Students in this unit should read this unit outline carefully at the start of semester. It contains important information about the unit. If anything in it is unclear, please consult one of the teaching staff in the unit.

### ABOUT THIS UNIT

Credit Points: 3

Unit Description:

This unit aims to assist students to:

(a) understand the basic concepts of mathematics of finance (present value and accumulated value) and their application to both single payments and annuities;

(b) apply these basic mathematical concepts in valuing a range of financial instruments including savings and investment accounts, promissory notes, mortgage loans, personal loans, bonds and debentures, etc.; and

(c) know the functions of the Australian financial system, and the financial institutions (banks, insurance companies, finance companies, credit unions, etc.), financial instruments (bills, bonds, debentures, shares, etc.) and financial markets which form part of it.

A background of HSC Mathematics or equivalent numerical competency is desirable.

Unit Rationale:

Students will gain skills in the pricing of financial instruments in the Techniques section and knowledge of financial institutions, instruments and markets in the Elements section. ACST101 is a prerequisite for further study in the areas of actuarial studies and finance.

### TEACHING STAFF

The staff members involved in the teaching and unit co-ordination of this unit are

<table>
<thead>
<tr>
<th>Name</th>
<th>Lecture Weeks</th>
<th>Room</th>
<th>Telephone</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>David Westcott</td>
<td>Unit Co-ordinator,</td>
<td>E4A615</td>
<td>9850 8568</td>
<td>Use Mail link on</td>
</tr>
<tr>
<td></td>
<td>Weeks 1 - 5, 8 - 13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brian Chu</td>
<td>Weeks 6 and 7</td>
<td></td>
<td></td>
<td>ACST101 website</td>
</tr>
</tbody>
</table>
For ALL email use the Mail link on the ACST101 website. Click on Mail, then on Compose Message and send to **ACST101 Inquiries** which is at the top of the Browse for Recipients list.

Questions relating to the administration of the unit should be directed to the Unit Co-ordinator. Questions relating to the unit content should be directed to your tutor at your tutorial or by email to ACST101 Inquiries.

**Consultation hours for the Unit Co-ordinator and the tutors will be shown on the ACST101 Blackboard website under the Announcements link.**

### CLASSES

There are 3 hours of face-to-face teaching per week consisting of 2 x 1 hour lectures and 1 x 1 hour tutorial.

Class times can be found at: [http://www.timetables.mq.edu.au](http://www.timetables.mq.edu.au)

### Lectures

The **Techniques** lecture is held at the following time:

<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wednesday</td>
<td>10 am</td>
<td>Macquarie Theatre</td>
</tr>
<tr>
<td>Wednesday</td>
<td>12 pm</td>
<td>Mason Theatre (E7B)</td>
</tr>
</tbody>
</table>

The **Elements** lecture is held at the following time:

<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thursday</td>
<td>11 am</td>
<td>Macquarie Theatre</td>
</tr>
<tr>
<td>Thursday</td>
<td>12 pm</td>
<td>Mason Theatre (E7B)</td>
</tr>
</tbody>
</table>

You should attend your allocated techniques lecture and elements lecture each week.

The lecture notes for both techniques lectures and elements lectures are available from the ACST101 website. A copy should be brought to each lecture.

### Tutorials

**Tutorials which are held weekly commence in the second week of the semester.**

**Tutorial attendance is compulsory.**
Students must attend and fully participate in at least 9 tutorials.

**Tutorial enrolment** or change of tutorial can be made through eStudent in the first two weeks of the semester. **No tutorial changes are allowed after Week 2.**

**To prepare for each weekly tutorial**, attempt at least the first few questions from the **Revision Exercises** for the previous week's Techniques lecture eg for the Week 2 tutorial you should attempt the Revision Exercises on Week 1. Revision Exercises are accessed from the website page for the corresponding techniques lecture.
**Tutorial Room** locations are shown on your enrolment printout. The tutorial list will also be shown under the Announcements link of the ACST101 website on the Monday of the second week of classes. **You must attend your allocated tutorial.**

**RECOMMENDED TEXTS**

The textbooks are available as a package from the Macquarie University Co-op Bookshop.


