



**MONASH** University  
Information Technology

**FIT3081**  
**Image processing**

**Unit Guide**

**Semester 1, 2011**

The information contained in this unit guide is correct at time of publication. The University has the right to change any of the elements contained in this document at any time.

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# **FIT3081 Image processing - Semester 1, 2011**

This unit covers fundamental techniques in image processing. Topics include image representation and enhancement, thresholding, image algebra, neighbourhood operations on images, Fourier methods, edge detection, feature extraction and representation, shape, texture, segmentation, classification, restoration, image compression, and colour and multiband image processing.

## **Mode of Delivery**

Sunway (Day)

## **Contact Hours**

2 hrs lectures/wk, 1 hr laboratory/wk, 1 hr tutorial/wk

## **Workload**

- Lectures: Two 1 hour lectures per week
- Tutorial: 1 hour tutorials starting week 2
- Lab Session: 1 hour session starting week 3

and up to an additional 8 hours in some weeks for completing lab and project work, private study and revision.

## **Unit Relationships**

### **Prohibitions**

CSE3314

### **Prerequisites**

FIT2004 (or CSE2304) and FIT2014 (or CSE2303)

### **Chief Examiner**

Loke Kar Seng

### **Campus Lecturer**

### **Clayton**

Sid Ray

## Learning Objectives

At the completion of this unit students will have -  
Developed the ability to:

- understand the processes of image formation, acquisition, processing and analysis;
- develop programs for manipulating grey level, colour and multi-spectral images; and
- use standard image processing software;
- undertake computer analysis of medical, remotely-sensed, document, and other images.

Developed attitudes that enable them to:

- understand the role of visual information processing and analysis; and
- apply the theory and methods in practical problem solving.

Developed the skills to:

- write programs to carry out basic image processing tasks such as image denoising, image filtering and segmentation of an image in its constituent parts or objects;
- write programs to carry out advanced image processing and analysis tasks such as image segmentation, image, image classification, image data mining, and robotic vision; and
- build a software system for processing and analysis of image data.

Demonstrated the communication and teamwork skills necessary to:

- function as an image processing specialist in a group which is involved in developing a major software system; and
- produce appropriate documentation.

## Graduate Attributes

Monash prepares its graduates to be:

1. responsible and effective global citizens who:
  - a. engage in an internationalised world
  - b. exhibit cross-cultural competence
  - c. demonstrate ethical values

critical and creative scholars who:

- a. produce innovative solutions to problems
- b. apply research skills to a range of challenges
- c. communicate perceptively and effectively

## Assessment Summary

Examination (3 hours): 70%; In-semester assessment: 30%

<b>Assessment Task</b>	<b>Value</b>	<b>Due Date</b>
Assignment 1	10%	Week 6, Thursday

Assignment 2          20%    Week 12, Thursday

Examination 1        70%    To be advised

## Teaching Approach

### Lecture and tutorials or problem classes

This teaching and learning approach provides facilitated learning, practical exploration and peer learning

### Feedback

### Our feedback to You

Types of feedback you can expect to receive in this unit are:

- Informal feedback on progress in labs/tutes
- Graded assignments with comments

### Your feedback to Us

Monash is committed to excellence in education and regularly seeks feedback from students, employers and staff. One of the key formal ways students have to provide feedback is through SETU, Student Evaluation of Teacher and Unit. The University's student evaluation policy requires that every unit is evaluated each year. Students are strongly encouraged to complete the surveys. The feedback is anonymous and provides the Faculty with evidence of aspects that students are satisfied and areas for improvement.

For more information on Monash's educational strategy, and on student evaluations, see:

<http://www.monash.edu.au/about/monash-directions/directions.html>

<http://www.policy.monash.edu/policy-bank/academic/education/quality/student-evaluation-policy.html>

## Previous Student Evaluations of this unit

If you wish to view how previous students rated this unit, please go to

<https://emuapps.monash.edu.au/unitevaluations/index.jsp>

## Required Resources

### Software

- Java Development Kit
- Netbeans

These are freely available from:

JDK - <http://www.oracle.com/technetwork/java/javase/downloads/jdk6-jsp-136632.html>

Netbeans -<http://netbeans.org/>

## Examination material or equipment

Writing tools

## Unit Schedule

Week	Date*	Activities	Assessment
0	21/02/11		No formal assessment or activities are undertaken in week 0
1	28/02/11	Image Processing Fundamentals; Arithmetic Operations on Images	
2	07/03/11	Introduction to Image Enhancement Techniques; Linear Stretching	
3	14/03/11	Spatial Filtering Methods; Sharpening Filters	
4	21/03/11	Histogram Equalization; Line and Edge Detection	
5	28/03/11	Image Thresholding; Image Segmentation Methods	
6	04/04/11	Clustering-Based Image Segmentation; Region Growing; Splitting and Merging	Assignment 1 due Thursday this week
7	11/04/11	Texture Characterization; Co-occurrence Matrices; Entropy-Based Thresholding	
8	18/04/11	Image Filtering in Frequency Domain	
Mid semester break			
9	02/05/11	Image Data Compression	
10	09/05/11	Image Representation and Description	
11	16/05/11	Image Recognition I	
12	23/05/11	Image Recognition II	Assignment 2 due Thursday this week
	30/05/11	SWOT VAC	No formal assessment is undertaken SWOT VAC

\*Please note that these dates may only apply to Australian campuses of Monash University. Off-shore students need to check the dates with their unit leader.

