



**MONASH** University  
Information Technology

**FIT3081**  
**Image processing**

**Unit Guide**

**Semester 1, 2014**

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# **FIT3081 Image processing - Semester 1, 2014**

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**

Malaysia (Day)

## **Workload Requirements**

Minimum total expected workload equals 12 hours per week comprising:

(a.) Contact hours for on-campus students:

- Two hours of lectures
- One 2-hour laboratory

(b.) Additional requirements (all students):

- A minimum of 8 hours independent study per week for completing lab and project work, private study and revision.

## **Unit Relationships**

### **Prohibitions**

CSE3314

### **Prerequisites**

FIT2004 (or CSE2304) and FIT2014 (or CSE2303)

### **Chief Examiner**

Dr Anuja Dharmaratne

### **Campus Lecturer**

### **Malaysia**

**Dr Anuja Dharmaratne**

Consultation hours: Mon 2-5, Wed 2-5

## Tutors

### Malaysia

**Dr Anuja Dharmaratne**

Consultation hours: Mon 2-5, Wed 2-5

## 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 the Student Evaluation of Teaching and Units (SETU) survey. 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, see:

[www.monash.edu.au/about/monash-directions/](http://www.monash.edu.au/about/monash-directions/) and on student evaluations, see:  
[www.policy.monash.edu/policy-bank/academic/education/quality/student-evaluation-policy.html](http://www.policy.monash.edu/policy-bank/academic/education/quality/student-evaluation-policy.html)

## Previous Student Evaluations of this Unit

Based on previous student feedback this unit is considered to be well structured and students are satisfied with the delivery of lectures as well as the unit content. For this semester lecture slides have been shortened, updated and re-organized.

The following subtopics have been added:

1. Color Models (RGB, HSV, etc)
2. Image Noise, Noise types and noise removal
3. Hough transform for straight line detection
4. Morphological operations
5. Connected Component labeling
6. Size filter

The content on the following subtopics have been reduced:

1. Image acquisition methodologies
2. Segmentation
3. Image representation & Description
4. Organization of visual systems in the brain

If you wish to view how previous students rated this unit, please go to  
<https://emuapps.monash.edu.au/unitevaluations/index.jsp>

# Academic Overview

## Learning Outcomes

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;
- 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;
- 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;
- produce appropriate documentation.

## Unit Schedule

Week	Activities	Assessment
0		No formal assessment or activities are undertaken in week 0
1	Course overview, Why digital image processing is important	
2	Human Visual Perception, Image Processing using Java	
3	Introduction to Image Processing algorithms	
4	Image enhancement in Spatial domain	
5	Edge Sharpening, Edge detection	
6	Edge detection (continued), Hough transform	Assignment 1 due Friday
7	Image enhancement in frequency domain	
8	Image segmentation	
9	Boundary extraction	
10	Edge thinning, Skeletonization, Medial axis transformation	
11	Image compression, Texture analysis	
12	Recap	Assignment 2 due Friday
	SWOT VAC	No formal assessment is undertaken in SWOT VAC
	Examination period	LINK to Assessment Policy: <a href="http://policy.monash.edu.au/policy-bank/academic/education/assessment/assessment-in-coursework-policy.html">http://policy.monash.edu.au/policy-bank/academic/education/assessment/assessment-in-coursework-policy.html</a>

\*Unit Schedule details will be maintained and communicated to you via your learning system.

## Teaching Approach

### Lecture and tutorials or problem classes

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

### Assessment Summary

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

Assessment Task	Value	Due Date
Assignment 1	10%	Week 6, Friday
Assignment 2	20%	Week 12, Friday
Examination 1	70%	To be advised

# Assessment Requirements

## Assessment Policy

Faculty Policy - Unit Assessment Hurdles

(<http://intranet.monash.edu.au/infotech/resources/staff/edgov/policies/assessment-examinations/assessment-hurdles>)

Academic Integrity - Please see resources and tutorials at

<http://www.monash.edu/library/skills/resources/tutorials/academic-integrity/>

## Assessment Tasks

### Participation

#### • Assessment task 1

**Title:**

Assignment 1

**Description:**

Writing a proposal - a computer vision system needs to be implemented for a real life problem as the first assignment. A complete proposal together with the higher level system design has to be prepared. It should highlight the Image processing algorithms that can be used in the implementation.

**Weighting:**

10%

**Criteria for assessment:**

1. Satisfactory documenting according to the requirements of the assignment
2. Acceptable Higher level system design
3. The implementation plan
4. Demonstrate the use of Image processing algorithms

**Due date:**

Week 6, Friday

#### • Assessment task 2

**Title:**

Assignment 2

**Description:**

Programming and Analysis for Image Processing Tasks

**Weighting:**

20%

**Criteria for assessment:**

1. Satisfactory implementation according to the requirements of the assignment
2. Structure, modularity and efficiency of code
3. Ease of use of program user interface
4. Evidence of testing

**Due date:**

Week 12, Friday

## Examinations

- **Examination 1**

**Weighting:**

70%

**Length:**

3 hours

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

Closed book

**Electronic devices allowed in the exam:**

None

## Learning resources

### Reading list

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 CVIPtools, Prentice Hall PTR, 1998.

