DESCRIPTION OF THE COURSES

- Course code: ARE0064
- Course title: Foundations of robotics
- Language of the lecturer: Polish

Course form	***Lecture***	***Classes***	***Laboratory***	***Project***	***Seminar***
*Number of hours/week**	*2*		*1*		
*Number of hours/semester**	*30*		*15*		
Form of the course completion	*egzamination*		*pass*		
ECTS credits	*3*		*1*		
Total Student's Workload	*90*		*30*		

- Level of the course (basic/advanced): advanced
- Prerequisites: Mathematical analysis, Algebra with analytical geometry
- Name, first name and degree of the lecturer/supervisor: PhD.,DSc Ignacy Dulęba,
- Names, first names and degrees of the team's members: PhD. Alicja Mazur, MSc. Paweł Ludwików
- Year: 3 Semester: 5
- Type of the course (obligatory/optional): obligatory
- Aims of the course (effects of the course): The goal of this course is to introduce basic robotic tasks and methods of solving the tasks. Students are taught to define robotic tasks and find literature methods of solving them. In laboratory sessions, students program robots.
- Form of the teaching (traditional/e-learning): traditional
- Course description: The course is aimed at introducing basic concepts related to the modeling of kinematics and dynamics of manipulators and mobile robots. Some techniques of trajectory, path, motion planning are discussed. Basic algorithms of control are also presented.
- Lecture:

Particular lectures contents	*Number of hours*
1. A short history of robotics. Classification of robots	*2*
2. Rotations in 3D Euclidean space. Special orthogonal group SO(3).	*2*
3. Motion of a rigid body.	*2*
4. Uniform coordinates.	*2*
5. Forward kinematics according to Denavit-Hartenberg convention.	*2*
6. Inverse kinematics problem.	*2*
7. Newton algorithm for nonredundant and redundant manipulators.	*2*
8. Singular configurations.	*2*
9. Modeling of dynamics – Euler-Lagrange formalism	*2*
10. Kinematics of mobile platforms.	*2*
11. Trajectory planning for manipulators along prescribed path.	*2*
12. Motion planning for mobile robots.	*2*

13. Sensors of robots.	*2*
14. Computer torque algorithm.	*2*
15. Holonomic and nonholonomic robots.	*2*

- Classes – the contents:
- Seminars – the contents:
- Laboratory – the contents: The course is aimed at checking theory in practice. Laboratory exercises allow student to program a few robots and run some simulation programs dealing with some aspects of trajectory and motion planning.
- Project – the contents:
- Basic literature:

1. J.J.Craig, Introduction to robotics. WNT, Warszawa, 1983, in Polish
2. M.W. Spong, M.Vidyasagar, Dynamics and robot control. WNT, 1997, in Polish
3. K. Tchoń, A. Mazur, I. Dulęba, R. Hossa, R. Muszyński, Manipulators and mobile robots. Acad. Publ. EXIT, Warszawa, 2000, in Polish

- Additional literature:

1. J.C.Latombe, Robot Motion Planning. Kluwer, Boston, 1993.
2. K. Kozłowski, Modelling and Identification in Robotics. Springer-Verlag, Berlin, 1998.
3. A. Morecki, J. Knapczyk, Introduction to robotics. Theory and elements of manipulators. WNT, Warszawa, 1999, in Polish
4. S.M. LaValle, Planning Algorithms, Cambridge, 2006
5. I. Dulęba, Metods and algorithms of motion planing of mobile robots and manipulators. Akad. Oficyna Wyd. EXIT, 2001, in Polish
6. P.J. McKerrow, Introduction to Robotics. Addison-Wesley, Publ.1991.

- Conditions of the course acceptance/credition: pass grades in exam and laboratory

***** - depending on a system of studies