**UNIT WEB PAGE**

The web page for this unit can be found at [http://learn mq.edu.au](http://learn mq.edu.au)

The Student IT Service Desk (C5C244 ) provides information technology support and assistance to students of Macquarie University.

The login address gives you access to all of your online units. Just click on the name of the unit you want to work on. When you want to change from one unit to another click on My Online Units at the top right of the screen.

If you do not attend a lecture, you should consult the Announcements section of the website to see what information, if any, you have missed.

If you wish to contact the unit co-ordinator, use the ACST101 website. Click on Mail, then on Compose Message and send to ACST101 Inquiries.

The following are available on the website:
1. Lecture notes and Revision Exercises for "Techniques".
2. Lecture notes and internet exercises for "Elements".
3. Tutorial Exercise solutions.
4. Assignments.
5. Class Test solutions for the past two semesters and the current semester.
6. Final Examination specimen exam papers and solutions.

When moving around the website the path that you have followed is displayed below the ACST101 Techniques and Elements of Finance line. To move back to a previous page, click on the title of that page. In particular to move back to the opening page, click on Home Page.
An example is: Home Page > Tutorial Solutions > Tutorial Exercises on Week 1.
To close your connection click on Log out at the top right of the screen.

**LEARNING OUTCOMES**

The learning outcomes of this unit are summarised in the lecture notes. **Understanding of the concepts is required rather than memorisation of formulae.**
It is essential that you work steadily and consistently over the whole semester; in particular attend tutorials and keep up with the weekly assignments. You should revise the previous week's techniques lecture before you attend your weekly tutorial. Each topic builds on the previous one. It is extremely difficult to catch up if you fall behind.

The Academic Senate of the University has set the average workload as three hours total work per credit point per week. (ie 9 hours per week for ACST101). Total work includes time for private study and reading as well as attending classes and performing set tasks.

In addition to the discipline-based learning objectives, all academic programs at Macquarie seek to develop students’ generic skills in a range of areas. In this unit students develop logical thinking, reasoning and problem solving skills.

**TEACHING AND LEARNING STRATEGY**

This unit is taught via lectures and tutorials. Tutorial exercises will be provided at each tutorial so that you can practise applying the results developed in lectures.

Weekly online assignments will encourage you to revise the material regularly.

The week-by-week list of the topics is as follows:

<table>
<thead>
<tr>
<th>Week Number</th>
<th>Week Beginning</th>
<th>Techniques Wed 10am/Wed 12pm</th>
<th>Elements Thu 11am/Thu 12pm</th>
<th>Class Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3 August</td>
<td>Simple interest &amp; simple discount</td>
<td>Information about Assignments</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>10 August</td>
<td>Compound interest</td>
<td>Overview</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>17 August</td>
<td>Compound interest</td>
<td>Banks and RBA</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>24 August</td>
<td>Annuities</td>
<td>Banks and RBA</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>31 August</td>
<td>Annuities</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>7 September</td>
<td>Annuities</td>
<td>Non-bank institutions</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>14 September</td>
<td>Mortgage loans</td>
<td>Non-bank institutions</td>
<td>-</td>
</tr>
<tr>
<td>STUDY</td>
<td>21 September</td>
<td>STUDY</td>
<td>STUDY</td>
<td>-</td>
</tr>
<tr>
<td>BREAK</td>
<td>28 September</td>
<td>BREAK</td>
<td>BREAK</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>5 October</td>
<td>Flat rate loans, NPV, IRR</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>12 October</td>
<td>Bonds &amp; debentures</td>
<td>Government finances and instruments</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>19 October</td>
<td>Tax on bonds</td>
<td>Corporate finances and instruments</td>
<td>-</td>
</tr>
<tr>
<td>11</td>
<td>26 October</td>
<td>Varying annuities</td>
<td>Financial markets</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td>2 November</td>
<td>Sinking funds and capitalised costs</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>13</td>
<td>9 November</td>
<td>Revision</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

In weeks where there is a Class Test:
The test is held in the Wednesday lecture time; The Techniques lecture will be held on Thursday; There will be no Elements lecture.
**Relationship Between Assessment and Learning Outcomes**

The following table gives the relative weighting of the assessment components:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly Assignments (11)</td>
<td>10%</td>
</tr>
<tr>
<td>Class Tests (3)</td>
<td>30%</td>
</tr>
<tr>
<td>Final Examination</td>
<td>60%</td>
</tr>
</tbody>
</table>

Assignments, Final Examination and Tutorial Attendance have minimum requirements.

