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HUman-TOol interaction Network (HUTON)

The naster program:

MECHATRONICS IN MEDICAL REHABILITATION

Curriculum

prepared by: **Nikola Jorgovanović**
modified and presented by: **Dejan Popović**

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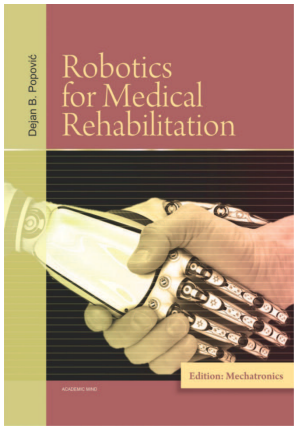
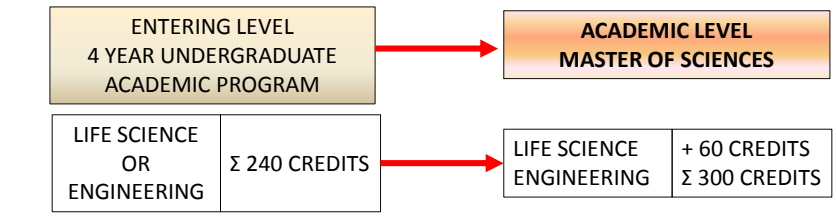
HUTON – Important Dates

- Accreditation was finalized, June 2016.
- Student enrollment has started in August 2016, and it is still in progress
- The teaching is scheduled to start on October 3rd 2016

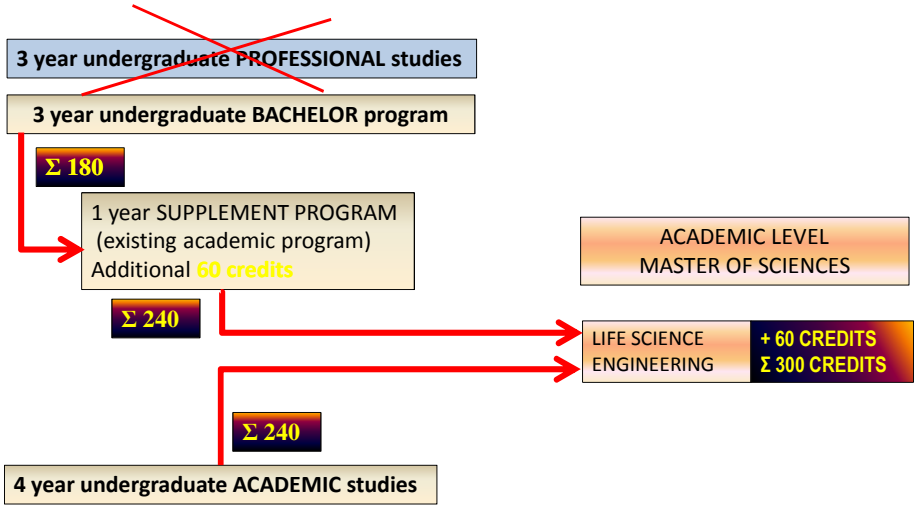


An example of the published teextbook

Curriculum Level



Curriculum Level



Curriculum is Intended for Students Who

STUDENTS BACKGROUND	ENGINEERING	LIFE SCIENCE
VOCATION	LIFE SCIENCE ENGINEERING	

ACADEMIC LEVEL: MASTER OF SCIENCE

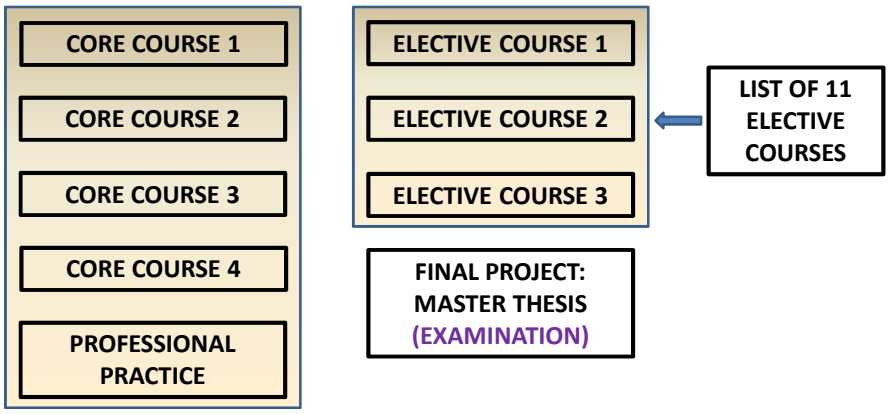
Curriculum Learning Outcomes for Engineering Background Students

- Understanding of technical requirements
- Ability to integrate mechatronics into the rehabilitation practice
- Ability to design/adapt mechatronics systems for the rehabilitation practice

Curriculum Learning Outcomes for Life Science Background Students

- Understanding of assistive devices and their potentials
- Recognition of human needs after the onset of disability
- Ability to select the appropriate and effective mechatronic system for rehabilitation

Mechatronics in Medical Rehabilitation Curriculum Structure



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Mechatronics in Medical Rehabilitation
Core Courses

	CORE COURSES
1	DISABILITY ASSESSMENT METHODS
2	CONTROL OF MOVEMENT IN HUMANS
3	MECHATRONIC SYSTEMS
4	SIGNALS AND SYSTEMS IN REHABILITATION

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Mechatronics in Medical Rehabilitation
Elective Engineering Courses: Sensors, Controls, Actuators

