Diploma in Information Technology
(CRICOS course codes: 057233A, 057234M)

Subject Outline
Autumn 2011

WUCT121
Discrete Mathematics
Discrete Mathematics

Subject Description

Students will be introduced to the spirit of mathematical inquiry and critical analysis, and encouraged to develop the ability to apply mathematical principles to the formulation and solution of problems. This will be done using non-calculus techniques, especially those of logic and number theory. This subject is well suited to computer science students. Topics include logic, number theory, mathematical induction, set theory, relations and functions, and graph theory.

Subject Structure

Discrete Mathematics is delivered in a face-to-face format of 6 (six) hours per week. The subject consists of $2 \times 2$ hour lectures and $1 \times 2$ hour tutorial each week. The session is of 14 weeks’ duration with face-to-face classes scheduled for the first 12 weeks and a study/examination period in Weeks 13 and 14.

In addition to scheduled class sessions, students are expected to spend additional time in individual study and research. As a general guideline students will need to spend at least 1 hour in private study (including completing homework and revision) for every two hours of scheduled class time.

Teachers will be available for a consultation time each week. Students will be notified of the time and location of the consultation session during Week 1 of the Session. It is recommended that students experiencing difficulty with this subject arrange to consult with the teacher as difficulties are encountered.

Some students may require tutorial support to improve language/literacy skills. Where this is recommended, students will be advised to use the College’s self-access facilities in the Multimedia Centre in their own time. These facilities are located upstairs in building 30.

Assumed Knowledge:

Band 4 or higher in NSW HSC Mathematics, or Band 2 or higher in NSW HSC Mathematics Extension 1, or any band in NSW HSC Mathematics Extension 2.
Learning Resources

Epp, Susanna S, 1993, *Discrete Mathematics with Applications*

Lucas, John F, 1986, *Introduction to Abstract Mathematics*


You are not required to purchase reference books. Several copies of these books are available in the University of Wollongong Library. These readings are not intended to be an exhaustive list. Students are encouraged to use the Library catalogue and databases to locate additional readings with similar titles and contents.

Calculators

Students will be required to bring a scientific calculator to all classes. Students who need to purchase a calculator for this subject are strongly recommended to purchase a Casio FX-82 series (approximately $25 – $40) calculator.

Only approved scientific calculators will be permitted in examinations. The list of approved calculators is located on the college website (www.wca.uow.edu.au). Students should refer to this list to confirm their calculator has been approved for use in examinations. Programmable calculators are not permitted. Programmable calculators usually have a RUN, EXE, CALC or SOLVE button.

Subject Outcomes

Successful completion of this subject will enable students to:

1. apply mathematical principles to the interpretation of data, the formulation and solution of problems and the critical analysis of answers for use in a range of problems in both mathematics and computer science;

2. construct truth tables for logical expressions; test statements for logical equivalence and represent mathematical statements in the language of predicate logic;

3. use appropriate methods of proof to derive results in set theory, number theory and the elementary theory of relations and functions;

4. define the basic elements of graph theory, and apply these in analysing types of graphs.
Subject Content

This subject will cover the following content areas:

1. Overview of subject and introduction to logic.
2. Logic.
3. Predicate logic.
5. Set theory.
6. Relations and functions.
7. Natural numbers.
10. Elementary number theory.
11. Congruence arithmetic.
12. Graph theory

Graduate Qualities

The Diploma in Business and Diploma in Information Technology courses are designed to assist students in developing the WCA Graduate Qualities. It helps students become:

1. **Informed**: have a sound knowledge of an area of study or profession and understand its issues locally and internationally. Know how to apply this knowledge. Understand how an area of study has developed and how it relates to other areas.
2. **Independent Learners**: engage with new ideas and ways of thinking and critically analyse issues. Seek to extend knowledge through ongoing research, enquiry and reflection. Find and evaluate information, using a variety of sources and technologies. Acknowledge the work and ideas of others.
3. **Problem Solvers**: take on challenges and opportunities. Apply creative, logical and critical thinking skills to respond effectively. Make and implement decisions. Be flexible, thorough, innovative, and aim for high standards.
4. **Effective Communicators**: articulate ideas and convey them effectively using a range of media. Work collaboratively and engage with people in different settings. Recognise how culture can shape communication.
5. **Responsible**: understand how decisions can affect others and make ethically informed choices. Appreciate and respect diversity. Act with integrity as part of local, national, global and professional communities.
## Subject Outline in Weeks

The following guide to lessons and activities may be adjusted to suit the needs of the group as long as subject outcomes and assessment criteria are met.

<table>
<thead>
<tr>
<th>Week</th>
<th>Lessons</th>
</tr>
</thead>
</table>
| **Week 1** | Lecture 1: Subject Introduction, Logic  
Lecture 2: Natural Numbers |
| **Week 2** | Lecture 1: Logic  
Lecture 2: Integers & Real Numbers |
| **Week 3** | Lecture 1: Logic  
Lecture 2: Predicate Logic |
| **Assignment 1 due** |  |
| **Week 4** | Lecture 1: Mathematical Induction  
Lecture 2: Mathematical Induction |
| **Week 5** | Lecture 1: Methods of Proof  
Lecture 2: Mathematical Induction |
| **Assignment 2 due** |  |
| **Week 6** | Lecture 1: Methods of Proof  
Lecture 2: Graph Theory |
| **Mid-Session Test 1** |  |
## Week 7

Lecture 1: Graph Theory  
Lecture 2: Graph Theory  

**Assignment 3 due**

## Week 8

Lecture 1: Number Theory  
Lecture 2: Congruence Arithmetic  

## Week 9

Lecture 1: Number Theory  
Lecture 2: Set Theory  

**Assignment 4 due**

## Week 10

Lecture 1: Congruence Arithmetic  
Lecture 2: Set Theory  

**Mid-Session Test 2**

## Week 11

Lecture 1: Set Theory  
Lecture 2: Relations and Functions  

**Assignment 5 due**

## Week 12

Lecture 1: Relations and Functions  
Lecture 2: Relations and Functions  

### Weeks 13 & 14  Final examination Period

Examination and study period. Please refer to examination timetable for the exact date, time and location of the final examination.
Assessment

Assessment and Plagiarism Policy

All written assessment tasks, with the exception of examinations and in-class tasks, must be word-processed unless students are otherwise advised.