**Weekly Assignments**

A satisfactory attempt by the due date is required for at least 8 assignments.

There are 11 weekly assignments, each mainly based upon a "techniques" topic. For each assignment you will use the website to obtain the questions and to enter your answers and obtain the full solutions.

Before you can access Assignment 1 due in Week 3 you must score 100% in the Unit Requirements Quiz and at least 80% in both the Maths Revision Exercises and the Practice Assignment. These preliminary quizzes are all due early in Week 2.

The marks for all 11 assignments are used to calculate the component of the final assessment based on assignments. Assignments 10 and 11 are given triple weighting.

Full details of the computerised assignments including the due dates are given separately.

**Class Tests**

<table>
<thead>
<tr>
<th>Test One (Week 5)</th>
<th>Wednesday 2 September 10 am Macquarie Theatre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Two (Week 8)</td>
<td>Wednesday 7 October 10 am Macquarie Theatre</td>
</tr>
<tr>
<td>Test Three (Week 12)</td>
<td>Wednesday 4 November 10 am Macquarie Theatre</td>
</tr>
</tbody>
</table>

The three Class Tests each count 10% of the final assessment.

Full details of the Class Tests will be given on the website under Announcements. Students must attend at the lecture time for which they are enrolled.

The formula sheet will be displayed on the overhead projector.

Tests will be returned to students at the tutorial in the week following the test.

The procedure for requesting Special Consideration is detailed in a later section.

Class Tests will be based on the following lecture topics from page 4:

<table>
<thead>
<tr>
<th>Techniques</th>
<th>Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test 1</td>
<td>Weeks 1,2,3</td>
</tr>
<tr>
<td>Test 2</td>
<td>Weeks 4,5,6</td>
</tr>
<tr>
<td>Test 3</td>
<td>Weeks 7,8,9,10</td>
</tr>
</tbody>
</table>
Attendance

Tutorial attendance is compulsory.
Students must attend and fully participate in at least 9 tutorials.

Final Examination

To pass this unit a satisfactory performance is required in the final examination.

The final examination will contain questions from all techniques and all elements lectures. It will be a three-hour written paper with ten minutes reading time.
The University examination period is between Wed. 18 Nov. and Fri. 4 Dec. 2009.

Part A: Forty-five multiple choice questions - twenty-two based on "techniques" and twenty-three based on "elements". Marked out of 45.
Part B: Three questions requiring application of "techniques" to the solution of practical problems. Marked out of 30.
The list of basic formulae shown at the end of this Unit Outline will be supplied.
The multiple choice questions are answered by marking (in pencil) a computer readable answer sheet. Bring TWO 2B Pencils, and an eraser, into the examination with you.

You are expected to present yourself for examination at the time and place designated in the University Examination Timetable. The timetable will be available in Draft form approximately eight weeks before the commencement of the examinations and in Final form approximately four weeks before the commencement of the examinations.
http://www.timetables.mq.edu.au/exam

The only exception to not sitting an examination at the designated time is because of documented illness or unavoidable disruption. In these circumstances you may wish to consider applying for Special Consideration. Information about unavoidable disruption and the special consideration process is given below.

If a Supplementary Examination is granted as a result of the Special Consideration process the examination will be scheduled after the conclusion of the official examination period.

You are advised that it is Macquarie University policy not to set early examinations for individuals or groups of students. All students are expected to ensure that they are available until the end of the teaching semester, that is the final day of the official examination period.

SPECIAL CONSIDERATION

If the quality of your work in this unit is adversely affected by illness, accident or other form of unavoidable disruption, you should acquaint yourself with the University Special Consideration Policy
http://www.mq.edu.au/policy/docs/special_consideration/policy.html

All requests for special consideration should be made in writing to the Student Enquiry Service and include full supporting documentation.
The Application Form and the Professional Authority Form which is required if you wish to request special consideration due to illness can be found at http://www.registrar.mq.edu.au/Forms/APSCons.pdf

Requests for special consideration for a Class Test should be made within 1 week of the test. Also email ACST101 Inquiries indicating that you have submitted the form.