	ELECTIVE COURSES
1	Mechanics of robots
2	External control for biological actuators
3	Control and sensors in rehabilitation devices
4	Pneumatic and hydraulic actuators
5	Electrical and magnetic actuators
6	Method and instrumentation for movement analysis
7	Microcomputers in rehabilitation
8	Scientific and experimental methods in rehabilitation
9	Robotics in rehabilitation
10	Biostatistics

Mechatronics in Medical Rehabilitation

Time schedule for the 2016/17 School Year

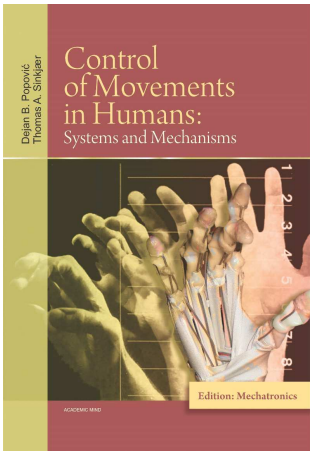
	COURSE	FROM	TO
1	Control of movement in humans	3.10.2016.	21.10.2016.
2	Mechatronic systems	24.10.2016.	11.11.2016.
3	Signals and systems in rehabilitation	14.11.2016.	2.12.2016.
4	Disability assessment methods	5.12.2016.	23.12.2016.
	Professional practice	24.12.2016.	5.2.2017.
5	Research methods in rehabilitation and ethics	6.2.2017.	24.2.2017.
6	Mechanics of robots	27.2.2017.	17.3.2017.
7	External control of biological actuators	20.3.2017.	7.4.2017.
	Preparation of master thesis	8.4.2017.	

Mechatronics in Medical Rehabilitation

Core Couse

CONTROL OF MOVEMENT IN HUMANS

- Natural control of movement
- Mechanisms for postural control
- Mechanisms for control of walking
- Mechanisms for control of goal-directed movement
- Pathology of sensory-motor systems



Published Teaching Material

Mechatronics in Medical Rehabilitation
Core Couse

MECHATRONIC SYSTEMS

- Description of smart machines and devices
- Targets of mechatronic engineering
- Sensing in mechatronics
- Synthetic intelligence
- Drives in mechatronics
- Modeling of human motion

Teaching Material In Press

Mechatronics in Medical Rehabilitation
Core Couse

DISABILITY ASSESSMENT METHODS

- Definition of impairments, disabilities and handicaps
- Functional evaluation and outcome measurement
- Components of rehabilitation
- Factors of disability
- Types of functional scales

Teaching Material In Press

Mechatronics in Medical Rehabilitation
Core Couse

SIGNALS AND SYSTEMS IN REHABILITATION

- Electrophysiology
- Characteristics of measured signals
- Modelling
- Pathologies leading to motor impairment
- Stimulation
- Rehabilitation

Published Teaching Material

Mechatronics in Medical Rehabilitation
Elective Couse

MECHANICS OF ROBOTS

- The mechanics and control of robots
- Spatial description and transformation
- Robot kinematics
- Robot dynamics
- Trajectory generation
- Robot mechanism
- Linear control of robots

Mechatronics in Medical Rehabilitation
Elective Couse

RESEARCH METHODS IN REHABILITATION AND ETHICS

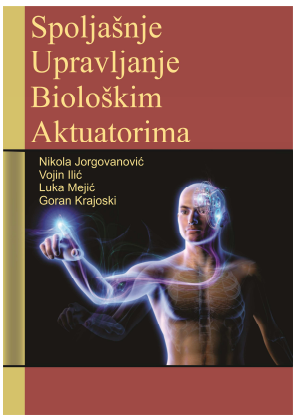
- Rehabilitation process
- Types of research studies
- Structure of research studies
- Methods and phases of clinical studies
- Specific issues of interventional research
- Research design and plan
- Ethical issues in clinical research in rehabilitation

Teaching Material In Press

Mechatronics in Medical Rehabilitation
Elective Couse

EXTERNAL CONTROL OF BIOLOGICAL ACTUATORS

- Biological actuators
- Electrical stimulation
- Electrodes for electrical stimulation
- Magnetic stimulation
- Functional electrical stimulation - FES
- Control of FES
- Electrical Safety



Teaching Material In Press

PRACTICAL ISSUES

- The teaching during the first year will be organized in the HUTON developed center (Institute "Mihajlo Pupin", Belgrade), and at the University of Novi Sad.
- Students will use the telelink for the lectures if necessary.
- Laboratory work will be organized by the course responsible in the space that is dedicated for this curriculum where special equipment/instrumentation is installed at the location of all three clinical partners by the teaching staff.
- Student's travel fees are covered during the duration of the project (when and if necessary).

PRACTICAL ISSUES

The individual curriculum for a stuent is formed by: **four** mandatory courses (24 ECTS), **three** elective courses (15 ECTS), **practical work** (3 ECTS), **research project** (10 ECTS) and **final project - master thesis** (8 ECTS).

The total number of ECTS is 60. With the 60 ECTS from the HUTON curriculum, students who enter into the program with 240 ECTS, accumulate **300 ECTS** and the title
"**Master of Mechatronics in Medical Rehabilitation**".

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PRACTICAL ISSUES

- The final project (thesis hypothesis) is being formulated during the first three weeks of teaching and each student gets a mentor who is responsible for the guidance that results with the excellence.
- The plan is that students finalize the whole program within 12 months.
- Practical work will be organized by one of the clinical partners during the three weeks period.