



**UNSW**  
AUSTRALIA

# Course outline

Semester 1 2017

Never Stand Still

Engineering

Mechanical and Manufacturing Engineering

Automotive Engineering

## **MTRN4010**

# **ADVANCED AUTONOMOUS SYSTEMS**



## 1. Staff c

Processes, in particular for Robot Perception and Localization.

- Understanding the Implementation of stochastic Sensor Data Fusion for solving Engineering Problems.
- Understanding the theory of advanced techniques such as Fuzzy Logic, PSO and Neural Networks.
- Be able to implement simulations and real systems for the control and estimation of processes such as a mobile robotic platform.
- Enable students to work to improve problem-solving skills.
- Obtain experience working with current state of the art sensing technology in Field Robotics.

Concepts included in this course are useful for other disciplines, in research, development and industrial application.

### Student learning outcomes

This course is designed to address the following learning outcomes and the corresponding Engineers Australia Stage 1 Competency Standards for Professional Engineers, as shown. The full list of Stage 1 Competency Standards may be found in Appendix A.

After successfully completing this course, students should be able to:

Learning Outcome		EA Stage 1 Competencies
1.	Understand the general theory of Bayesian Estimation. Understand the theory and application of the Kalman Filter (KF and EKF) for solving diverse types of problems in the area of Engineering	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals
2.	Understand methods such as Neural Networks, Fuzzy Logic and PSO.	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals
3.	Be able to develop software for applying the theory and actually solving complex problems. Have experience in using state of the art sensors, used in Field Robotics and Autonomous Systems	PE2.3 Application of systematic engineering synthesis and design processes

## 3. Teaching strategies

Teaching of this course is implemented through lectures, to cover the theory, and project sessions to put those concepts in practice. All laboratory/project work is individual work, and attendance is necessary.

The provision of the learning environment in the laboratory is to facilitate the students to develop confidence in managing laboratory tasks as projects. Demonstrators in the laboratories are there to provide all the guidance and assistance in managing the laboratory tasks.



Special Topic	week 9	LR	Case of Study: SLAM (Simultaneous Localization and Mapping) or similar problem (to be decided by students).	Moodle lecture notes
PSO	week 10	LR	Introduction to PSO (Particle Swarm Optimization)	Moodle lecture notes
Neural Networks	week 11	LR	Introduction to Neural Networks	Moodle lecture notes
Fuzzy Logic	week 12	LR	Introduction to Fuzzy Logic	Moodle lecture notes
Revision	week 13	LR	Revision and discussion	Moodle lecture notes

\*Note: LR = lecture Room = Colombo Theatre B

# 5. Assessment

## Assessment Overview

Assessment task	Length	Weight	Learning outcomes assessed	Assessment criteria	Due date, time, and submission requirements	Deadline for Absolute fail	Marks returned
Projects	4 projects	50%	1,3	Refer to assignments specifications for exact details.	See details in the section about Projects	See details in the section about Projects	See details in the section about Projects
Final exam	2 hours	50%	1,2,3	All course content from weeks 1-12	Exam period, date TBC.	N/A	Upon release of final results

Necessary conditions in order to pass the course:

- a) The exam mark must be 50/100 or higher.
- b) The total mark of the project component must be 50/100 or higher.

### Projects

Assessment task	Length	Weight (of Project component)	Learning outcomes assessed	Assessment criteria	Due date, time, and submission requirements	Deadline for Absolute fail	Marks returned
Task 0	Problems	0%	(refreshing concepts and skills)	No assessment	---	N/A	N/A
Task 1	Completely operational software	9%	3	Refer to assignment specification for exact details (*).	Meeting with a demonstrator during week 5.	1 week later	< 10 days later
Task 2	Completely operational software	9%	3	Refer to assignment specification for exact details (*).			





### *Calculators*

You will need to provide your own calculator, of a make and model approved by UNSW, for the examinations. The list of approved calculators is shown at [student.unsw.edu.au/exam-approved-calculators-and-computers](http://student.unsw.edu.au/exam-approved-calculators-and-computers)

It is your responsibility to ensure that your calculator is of an approved make and model, and to obtain an “Approved” sticker for it from the School Office or the Engineering Student Centre prior to the examination. Calculators not bearing an “Approved” sticker will not be allowed into the examination room.

### **Special consideration and supplementary assessment**

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## 8. Academic honesty and plagiarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.*

Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.*

- [Computing Facilities](#)
- [Assessment Matters](#) (including guidelines for assignments, exams and special consideration)
- [Academic Honesty and Plagiarism](#)
- [Student Equity and Disabilities Unit](#)
- [Health and Safety](#)
- [Student Support Services](#)

*Jose Guivant  
01/February/2017*