## Assessment Policy

To pass a unit which includes an examination as part of the assessment a student must obtain:

- 40% or more in the unit's examination, and
- 40% or more in the unit's total non-examination assessment, and
- an overall unit mark of 50% or more.

If a student does not achieve 40% or more in the unit examination or the unit non-examination total assessment, and the total mark for the unit is greater than 50% then a mark of no greater than 49-N will be recorded for the unit

## Assessment Tasks

### Participation

- **Assessment task 1**

**Title:**

Assignment 1

**Description:**

Programming and Analysis for Image Processing Tasks

**Weighting:**

10%

**Criteria for assessment:**

**Due date:**

Week 6, Thursday

- **Assessment task 2**

**Title:**

Assignment 2

**Description:**

Programming and Analysis for Image Processing Tasks

**Weighting:**

20%

**Criteria for assessment:**

**Due date:**

Week 12, Thursday

### Examinations

- **Examination 1**

**Weighting:**

70%

**Length:**

3 hours

**Type (open/closed book):**

Closed book

**Electronic devices allowed in the exam:**

None

### Assignment submission

Assignment coversheets are available via "Student Forms" on the Faculty website:

<http://www.infotech.monash.edu.au/resources/student/forms/>

You MUST submit a completed coversheet with all assignments, ensuring that the plagiarism declaration section is signed.

## Extensions and penalties

Submission must be made by the due date otherwise penalties will be enforced.

You must negotiate any extensions formally with your campus unit leader via the in-semester special consideration process:

<http://www.infotech.monash.edu.au/resources/student/equity/special-consideration.html>.

## Returning assignments

Students can expect assignments to be returned within two weeks of the submission date or after receipt, whichever is later

## Policies

Monash has educational policies, procedures and guidelines, which are designed to ensure that staff and students are aware of the University's academic standards, and to provide advice on how they might uphold them. You can find Monash's Education Policies at:

<http://policy.monash.edu.au/policy-bank/academic/education/index.html>

Key educational policies include:

- Plagiarism  
(<http://www.policy.monash.edu/policy-bank/academic/education/conduct/plagiarism-policy.html>)
- Assessment  
(<http://www.policy.monash.edu/policy-bank/academic/education/assessment/assessment-in-coursework-p>)
- Special Consideration  
(<http://www.policy.monash.edu/policy-bank/academic/education/assessment/special-consideration-policy.h>)
- Grading Scale  
(<http://www.policy.monash.edu/policy-bank/academic/education/assessment/grading-scale-policy.html>)
- Discipline: Student Policy  
(<http://www.policy.monash.edu/policy-bank/academic/education/conduct/student-discipline-policy.html>)
- Academic Calendar and Semesters (<http://www.monash.edu.au/students/key-dates/>);
- Orientation and Transition (<http://www.infotech.monash.edu.au/resources/student/orientation/>);  
and
- Academic and Administrative Complaints and Grievances Policy  
(<http://www.policy.monash.edu/policy-bank/academic/education/management/complaints-grievance-policy>)

## Student services

The University provides many different kinds of support services for you. Contact your tutor if you need advice and see the range of services available at [www.monash.edu.au/students](http://www.monash.edu.au/students) The Monash University Library provides a range of services and resources that enable you to save time and be more effective in your learning and research. Go to <http://www.lib.monash.edu.au> or the library tab in my.monash portal for more information. Students who have a disability or medical condition are welcome to contact the Disability Liaison Unit to discuss academic support services. Disability Liaison Officers (DLOs) visit all Victorian campuses on a regular basis

- Website: <http://adm.monash.edu/sss/equity-diversity/disability-liaison/index.html>;
- Telephone: 03 9905 5704 to book an appointment with a DLO;
- Email: [dlu@monash.edu](mailto:dlu@monash.edu)



- Drop In: Equity and Diversity Centre, Level 1 Gallery Building (Building 55), Monash University, Clayton Campus.

## **READING LIST**

### **Recommended Reading**

R. C. Gonzalez and R. E. Woods, Digital Image Processing using MATLAB, Prentice Hall, 2004. A. K. Jain, Fundamentals of Digital Image Processing, Prentice-Hall, 1990. W. Niblack, An Introduction to Digital Image Processing, PHI, 1986. D. H. Ballard and C. M. Brown, Computer Vision, Prentice-Hall, 1982. M. D. Levine, Vision in Man and Machine, McGraw-Hill, 1995. R. Jain, R. Kasturi, and B. G. Schunck, Machine Vision, McGraw-Hill, 1995. C. Watkins, A. Sadun, and S. S. Marenka, Modern Image Processing: Warping, Morphing, and Classical Techniques, Academic Press, 1993. H. R. Myer and A. R. Weeks, The Pocket Handbook of Image Processing Algorithms in C, Prentice-Hall, 1993. S. E. Umbaugh, Computer Vision and Image Processing: a practical approach using C, Prentice Hall PTR, 1998.