Óbuda University Bánki Donát Faculty of Mechanical and Safety Engineering	Insitute of Mechatronics and Vehicle Engineering

Subject title and code: *Industrial Robot programming and simulation , BMXRPY7BNE* **Credits:** *5*

Full-time study 2023/24 *ac. year* 1 *semester*

The course is available at: mechatronical engineering

Supervised by: István Nagy **Instructors:** Bence Varga, István Nagy

Prerequisite (neptun code): **Control Engineering (**BMXIR14BNE**)}, Industrial Robot Kinematics and Dynamics (**BMXRR25BNE**)**

Weekly number of lessons

Lecture: 1	Group seminar: 0	Lab: 2	Consultation: see, institute WEB-link

Way of assessment: Midterm mark (Written)

Online consultation *(in case it's required):* *... (BBB link)*

Educational goal: *To acquire basic knowledge of programming industrial robots and manipulators, both theoretical and practical. Theoretical knowledge will be taught in lectures, while practical knowledge will be taught on a 3D robot simulation system. The robot simulation environment will be based on ABB (or, depending on time, FANUC) systems. In addition, real robot programming tasks will be carried out for MITSUBISHI (humanoid robot arm) and YAMAHA (SCARA robot arm) robot arms*

Schedule

Education week	**Topics**
1.	**Reviewing** the basics of mathematics used in robot systems: coordinate systems, Rotational matrices, translational matrices, HTM, D-H calculations, Jacoby matrices, basic path planning methods, ….
2.	
3.	from 12:30 Rector's holiday, **Introduction:** reviewing basics of robot technics: coordinate systems, joints, segments, DoF,…. Types of Robot controller(s): PLC controlled, own controller, combinations,..). Architecture and types of robot programs from program writing to execution (interpreter, compiler, ...).
4.	
5.	Description and characteristics of **On-Line** and **Off-Line programming methods.** Basic IT structures related to robot programming (macros, recursions, functions, subroutines, ...).
6.	
7.	Levels of robot programs (machine code, objects, .., high-level program) and tools for robot programming (3D simulation system, PC, training panel)
8.	
9.	Modes of motion control: low level control (at the level of motors, servos, sensors); high level control (levels of SWs). Control flowcharts and their implementation. Open system robot controllers, embedded robot controllers, cooperative, collaborative robot-arms.
10.	
11.	Rector's Holiday
12.	
13.	**Theory TP**
14.	

Mid-semester requirements

Test		Assignment to be submitted		Lab measurement	
amount	dates	amount	deadlines	amount	dates

1	see schedule	0		0	

According to the Study and Examination regulations of Óbuda University attendance of group seminars and lab exercises are mandatory.

Other requirements for participation in sessions not covered by the regulations and restrictions on substitutions:
The presentations are **mandatory**, 30% absence allowed, see TVSZ

Test		Assignment to be submitted		Lab measurement	
maximum points available	minimum score required to pass /test	maximum points available	minimum score required to pass / assignment	maximum points available	minimum score required to pass /lab
100points	50points	…points	…points	…points	…points

Total number of points achievable in semester: 100points				
Grading thresholds	**satisfactory** 50 % and above	**average** 65 % and above	**good** 75 % and above	**excellent** 90 % and above
Other evaluation criteria:				
Receive a signature denied entry: over 30% absence; insufficient retake TP results				
Required references: J.N. Pires: *Industrial Robots Programming: Building Applications for the Factories of Future, Springer, 2007* more*: http://siva.bgk.uni-obuda.hu/jegyzetek/Mechatronikai_alapismeretek/IpRobProgrSzim/*				
Recommended references: see, moodle				
Quality assurance methods of the subject:				

Things, that are not included, can be found within the regulations of Óbuda University.