Monash Library Unit Reading List (if applicable to the unit)

<http://readinglists.lib.monash.edu/index.html>

Faculty of Information Technology [Style Guide](#)

## Feedback to you

Examination/other end-of-semester assessment feedback may take the form of feedback classes, provision of sample answers or other group feedback after official results have been published. Please check with your lecturer on the feedback provided and take advantage of this prior to requesting



## Assessment Requirements

individual consultations with staff. If your unit has an examination, you may request to view your examination script booklet, see <http://intranet.monash.edu.au/infotech/resources/students/procedures/request-to-view-exam-scripts.html>

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

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

## 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.monash.edu.au/exams/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.

## Assignment submission

It is a University requirement

(<http://www.policy.monash.edu/policy-bank/academic/education/conduct/student-academic-integrity-managing-pla>) for students to submit an assignment coversheet for each assessment item. Faculty Assignment coversheets can be found at <http://www.infotech.monash.edu.au/resources/student/forms/>. Please check with your Lecturer on the submission method for your assignment coversheet (e.g. attach a file to the online assignment submission, hand-in a hard copy, or use an online quiz). Please note that it is your responsibility to retain copies of your assessments.

## Online submission

If Electronic Submission has been approved for your unit, please submit your work via the learning system for this unit, which you can access via links in the my.monash portal.

## Required Resources

Please check with your lecturer before purchasing any Required Resources. Limited copies of prescribed texts are available for you to borrow in the library, and prescribed software is available in student labs.

### Software

- Java Development Kit
- Netbeans

These are freely available from:

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

Assessment Requirements

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

## **Prescribed text(s)**

Limited copies of prescribed texts are available for you to borrow in the library.

Gonzalez and Woods. (2001). *Digital Image Processing*. (2nd Edition) Prentice-Hall.

## **Examination material or equipment**

Writing tools.

## Other Information

### 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:

[www.policy.monash.edu.au/policy-bank/academic/education/index.html](http://www.policy.monash.edu.au/policy-bank/academic/education/index.html)

Key educational policies include:

- Student Academic Integrity Policy and Student Academic Integrity: Managing Plagiarism and Collusion Procedures ;  
<http://www.policy.monash.edu/policy-bank/academic/education/conduct/student-academic-integrity-policy.h>
- Assessment in Coursework Programs;  
<http://www.policy.monash.edu/policy-bank/academic/education/assessment/assessment-in-coursework-po>
- Special Consideration;  
<http://www.policy.monash.edu/policy-bank/academic/education/assessment/special-consideration-policy.ht>
- 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/dates/>
- Orientation and Transition; <http://intranet.monash.edu.au/infotech/resources/students/orientation/>
- Academic and Administrative Complaints and Grievances Policy;  
<http://www.policy.monash.edu/policy-bank/academic/education/management/complaints-grievance-policy.h>

### Faculty resources and policies

Important student resources including Faculty policies are located at

<http://intranet.monash.edu.au/infotech/resources/students/>

### Graduate Attributes Policy

<http://www.policy.monash.edu/policy-bank/academic/education/management/monash-graduate-attributes-policy.h>

### Student Charter

[www.opq.monash.edu.au/ep/student-charter/monash-university-student-charter.html](http://www.opq.monash.edu.au/ep/student-charter/monash-university-student-charter.html)

### 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 <http://www.monash.edu.au/students>. For Malaysia see <http://www.monash.edu.my/Student-services>, and for South Africa see <http://www.monash.ac.za/current/>.

## Monash University Library

The Monash University Library provides a range of services, resources and programs that enable you to save time and be more effective in your learning and research. Go to [www.lib.monash.edu.au](http://www.lib.monash.edu.au) or the library tab in [my.monash](http://my.monash.edu) portal for more information. At Malaysia, visit the Library and Learning Commons at <http://www.lib.monash.edu.my/>. At South Africa visit <http://www.lib.monash.ac.za/>.

## Disability Liaison Unit

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://www.monash.edu/equity-diversity/disability/index.html>
- Telephone: 03 9905 5704 to book an appointment with a DLO; or contact the Student Advisor, Student Community Services at 03 55146018 at Malaysia
- Email: [dlu@monash.edu](mailto:dlu@monash.edu)
- Drop In: Equity and Diversity Centre, Level 1, Building 55, Clayton Campus, or Student Community Services Department, Level 2, Building 2, Monash University, Malaysia Campus