



THE UNIVERSITY OF  
NEW SOUTH WALES

The School of Electrical Engineering and Telecommunications

*ELEC9722*

# Digital Image Processing

Elias Aboutanios

Course Outline

Session 1, 2009

## Course Staff

**Course Coordinator  
and Lecturer in Charge**      *Dr. Elias Aboutanios*      Room EE325  
Phone: 9385 5010  
Email: elias@unsw.edu.au

## Class Times and Locations

**Lectures**      Thurs. 6-9pm      OMB 144A (K13\*)

**Labs**      Thurs. 6-9pm      EE214

\*For the map references of the classroom locations see the [Campus Map](#) (click here).

## Consultation

The lectures and tutorials are the primary avenues of contact between the teaching staff and the students. The consultations are not meant to replace these, but to allow the students to raise concerns (or ask questions) they might have with the lecturer in charge should the standard contact channels prove inadequate. Initially, one consultation hour will be allocated on **Thursdays from 1pm to 2pm** and will be conducted in **Room EE325**. This, however, is subject to change as required and any changes will be announced on the subject website.

Students may contact the lecturer by email to seek an appointment or ask a question. However, while every effort will be made, a response is not always guaranteed and the students are encouraged to take full advantage of the consultation hour.

## Course Information

### Course Load and Weight

*This is a postgraduate course that is worth 6 units of credit (UoC).*

The University defines a UoC as requiring 25 hours of total learning effort per semester (spread over the formal contact hours and the student's own study time.) Therefore, it is expected that 150 hours will be allocated to this course. The formal contact hours amount to three (3) per week. Therefore the student is expected to put in the balance of the learning effort in their own time. This level of discipline is essential in order for the students to perform satisfactorily.

### Description and Objective

This course gives the students the fundamentals of digital image processing, covering some topics from the following list: image models and physical imaging systems; visual perception; rendering systems; linear filtering; linear transforms; mathematical morphology; compression; tomographic image reconstruction; inverse problems in imaging; image enhancement; edge detection; feature extraction; and geometric diffusion. The objectives of the course are:

1. Provide the student with the fundamentals of digital image processing.
2. Give the students a taste of the applications of the theories taught in the subject. This will be achieved through the project and some selected lab sessions.
3. Introduce the students to some advanced topics in digital image processing should time permit.
4. Give the students a useful skill base that would allow them to carry out further study should they be interested and to work in the field.

### Organisation

The subject will be organised into a series of lectures, tutorials, some practical lab sessions, and a project. See the course schedule for details.

## Teaching Methods

The primary method of material dissemination will be the lectures and tutorials. The tutorials will be run as needed during lecture times and students will be advised of a tutorial at least a week before. It is imperative that the students attempt the tutorial questions in order for them to reap the maximum benefit from these sessions. They are reminded that the contact time with the lecturer for a postgraduate course is quite limited and efficient use of it is important. The lectures and tutorials will be supported by a number of practical laboratory classes that will take place in the multimedia lab (EE214). The learning process will also be reinforced with regular assessment in the form of quizzes and a project which are intended to examine the student's progress and understanding during semester.

## Learning Outcomes

Upon successfully completing the course, the student should:

1. Have an appreciation of the fundamentals of Digital image processing including the topics of filtering, transforms and morphology, and image analysis and compression.
2. Be able to implement basic image processing algorithms in MATLAB.
3. Have a the skill base necessary to further explore advanced topics of Digital Image Processing.
4. Be in a position to make a positive professional contribution in the field of Digital Image Processing.

## Plagiarism

The University takes plagiarism very seriously and those committing this act are dealt with strictly. According to the University website, "*Plagiarism is taking the ideas or words of others and passing them off as your own. Plagiarism is a type of intellectual theft. Plagiarism can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. Plagiarism can have serious consequences...*"

In addition to being dishonest and unethical, plagiarism severely hinders the learning process of the person engaging in it. For more information please refer to [the UNSW Plagiarism Policy](#).

## Assessment

This course will not have a final exam. Instead a form of ongoing assessment will be employed that is aimed at continually examining the students' progress. This will permit any weakness to be identified in a timely manner and therefore addressed before the end of the semester. The assessment has two components:

- Quizzes: There will be five (5) quizzes in total. Two (2) of those will be worth 10% each, two will count 15% each, while the final one will contribute 20% towards the final mark.
- Project: worth 30%, to be submitted by 5pm on Wednesday, May 27<sup>th</sup>.

We point out that this is a postgraduate course and therefore a minimum mark of 50% is required to pass the subject.

## Project Submission

The project is to be submitted by 5pm on Wednesday in week 10 (27 May). An electronic copy of the report, code, and any other relevant material must be emailed to the lecturer in charge. All files must be zipped into a single archive that is named Elec9722\_Porject\_SN, where SN is the student number. The electronic submission is not valid until you get an email acknowledgment. This acknowledgement constitutes your receipt. If you do not receive it, see the lecturer during lecture on Thursday, May 28. A hardcopy of the project report must also be handed in to the school office by the deadline. This hard copy is time and date stamped and therefore any late submission will be penalised. In order to avoid a situation where email delivery problem unfairly affect the project submission, late penalties will be based on the time and date stamp of the school office.

## Course Schedule

The preliminary course schedule is shown in the table below. Note that this program is subject to change as necessary to improve students' experience.

Table 1: Course Schedule: *ELEC9722* - Digital Image Processing

<i>wk:</i>	<i>Activity</i>	-	<i>Topic</i>
0:	Lecture	-	Welcome and subject organisation.
1:	Lecture	-	Ch1 - Introduction to Image Processing.
	Practical	-	lab/tutorial
2:	Lecture	-	Ch2 - Imaging systems.
	Practical	-	lab/tutorial
			Project posted on subject website.
3:	Lecture	-	Ch3 - LSI filtering and the Fourier Transform.
	Practical	-	lab/tutorial
4:	Lecture	-	Ch4 - Colour Representation and Display.
	Assessment	-	Quiz (10%)
5:	Lecture	-	Ch5 - Morphology.
	Practical	-	lab/tutorial
6:	Lecture	-	Ch6 - Image Analysis.
	Assessment	-	Quiz (10%)
7:	Lecture	-	Ch7 - Image Transforms.
	Practical	-	lab/tutorial
8:	Lecture	-	Ch7 - Image Transforms.
	Assessment	-	Quiz (15%)
9:	Lecture	-	Ch6 - Image Analysis.
	Practical	-	lab/tutorial
10:	Lecture	-	Ch8 - Image compression.
	Assessment	-	Quiz (15%)
11:	Lecture	-	Ch8 - Image compression, continued.
	Practical	-	lab/tutorial
12:	Lecture	-	Introduction to video compression.
	Assessment	-	Quiz (20%)

## Resources

**Recommended Texts:** Woods and Gonzales, *Digital Image Processing* - Second Edition, Prentice-Hall, 2002

**Links:** The primary source of information and resource for this course should be the [subject website](#), which can be accessed at using your student number and unipass.

**Other Resources:** The students are reminded that the UNSW library is an excellent resource.

## Continual Course Improvement

This course is under constant revision in order to improve the learning outcomes for the students. The students are encourage to give any constructive feedback to the lecturer in charge, either in person or by email during the course of the semester. We also kindly ask the students to express any feedback (positive or negative) on the course and their own experience of it via the Course and Teaching Evaluation and Improvement Process.

## 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's policies and procedures](#).