



# İSTANBUL TECHNICAL UNIVERSITY

## Department of Computer Engineering

### BLG456E – Robotics – Fall 2015

#### Course Summary

**BLG456E SYLLABUS**

**Lecturer** Dr. Damien Jade Duff  
**Lecturer email** [djduff@itu.edu.tr](mailto:djduff@itu.edu.tr)  
**Lecturer office** EEBF 2316  
**Lecturer office hours** Monday 15:00-14:00  
Thursday 10:30-11:30  
**Lecturer calendar** <http://djduff.net/my-schedule>  
**Assistant** Çağatay Koç  
**Assistant Email** [kocca@itu.edu.tr](mailto:kocca@itu.edu.tr)  
**Assistant office** AI Research Lab  
**Course coordination** <http://ninova.itu.edu.tr/Ders/4709>

## Goal

- To see what is possible with robots, and to get a feel for the scope and difficulty of the relevant tasks.
- To have practical experience with programming solutions for fundamental robot tasks.
- To have an overview of the problems and general classes of known solutions to problems in the field of robotics.
- To gain an understanding of the fundamentals of robot hardware and of the range of different components and morphologies.
- To have hands on experience with sensing, actuation, control, localisation, mapping, path planning, architecture, and robot learning.
- Have practical experience with using the math underlying robot programming and design, including kinematics, probability and geometry.

## Assessment

### Weightings:

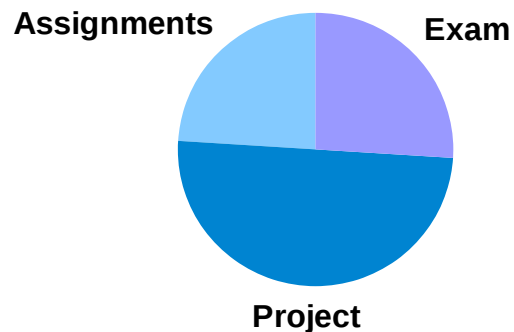
- Assignments: 24%.
- Project: 50%.
- Final Exam: 26%.

### To avoid VF:

- Attendance  $\geq 70\%$ .
- $\geq 2$  assignments submitted (min 20%).
- Project submitted.
- Average of projects & assignments  $\geq 30\%$

### To avoid FF:

- Average:  $\geq 40\%$ .



Meanings of grades	
Grade	Meaning
AA	Pursued excellence.
BB	Went beyond requirements.
CC	Fulfilled the requirements of the course.
DD	Substandard but effortful.
FF	Unacceptable/negligent.

## Workload

ECTS Credits: 4

Total workload: 4 x 25.5 ~ 102 hours

Workload per class hour (13 class hours):

51 / 13 ~ **7.5 hours.**

= 2 hours in-class +

5.5 hours:

- assignments, project.
- study, general reading and reflection.

**Assignments** will be practical programming assignments based around solving problems for the Turtlebot robot in the Gazebo simulation on ROS Indigo.

**The project** will be a group project around solving a practical robot problem of the students' choice.

**The exam** will be mathematical and conceptual questions related to practical mobile robotics.

## Textbook & Readings

### Textbook:

*Introduction to Autonomous Mobile Robots*, Roland Siegwart, Illah Reza Nourbakhsh and Davide Scaramuzza, MIT Press: Cambridge, MA, USA, 2011.

### Other readings:

*Springer Handbook of Robotics*, Bruno Siciliano and Oussama Khatib, Springer: New York, 2008.

*Computational Principles of Mobile Robotics*, Gregory Dudek and Michael Jenkin, Cambridge University Press: Cambridge, YK; 2nd edition, 2010.

## Course plan

### PART I - Reactive Robotics

Week 1 - Introduction to robotics (+ intro to ROS).

Week 2 - *Holiday*.

Week 3 - 2D mobile robot locomotion (+ intro to ROS).

Week 4 - 2D mobile robot kinematics (+ intro to ROS).

Week 5 - Basic control & learning.

### Assignment due

*Assignment 1.*  
*Proposal.*

### PART II - Cognitive Robotics

Week 6 - Estimation & localization.

Week 7 - *Holiday*.

Week 8 - Map estimation & SLAM.

Week 9 - Path planning.

Week 10 - Model learning & simulation.

*Assignment 2.*

*Project WP1.*

### Part III - Advanced topics.

Week 11 - Robot vision + robust cognitive robots (guest).

Week 12 - Locomotion/kinematics + robot audition (guest).

Week 13 - 3D geometry & dynamics.

Week 14 - Catch-up + human-robot interaction (guest).

Week 15 - Demos.

*Project due.*

**It is your job to keep tabs on announcements, assignments and updates via your İTÜ email and the course page on Ninova.**

## Academic dishonesty

Academic honesty, including copying and plagiarism, will result in an automatic zero on the work at hand and possible referral to a disciplinary commission. Plagiarism includes uncited use of ideas and uncited or unquoted use of text.