimedia center - 1	150,00 m2
workshops - 4	245,64 m2
library with reading room - 2	113,95 m2
cabinets - 34	545,10 m2
administration - 7	201,52 m2
hall meetings - 1	58,91 m2
space for social activity - 1	30,00 m2
warehouses - 1	53,50 m2
boiler room - 1	46,52 m2
phone. Plant and facility maintenance	233,22 m2
halls, corridors, staircases and toilets	1686,72 m2

According to the attached Technical Faculty - Bitola has capacities and facilities for the teaching of this kind of study.

16. List of equipment intended for the realization of the study program

Within TEMPUS project DRIMS provided funds amounting to 45,000 euros to equip the laboratory of Mechatronics in which you perform most of the practical classes and laboratory exercises. Procured following equipment:

No.	Piece.	code	NI Academic Site License - Department Teaching, with 2 years Standard Service Program, includes LabVIEW Core, Controls and Embedded, and Signal Processing and Communications Software:
1	15	779051-01	USB-6008 12-bit, 10kS / s Multifunction I / O and NI-DAQmx Software
2	1	781157-01	cDAQ-9174, CompactDAQ chassis (4 slot USB)
3	1	780495-01	NI WLS-9163 IEEE 802.11b / g Wireless Carrier for C Series Modules and NI-DAQmx Driver Software
4	2	779471-01	USB Single Module Carrier for C Series Modules (see USB-9162 webpage for module compatibility)

5	1	779781-01	Nl 9219 4 Ch-Ch Isolated, 24-bit, ± 60V, 100S / S Univeral Al Module
6	1	779521-01	Nl 9237 4-Ch 50 kS / s per Channel, 24-Bit Bridge Analog Input Module
7	1	779013-01	Nl 9201 8-Channel, 12-Bit, +/- 10 VDC, 500 kS / s, Analog Input Module
8	1	779680-01	Nl 9234, 24-Bit Sigma-Delta ADCs, 51.2 kS / s Max Samp Rate, 4 Input Simultaneous, Software Selectable IEPE and AC / DC Coupling, Anti-Aliasing Filters, 102 dB Dynamic Range
9	1	780918-01	cRIO-9114 8-slot Virtex-5 LX Reconfigurable Chassis for 50 CompactRIO
10	1	780718-01	CRIO-9022, Real-Time PowerPC Embedded Controller for CompactRIO, 533 MHz, 2 GB storage, 256 MB DRAM
11	1	779003-01	Nl 9474 8-Channel 24 V, 1 us, High-Speed Sourcing Digital Output Module
12	1	779006-01	Nl 9481 4-Ch 30 VDC (2 A), 60 VDC (1 A), 250 VAC (2 A) EM Form A SPST Relay Module
13	1	779009-01	Nl 9423 8-Channel 24 V, 1 us, High-Speed Sinking Digital Input Module
14	1	779012-01	Nl 9263 4-Channel, 16-Bit, +/- 10 V, 100 kS / s per Channel, Analog Output Module
15	1	779351-01	Nl 9401 8-Channel, 100 ns, TTL Digital Input / Output Module
16	1	779519-01	Nl 9205 32-Channel +/- 10 V, 250 kS / s, 16-Bit Analog Input Module
17	1	779781-01	Nl 9219 4 Ch-Ch Isolated, 24-bit, ± 60V, 100S / S Univeral Al Module
18	1	781068-01	Nl 9207 8-ch (current) + 8-ch (voltage) combo module, 24bit with 50 / 60Hz rejection
19	1	781093-01	Nl PS-15 Power Supply, 24 VDC, 5 A, 100-120 / 200-240 VAC Input
20	1	779006-01	Nl 9481 4-Ch 30 VDC (2 A), 60 VDC (1 A), 250 VAC (2 A) EM Form A SPST Relay Module
21	1	780465-01	sbRIO-9632 400 MHz Controller and 2M Gate FPGA, Multifunction DIO, Al, AO
22	1	40301.230.257	LEGO FLL Robot Set NXT 2011
23	2	40301.230.063	LEGO MINDSTORMS Education NXT-Basic-Set (9797)
24	2	40301.230.077	LEGO MINDSTORMS Education Resource-Set 2.0 for 9797 (9695)
25	1	40307.230.001	TETRIX Education Basic-Set
25	1	33521A	Agilent -Channel Function / Arbitrary Waveform Generator, 30 MHz sine, square, triangle, ramp, pulse, noise, sin (x) / x, xponential rise & fall, cardiac, DC volts, arbitrary, AM, FM, PM, SK, PWM 16 bits, 250 MSa / s, one million points, optional 16 million points LAN, USB, GPIB, Power supply: 230 V
27	2	E3630A	Agilent Multiple Output Bench Power Supplies 15W, 20V, 2.5A, 3 outputs 35W, DC Bench Power Supply, Triple Output
28	2	U1242B	Agilent Handheld Digital Multimeter, 10000 counts, ac & dc voltage, dc & ac current, resistance, frequency, continuity with beeper, capacitance, temperature, switch counter, harmonic ratio, dual and differential temperature Accuracy: 0.09%, Speed: 7 rdgs / s, Power supply: 230 V