Requests for special consideration for the Final Examination should be made within 5 working days after the date of the examination or the day after the end of the examination period whichever is sooner.

Special Consideration will NOT be granted where a student has unsatisfactory class test marks, unsatisfactory assignment marks or unsatisfactory tutorial attendance. The exam content and/or assessment standards of supplementary examinations will be made more stringent to allow for the extra time available for prior study.

Further details about Special Consideration and Supplementary Examinations will be posted on the ACST101 website under Announcements in the last week of the semester.

**Calculators**

Calculators will be allowed in the class tests and the final examination but a clear indication of the steps involved in every calculation must be shown.

**Calculators that have a text-retrieval capacity are not allowed. Calculators that have a full alphabet on the keyboard are not allowed.**

You will need a calculator which has $x^y$ or $\wedge$, $1/x$ and log or ln functions, and a memory.

**Plagiarism**

The University defines plagiarism in its rules: "Plagiarism involves using the work of another person and presenting it as one's own." Plagiarism is a serious breach of the University's rules and carries significant penalties. You must read the University's practices and procedures on plagiarism. These can be found in the *Handbook of Undergraduate Studies* or on the web at: http://www.student.mq.edu.au/plagiarism

The policies and procedures explain what plagiarism is, how to avoid it, the procedures that will be taken in cases of suspected plagiarism, and the penalties if you are found guilty. Penalties may include a deduction of marks, failure in the unit, and/or referral to the University Discipline Committee.

**Student Support Services**

Macquarie University provides a range of Academic Student Support Services. Details of these services can be accessed at http://www.student.mq.edu.au

**BESS E4B106** (The Faculty of Business and Economics Student Services) http://businessandeconomics.mq.edu.au/for/new_and_current_students/undergraduate

**Numeracy Centre C5A225**

Students who lack the knowledge of mathematics needed for ACST101 are encouraged to seek the help of the Centre. Consultations are free of charge. Staff will recommend work to fill gaps in background knowledge of mathematics.
**Textbook**


<table>
<thead>
<tr>
<th>Week</th>
<th>Techniques Topic</th>
<th>Textbook Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Simple Interest and Simple Discount</td>
<td>Chapter 1 (exclude 1.4 and 1.5)</td>
</tr>
<tr>
<td>2</td>
<td>Compound Interest</td>
<td>Chapter 2, 2.1 to 2.3 (exclude 2.4)</td>
</tr>
<tr>
<td>3</td>
<td>Compound Interest, Logarithms and Linear Interpolation</td>
<td>Chapter 2, 2.5 to 2.8 Appendices A &amp; C</td>
</tr>
<tr>
<td>4</td>
<td>Valuation of Annuities</td>
<td>Chapter 3, 3.1 to 3.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chapter 4, Section 4.2</td>
</tr>
<tr>
<td>5</td>
<td>Valuation of Annuities</td>
<td>Chapter 3, 3.4 to 3.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chapter 4, 4.3 and 4.5</td>
</tr>
<tr>
<td>6</td>
<td>Valuation of Annuities</td>
<td>Chapter 4, Section 4.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chapter 5 (exclude 5.4)</td>
</tr>
<tr>
<td>7</td>
<td>Mortgage Loans</td>
<td>Chapter 6, 6.1 to 6.4</td>
</tr>
<tr>
<td>8</td>
<td>Flat Rate Loans</td>
<td>Chapter 6, Section 6.6 (exclude Rule of 78)</td>
</tr>
<tr>
<td></td>
<td>Net Present Value and Internal Rate of Return</td>
<td>Chapter 8, 8.1 and 8.2</td>
</tr>
<tr>
<td>9</td>
<td>Bonds and Debentures</td>
<td>Chapter 7, 7.1 to 7.4</td>
</tr>
<tr>
<td>10</td>
<td>Tax on Bonds</td>
<td>Chapter 7, 7.5 and 7.7 (exclude section 7.6 and pages 207 - 211)</td>
</tr>
<tr>
<td>11</td>
<td>Varying Annuities</td>
<td>Chapter 4, Section 4.6</td>
</tr>
<tr>
<td></td>
<td>(The approach taken will be different to that of the textbook)</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Sinking Funds and Capitalised Costs</td>
<td>Sections 6.5, 7.8 and 8.3</td>
</tr>
</tbody>
</table>