Students must keep copies of all assessment tasks submitted for marking with the exception of class tests and examinations.

Plagiarism is a form of cheating or stealing that happens when a student uses someone else’s work and presents it as his/her own without showing where it comes from. To avoid this, students are expected to submit their own original work for assessment and to accurately acknowledge all references and sources used in essays and assignments.

For information regarding assessment, plagiarism, acknowledging sources and examination rules, please refer to the Wollongong College Australia Student Handbook http://www.wca.uow.edu.au/handbook

Assessment and Learning Schedule

<table>
<thead>
<tr>
<th>Assessment Task</th>
<th>Weight %</th>
<th>Week No.</th>
<th>Length Time</th>
<th>Contents Assessed</th>
<th>Outcomes Assessed</th>
<th>Graduate Qualities Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly assignments</td>
<td>20%</td>
<td>2, 4, 6, 8, 10</td>
<td>1 – 2 hours each</td>
<td>1 – 12</td>
<td>1 – 3</td>
<td>1, 3</td>
</tr>
<tr>
<td>Mid-session test 1</td>
<td>15%</td>
<td>6</td>
<td>1 hour</td>
<td>1 – 3</td>
<td>1, 2</td>
<td>1, 3</td>
</tr>
<tr>
<td>Mid-session test 2</td>
<td>15%</td>
<td>10</td>
<td>1 hour</td>
<td>4 – 8</td>
<td>1, 3</td>
<td>1, 3</td>
</tr>
<tr>
<td>Final examination</td>
<td>50%</td>
<td>13 / 14</td>
<td>3 hours</td>
<td>1 – 12</td>
<td>1 – 4</td>
<td>1, 3</td>
</tr>
</tbody>
</table>

Note: A final mark of 50% or higher is required to pass ALL Diploma subjects. A mark between 45% and 49% is NOT a pass.

Marking Guidelines

WCA best practice is that students can normally expect to have results and feedback to assessment tasks within two weeks and before the next assessment task is due. On occasion there may be exceptions to this time frame due to, for example, the size of the task, the size of the class, teacher illness or teacher leave.

Where there are several teachers marking a major assessment task, tasks will be handed back by all the teachers within the same week.
Assessment Criteria and Explanation of Components

All assessment components are marked according to set marking criteria.

Assignments  
20%

There will be five assignments which will be handed out in tutorials. Each assignment will be due as indicated in the assessment schedule. They will be marked during the ensuing week and returned in the following tutorial class.

- You must show working for each question on the assignment.
- Marking criteria includes correctness, presentation and working.
- Untidy or illegible work will not be assessed, and will be graded as 0 marks.
- Assignments must be submitted with the assignment cover sheet provided and you should make sure your receipt is initialed.
- Faxed or emailed assignments will not be accepted. You must submit your assignment in person.
- Late assignments must be dated and initialed by an authorized employee of the college and submitted in accordance with the local policy of individual campuses.
- The following penalties will apply to late assignments (in accordance with student handbook):
  - 1 day late − 10%
  - 2 days late − 20%
  - 3 days late − 30%
  - Work submitted more than three days late will be graded as 0 marks.
- Extension of the due date (without penalty) will only be granted if you are successful in applying to the College for special consideration. A student requiring an extension in these circumstances should submit a Special Consideration Request Form to the Program Manager, as outlined in the Wollongong College Australia student handbook.
- Assignments are only part of the expected weekly workload.
- You should keep a copy of all work submitted.

Every assignment submitted will contribute towards your final assessment. However, the primary purpose of each assignment is to give you feedback on your progress and understanding of the work.
Mid-Session Test 1  60 minutes  15%
Mid-session test 1 will be held in week 6 and will examine materials covered in the lectures and tutorials during weeks 1 – 4.

Mid-Session Test 2  60 minutes  15%
Mid-session test 1 will be held in week 10 and will examine materials covered in the lectures and tutorials during weeks 5 – 8.

Final Examination  3 hours  50%
The final examination will be held during the formal examination period in weeks 13 and 14. The examination will include all topics covered during the session with approximate emphasis as follows: 11.5% on topics studied in weeks 1 – 4, 11.5% on topics studied in weeks 5 – 8, and 27% on topics studied in weeks 9 – 12.

Non-English speaking background students in the Diploma Programs may use foreign language dictionaries for their final examinations. Diploma students who wish to use a dictionary must complete the Dictionary Use Application Form available at reception. This form and the dictionary must be submitted to reception no later than 5pm Friday week 11 for approval.

Please note the following regulations regarding dictionary use:

- The only dictionaries permitted are language dictionaries, with word to word translations only.
- English-English dictionaries, Electronic dictionaries, Terminology dictionaries, or other are not permitted. The dictionary must not include English translations or explanations. Any dictionary that includes English explanations or phrases is not acceptable and will not be approved.