Program Advanced Robotix – SS 2022 19.04.2022 – 03.06.2022

Program			
Date	**Time**	**Topic**	**Responsible**
Tuesday 19.04.2022	**17:00-18:30**	L1 & L2: Introduction and Sensor technologies in robotics and inspection application	ZeMA
Thursday 21.04.2022	**17:00-18:30**	E1: Deployment of sensor technologies in a robotic system	ZeMA
Friday 22.04.2022	**08:30-10:00**	L3: Robotics in the automotive and aircraft industry	ZeMA
Tuesday 26.04.2021	**17:00-18:30**	L4: AI in robotics	ZeMA
Thursday 28.04.2022	**17:00-18:30**	E2: Solving a robotic problem based on AI algorithms	ZeMA
Friday 29.04.2022	**08:30-10:00**	L5: Application in Logistics	Uni Lux

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Date	Time	Topic	Responsible
Tuesday 03.05.2022	**17:00-18:30**	L6: Theoretical and practical aspects of robotics simulation	Uni Liege
Thursday 05.05.2022	**17:00-18:30**	E3: Programming in a virtual environment with Gazebo and ROS	Uni Liege
Friday 06.05.2022	**08:30-10:00**	L7: Soft robotics	Uni Lux
Tuesday 10.05.2022	**17:00-18:30**	L8: Specific challenges in disassembly and separation technologies	UCB
Thursday 12.05.2022	**17:00-18:3**	L9: Disassembly-friendly connection techniques and planning	UCB
Friday 13.05.2022	**08:30-10:00**	E4: Planning and solution of disassembly robotic problem replace with project/Excercise	UCB
Tuesday 17.05.2022	**17:00-18:3**	L10: Introduction to surgical robotics	Uni Liege & Lorraine
Thursday 19.05.2022	**17:00-18:30**	L11: Mobile robotics and simulation	Uni Lux

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Date	Time	Topic	Responsible
Friday 20.05.2022	**08:30-10:00**	E5: Programming and path planning of mobile robots	Uni Lux
Tuesday 24.05.2022	**17:00-18:30**	L12: Exoskeletons: reducing of Musculoskeletal Disorders (MSD) - Industrial Applications	Uni Lorraine
Thursday/ Friday **26/27.05.2022**	**Holiday: Ascension Day**		
Tuesday 31.05.2022	**17:00-18:30**	P1: Development of robotic application based on sensor data und KI algorithms	ZeMA
Thursday 02.06.2022	**17:00-18:30**	P2: Realization a robotics application in simulation enviroment	Uni Liege
Friday 03.06.2022	**08:30-10:00**	P3: Development of a robotic application to realize a disassembly problem	UCB

Build a team:
Working and participation on robotic challenge

Structure and Concept – ZeMA (3 Lectures)

- Three Lectures (3 X 90 min)

Lecture 1 (90 min)	Lecture 2 (90 min)	Lecture 3 (90 min)
Sensor technology in robotics and inspection I/II – Overview of the sensors – Data planning – Basics QM and TM – Basics of data evaluation	**Robotics in the automotive and aircraft industry** – Robotics in the automotive industry – Robotics in the aircraft industry	**AI in Robotics** – Basics – Planning – Computer vision – Machine learning and path planning

Structure and Concept – Uni Lux (3 Lectures)

- Three Lectures (3 X 90 min)

Lecture 1 (90 min)	Lecture 2 (90 min)	Lecture 3 (90 min)
Application in Logistics – Logistic tasks in manufacturing industry – Use cases of logistic robots – Logistic robots enable flexibe manufacturing systems	**Mobile Robotics** – Control of mobile Robots – Obstacle avoidance – Multi-mobile robots control **Simulation** – ROS for Mobile robots control and navigation	**Soft Robotics** – Introduction: – Cable-actuated soft robots – Pneumatic-actuated soft robots – Kinematics and dynamics of soft robots – Grasping problems

Structure and Concept – Birkenfeld (3 Lectures)

Lecture 1 (90 min)

- **Introduction to robotics (60min)**
  - Change of expectations to robotics during time
  - Important technologial developments
  - Robotics in mechanical engineering; computer sciences; medicine/healthcare
- **Gripper 30(min)**
  - Sorting by the physical principles and types of energy used

Lecture 2 (90 min)

- **Specific challenges in disassembly (45min)**
  - Why disassembly?
  - Disassembly = Reverse assembly?
  - Planning of disassembly
- **Process technologies separation (45min)**
  - Loosening of frictional connections
  - Blast cleaning
  - Milling
  - Disassembly (circlips)

Lecture 3 (90 min)

- **Disassembly-friendly connection techniques (45min)**
  - Classification according to DIN 8593
  - Accessible arrangement of the joints
  - Distinction from other Design-for-X approaches
- **Disassembly planning (45min)**
  - Basics of planning
  - Planing methods
  - Practical disassembly planing example

Structure and Concept – Uni Liege (2 Lectures)

- Two Lectures (2 X 90 min)

Lecture 1 (90 min)	Lecture 2 (90 min)
Healthcare – Surgical Robotics	**Simulation** – The concept of simulation – ROS, Gazebo and MoveIt: the discovering of tools for simulation

Structure and Concept – Uni Lorraine (1 Lecture)

- One Lectures (1 X 90 min)

Lecture 1 (90 min)

- **Exoskeleton**
  - Musculoskeletal Disorders (WRMSD) reduction as a motivation to exoskeleton
  - Classification of assisting devices
  - Examples
    - Lower limb
    - Upper limb
    - Wearable exoskeleton
  - Applications
  - Mechanical impact of ESK on body
  - Exoskeleton good practice
  - Exoskeleton Control