**Notes**

1. Other sections of the textbook not referred to above are outside the scope of this unit and are NOT examinable.

2. The "Part A" exercises in the textbook are ideal for practice in applying the "techniques" to solve financial problems. Some "Part B" exercises which involve mathematical proofs are beyond the scope of this unit.
Textbook


References


In addition the *Reserve Bank of Australia Bulletin* contains articles of current interest and statistical information. The "elements" tutorial exercises will contain a link to the RBA website which contains much of this information.

Topics and Recommended Reading from Textbook

**Topic 1** Overview of the Financial System

Week 2 Chapter 1

**Topic 2** Banks and RBA

Week 3 Chapter 2 (2.1 to 2.4)
Week 4 Chapter 2 (2.5 to 2.8)

**Topic 3** Non-Bank Institutions

Week 6 Chapter 3 (3.2 to 3.4)
Week 7 Chapter 3 (3.1, 3.5 to 3.8) (exclude 3.9)

**Topic 4** Government Finances and Instruments

Week 9 Chapter 12

**Topic 5** Corporate Finances and Instruments

Week 10 Chapter 5 (5.3, 5.5 only), 9 (9.3, 9.5, 9.6 only) and 10 (10.3, 10.5 only)

**Topic 6** Financial Markets

Week 11 Chapter 18

**ERRATA TO KNOX, ZIMA & BROWN, Mathematics of Finance, 2nd edition**

Page 7 Example 2 Answer should be $8.91 not $6.51
Page 10 Example 4 The bill was purchased on 2 May not 3 May
Page 52 Solution Example 2 In the line beginning Step 1, 1000 should be 10000
Page 64 Example 2 The interest rate is $j_4 = 12\%$ not $j_4 = 3\%$
Page 227 Formula for $i$ Numerator should be $F_0 + F_1 + F_2 + F_3 + ... + F_n$
Page 297 Exercise 1.6 Q4 Answer should be $1025.28$ not $810.66$
Page 299 Exercise 3.6 A Q2 Answer should be $4291.72$ not $2262.56$
Page 300 Exercise 6.5 A Q2 Answer should be sinking fund by $302.25$ not $1090.80$
1 Future value at simple interest
\[ S = P(1 + rt) \]

2 Present value at simple interest
\[ P = S(1 + rt)^{-1} \]

3 Present value at simple discount
\[ P = S(1 - dt) \]

4 Future value at compound interest
\[ S = P(1 + i)^n \]

5 Present value at compound interest
\[ P = S(1 + i)^{-n} \]

6 Future value of \( n \) payments of \( R \) at compound rate \( i \)
\[ S = R s^i = R \left( \frac{(1 + i)^n - 1}{i} \right) \]

7 Present value of \( n \) payments of \( R \) at compound rate \( i \)
\[ P = R a^i = R \left( \frac{1 - (1 + i)^{-n}}{i} \right) \]

8 Approximation to bond or debenture yield for given price
\[ i \approx \frac{I + \frac{1}{i}(C - P)}{\frac{1}{2}(C + P)} \]

9 Present value of an annuity with payments increasing in arithmetic progression
\[ P = R[(1 + i)^{-1} + 2(1 + i)^{-2} + ... + n(1 + i)^{-n}] \]
\[ = R \left( (1 + i)a^i - n(1 + i)^{-n} \right) \]

10 Future value of an annuity with payments increasing in arithmetic progression
\[ S = R \left( (1 + i)s^i - n \right) \]

11 Present value of an annuity with payments increasing in geometric progression
\[ P = R[(1 + i)^{-1} + (1 + r)(1 + i)^{-2} + ... + (1 + r)^{n-1}(1 + i)^{-n}] \]
\[ = R(1 + r)^{-1}a^j \] where \( j = \frac{i - r}{1 + r} \)

12 Future value of an annuity with payments increasing in geometric progression
\[ S = R(1 + r)^{n-1} \frac{s^j}{m} \] where \( j = \frac{i - r}{1 + r} \)