29	1	34401A	Agilent Industry Standard Digital Multimeter, 6½ Digits: dc & ac voltage, dc & ac current, 2 & 4 wire resistance, frequency & period, continuity, diode test Accuracy: 0.0035%, Speed: 1000 rdgs / s, Connectivity: GPIB, RS232, IntuiLink SW Power supply: 230 V
30	1	DSO1002A	Agilent Portable oscilloscope Bandwidth: 60 MHz, Sample rate: 2 GSa / s, Chanells: 2, Max Memory Depth: 20 kpts Power supply: 230 V

17. Syllabi with information in accordance with Article 4 of this Regulation **(**Annex. 3)

Attached?

18. List of teaching staff with data referred to in Article 5 of this Regulation (Annex no. 4)

In the teaching of the study program in Mechatronics will participate the following teachers:

1. prof. e-Dr. Linda Stojanovska
2. Vonr. prof. e-Magdalena H..K.Josifovska
3. Ass. e-Dr. Sonja Mancevska
4. Ass. e-Dr. Ratka Neshkovska
5. prof. e-Dr. Elizabeth Bahtovska
6. prof. e-Dejan Trajkovski
7. prof. e-Dr. Cvetko Mitrovski
8. Vonr. prof. e-Dr. Vesna Cheshelkoska
9. Ass. e-Dr. Mile Petkovski
10. Ass. e-Mitko Kostov
11. prof. e-Dr. Stojanche Nysse
12. prof. e-Dr. Tale Geramitcioski
13. Ass. e-Dr. Ljupco Trajchevski
14. prof. e-Dr. Vesna Angelevska
15. Vonr. prof. e-Dr. Vangelche Mitrevski
16. Vonr. prof. e-Ilija Jolevski
17. prof. e-Dr. Pece Mitrevski
18. Ass. e-Dr. Gordana Janevska
19. prof. e-Aleksandar Markoski
20. prof. prof. e-Dr. Igor Nedelkovski
21. prof. e-Dr. Stojce Deskovski

19. A statement from the teacher for giving consent to participate in the teaching in certain subjects of the study program

Attached?

20. Consent of the higher education institution for teacher participation in the realization of the study program

Attached?

21. Information on the number of students enrolling in the first year of the study program

The study program is provided, in the first year of study to enroll a total of 20 students.

22. Information provided mandatory and additional literature

In the course programs of study program (addition 3.) given detailed information about the literature used in their implementation.

Also, of the funds allocated for this purpose, within the project DRIMS procured following literature:

	Book title
First	**Actuators** , Hartmut Janocha (Editor), Springer Verlag, Berlin (2004)
Second	**Hands-On Introduction LabVIEW for Scientists and Engineers**, John Essick, 2009 Oxford University Press
Third	**Hydraulic Components Design and Selection** , Fitch EC, Hong IT,, BarDyne Inc, 2008
4th	**Intelligent Sensor Systems,** J. Brignell and N. White, Revised Ed., IOP, 1996
5th	**Introduction to Mechatronics and Measurement Systems,** David G. Alciatore, Michael B. Histand,, McGraw-Hill, ISBN 007-125407-2, Boston (2007)
6th	**Introduction to Robotics: Mechanics and Contro**l, Craig, JJ, 3rd ed. Pearson Education, 2005 (2nd ed. 1989, 1st ed. 1986)
7th	**LabVIEW 2009 Student Edition** , Robert H. Bishop, 2010 Pearson Prentice Hall
8th	**LabVIEW for everyone**, J. Travis, Jim Kring, 3rd Edtition, 2007 Pearson Prentice Hall
9th	**Mechatronic Systems, Control, Logic and Data Acquisition** , Bishop, R., (Ed.), CRC Press Taylor & Francis Group, LLC, 2008, ISBN 978-0-8493-9260-3
10th	**Mechatronic Systems, Sensors and Actuators**, Robert H. Bishop (Ed.), CRC Press, ISBN 978-0-8493-9258-0, Boca Raton (2008)
11th	**Mechatronic Systems: Fundamentals**, Isermann, R., Springer, 2005 ISBN 1852339306
12th	**Mechatronics - An Integrated Approach,** Clarence W. de Silva, CRC Press, ISBN 0-8493-1274-4, Boca Raton (2005)
13th	**Mechatronics: Electronic Control Systems in Mechanical Engineering,** Bolton, W., 4th Edition, Pearson, 2008, ISBN 978-0132407632
14th	**Mechatronics,** Cetinkunt, S., John Wiley & Sons, Inc., 2007, ISBN-13 978-0-471-47987-1
15th	**MEMS - a practical guide to design, analysis and applications,** Jan G. Korvink, Oliver Paul, Springer, ISBN 3-540-21117-9, Heidelberg (2006)

