

# ELEC9741<sub>Term II, 2021</sub> Electrical Engineering Data Science

**Instructors:** Prof. V. Solo Dr. V. Sethu  
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**UOC:** 6  
**Class Times:** Wednesday, 6pm-9pm + 1 extra lecture for each part Online Using Zoom  
**Prerequisites:** Undergraduate Signal Processing Course  
& Undergraduate Control Course

## Course Organisation

There are two parts to the course  
Part I: weeks 1-5: Visualization & System Identification  
Part II: weeks 6-10: Pattern Recognition

## Aims:

Provide an introduction to Data Science principles and practice from a Control and a Signal Processing point of view.

## Assessment :

To pass, students must obtain a pass level in each part of the course

Assignments (one for each part) 2×15% each

Keep a copy of your assignment

Late assignments will be penalised at 10% of the maximum value per day late.

Exams (Take-home) 2×35% each

The same conditions apply as for Assignments.

## Assignment & Exam Timetable

Assignment 1: out - week 3 ; due - week 5

Exam 1: out - week 5 ; due - Friday of week 6

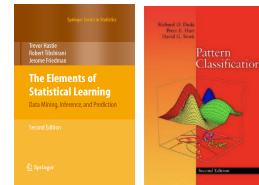
Assignment 2: out - week 8 ; due - week 10

Exam 2: out - week 10 ; due - Monday of week 12 (includes an oral presentation)

## Resources

<b>Software:</b>	<b>Part I</b>	<b>Part II</b>
<b>Textbook:</b>	Matlab & R	Matlab & Python
<b>Reference</b>	none.	none.
	R. Shumway & D. Stoffer (2011) Time Series Analysis and its Applications. 3rd. ed. Springer.	(i) T. Hastie, R. Tibshirani, J. Friedman The Elements of Statistical Learning, 2nd ed. Springer (2009). (ii) R.O. Duda, D.G. Stork, P.E.Hart (2001) Pattern Classification 2nd.ed., J. Wiley.

All three  
available Online



## Teaching Strategies

Lectures	To give the basic material in written form, and to highlight the importance of different sections, and help with the formation of schema.
Assignments	To give practice in problem solving, and to assess your progress.
Examination & Project	Final test of competency.

## Learning Outcomes

At the end of the course the student will: (i) know basic aspects of Data Science from both a Control and a Signal Processing point of view; (ii) be able to use this knowledge to solve basic problems in Data Science

## Academic Honesty and Plagiarism

Plagiarism means copying. You cannot copy other people's work of any kind; you cannot copy from any source. Plagiarism is a serious offence and (severe) penalties will apply; see <https://student.unsw.edu.au/plagiarism>

## Administrative Matters

On issues and procedures regarding such matters as special needs, equity and diversity, occupational health and safety, enrolment, rights, and general expectations of students, please refer to the School policies, on the School webpage.

## **Part I Topics**

<b>Week</b>	<b>Topic</b>
1a	Introduction to Data Science.
1b	Matrix Methods Review: emphasizing e.g. eigen-analysis.
2	Information Visualization: Principles & Practice.
3	Introduction to System Identification.
4	Stochastic Processes and Spectra in System Identification.
5	Kalman Filter, Wiener Filter.

## **Part II Topics**

<b>Week</b>	<b>Topic</b>
6	Introduction to Machine Learning.
7	Feature Representations: e.g. speech and image features
8	Linear Methods for Regression and Classification.
9	Generative Models and Support Vector Machines.
10a	Deep Learning.
10b	Hardware and Software Considerations: e.g. databases, toolboxes, GPUs, etc.

**COVID-19** Your health and the health of those in your class is critically important. You must stay at home if you are sick or have been advised to self-isolate by NSW health (<https://www.nsw.gov.au/covid-19/what-you-can-and-cant-do-under-rules/self-isolation>) or government authorities. Current alerts and a list of hotspots can be found here: <https://www.nsw.gov.au/covid-19/latest-news-and-updates>. **You will not be penalised for missing a face-to-face activity due to illness or a requirement to self-isolate.** We will work with you to ensure continuity of learning during your isolation and have plans in place for you to catch up on any content or learning activities you may miss. Where this might not be possible, an application for fee remission may be discussed.

If you are required to self-isolate and/or need emotional or financial support, please contact the Nucleus: Student Hub (<https://nucleus.unsw.edu.au/en/contact-us>).

If you are unable to complete an assessment, or attend a class with an attendance or participation requirement, please let your teacher know and apply for special consideration (<https://student.unsw.edu.au/special-consideration>) through the Special Consideration portal ([https://iARO.online.unsw.edu.au/special\\_consideration/home.login](https://iARO.online.unsw.edu.au/special_consideration/home.login)).

To advise the University of a positive COVID-19 test result or if you suspect you have COVID-19 and are being tested, please fill in this form (<https://www.covid-19.unsw.edu.au/covid-19-case-notification>).

UNSW requires all staff and students to follow NSW Health advice. Any failure to act in accordance with that advice may amount to a breach of the Student Code of Conduct. Please refer to the Safe Return to Campus (<https://www.covid-19.unsw.edu.au/safe-return-campus>) guide for students for more information on safe practices.

**Appendix C: Engineers Australia (EA) Professional Engineer  
Competency Standard**

	<b>Competency Standards</b>	<b>Learning Outcomes</b>
PE1 <sup>†</sup> :	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals	(i)
	PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing	(i)
	PE1.3 In-depth understanding of specialist bodies of knowledge	(i)
	PE1.4 Discernment of knowledge development and research directions	
	PE1.5 Knowledge of engineering design practice	(ii)
	PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice	
PE2 <sup>o</sup> :	PE2.1 Application of established engineering methods to complex problem solving	(ii)
	PE2.2 Fluent application of engineering techniques, tools and resources	(ii)
	PE2.3 Application of systematic engineering synthesis and design processes	(ii)
	PE2.4 Application of systematic approaches to the conduct and management of engineering projects	
PE3*:	PE3.1 Ethical conduct and professional accountability	
	PE3.2 Effective oral and written communication (professional and lay domains)	(ii)
	PE3.3 Creative, innovative and pro-active demeanour	
	PE3.4 Professional use and management of information	(i),(ii)
	PE3.5 Orderly management of self, and professional conduct	
	PE3.6 Effective team membership and team leadership	

† Knowledge and Skill Base

<sup>o</sup> Engineering Application Ability

\* Professional and Personal Attributes