**Content**

| Course Code | Course Name | Semester | Theory | Practice | Lab | Credit | ECTS |
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| INF430 | Robotics | 7 | 3 | 0 | 0 | 3 | 4 |

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| Prerequisites | ING220 |
| Admission Requirements | ING220 |

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| Language of Instruction | |
| Course Type | Elective |
| Course Level | Bachelor Degree |
| Objective | This course aims to introduce the fundamentals of robotics and its applications. Various software/hardware components to design and implement robotics applications are presented to the students. Different types of robots, actuators, sensors, open or closed loop system structures, robot control, kinematic equations, motion and trajectory planning algorithms, human-robot interaction are covered in the course content. Students are expected to apply the theoretical knowledge they have learned in the lectures into practice through applications and/or projects during the class hours. |
| Content | 1. Introduction to robotics<br>2. Actuators, types of actuators<br>3. Sensor, types of sensors, degrees of freedom<br>4. Forward kinematics<br>5. Backward kinematics<br>6. Rotation matrix, homogeneous transformations<br>7. Euler representation, roll-pitch-yaw<br>8. Denavit-Hartenberg notation<br>9. Midterm exam<br>10. Introduction to human-robot interaction<br>11. PID controller<br>12. Lab: PID controller calibration<br>13. Lab: 2-joint robot arm control, derivation of forward and inverse kinematic equations<br>14. Student presentations |
| References | 1) M.W. Spong, S.Hutchinson and M. Vidyasagar, “Robot Modeling and Control”, Wiley, 2006.<br>2) Phillip John McKerrow, “Introduction to Robotics”, Addison-Wesley, 1991.<br>3) Saeed B. Niku, “Introduction to Robotics. Analysis, Systems, Applications”, Prentice Hall, 2001.<br>4) Vladimir J. Lumelsky, “Sensing, Intelligence, Motion”,Wiley, 2006.<br>5) S. M. LaValle, “ Planning Algorithms”, Cambridge University Press, 2006. URL adresi http://planning.cs.uiuc.edu/. |

**Theory Topics**

| Week | Weekly Contents |
|---|---|
| 1 | Introduction to robotics |
| 2 | Actuators, types of actuators |
| 3 | Sensor, types of sensors, degrees of freedom |
| 4 | Forward kinematics |
| 5 | Backward kinematics |
| 6 | Rotation matrix, homogeneous transformations |
| 7 | Euler representation, roll-pitch-yaw angles |
| 8 | Denavit-Hartenberg notation |
| 9 | Midterm |
| 10 | Introduction to human-robot interaction |
| 11 | PID controller |
| 12 | Lab: PID controller calibration |
| 13 | Lab: 2-joint robot arm control, derivation of forward and inverse kinematic equations |
| 14 | Student presentations |