16th	**MEMS Mechanical Sensors**, Stephen Beeby, Graham Ensell, Michael Kraft, Neil White, Artech House, Boston (2004)
17th	**Mobile Robotics: A practical introduction**, Nehmzow, U., Springer Verlag, Heidelberg, SBN: 1-85233-173-9
18th	**Numerical simulation of mechatronics sensors and actuators**, Manfred Kaltenbacher Springer Verlag, Berlin (2004)
19th	**Pneumatic Drives: System Design, Modelling and Control**, Beater P., Springer, 2007
20th	**Principles of Robot Motion: Theory, Algorithms, and Implementation**, Howie C. [et al.]. MIT Press, 2005.

Also, within the project activities jointly prepare materials that will be used in teaching: lectures, presentations, Tutorials, labs which completely cover the needs of the students of this study program. These materials are prepared in English, financing of printing will also be covered by funds from the project and printed materials will be distributed to all partners. Each partner may, depending on the need to adjust, osnosno translated materials and language used in the country.

List of items that are preparing materials for students

Introduction to mechatronics	Milena Djukanovic, UCG Jovana Jovanova, Nake Babamov, UKIM
Sensors, measurment and signal conditioning	Zlatko Petreski, UKIM Petar Vukoslavcevic, UCG
Actuators in mechatronics	Agron Pajaziti, UNI-PR Aleksandar Markovski, UKLO
Mechatronic systems	Viktor Gavriloski, UKIM, With support of Gunter Starke, APS-ECM
Modeling and simulation of mechatronic systems	Gordana Janevska, UKLO, With support of Martin Kozek, TUWien
Embedded and real time control systems	Mile Petkovski, Ilija Jolevski, UKLO
MEMS	Milena Djukanovic, UCG, With support of Klaus Peter Kaemper, ACUAS
Intelligent sensor actuator systems	Agron Pajaziti, UNI-PR Zoran Mijanovic, UCG
Computer integrated manufacturing	Aleksandar Markoski, Andrijana Bocevska, UKLO, Shaban Buza, UNI-PR, With support of Todor Neshkov, TUSofia
Intelligent manufacturing systems	Aleksandar Markoski, Andrijana Bocevska, UKLO Shaban Buza, UNI-PR, With support of Todor Neshkov, TUSofia
Mobile systems	Arbnor Pajaziti, UNI-PR Darko Danev, UKIM
Vibration control	Viktor Gavriloski, UKIM, With support of Martin Kozek, TUWien
Real time systems and hardware in the loop	Mile Petkovski, UKLO, With support of Martin Kozek, TUWien
Robotics	Arbnor Pajaziti, UNI-PR Marina Mijanovic Markus, UCG

23. Information on website

www.tfb.edu.mk
www.tempus-drims.eu

24. Professional or academic title which confers the student after completion of the study program

Students at the end of the academic studies of second cycle (with the completion of all examinations until the tenth semester) ie meeting the required minimum 180 + 120 = 300 European points, acquire a diploma "Master in Mechatronics" or "Master of Science in Mechatronics".

25. Activities and mechanisms to develop and maintain the quality of teaching

- control the quality of teaching in accordance with the legislation and ensuring the active role of students in quality assessment programs;
- interviewing students for an indication of possible improvement of teaching and the organization of studies;
- monitoring the professional engagement of the student after its completion, communication with students who have completed studies for insight into the applicability of knowledge and skills acquired in studies.
- self-evaluation
- external evaluation
- taking appropriate measures to improve the quality of the study program, teaching, literature and teachers.

26. Results derived from self-evaluation Guidelines for sole basis of evaluation and evaluation procedures in universities delivered by the Agency for evaluation of higher education in the country and the Intercollegiate Conference of the Republic of Macedonia (Skopje, Bitola, September 2002)

Based on the process of self-evaluation can be concluded that the Faculty shows a trend of constantly upgrading and improving the teaching-education and scientific-research. The, in respect of most value to the research criteria can be found faculty shows positive results. Like that, in terms of teaching-educational process shown are values higher than 70%. specifically, 76,12% assessed that the teacher is properly prepared, clearly explains, understandable and causes interest in the subject; 74.33% assessed that the subjects covered by appropriate literature, and, 88.21% assessed that the teacher has adequate