STAT2032/6046
Financial Mathematics

Course Description
Compound interest functions; valuation of annuities certain; loans repayable by instalments; comparison of value and yield of cash flow transactions; valuation of fixed interest securities, with and without tax on interest and capital gains; duration and volatility of securities; introduction to concept of immunisation and matching; consumer credit contracts; introduction to stochastic interest rate models.

<table>
<thead>
<tr>
<th>Semester and Year</th>
<th>Semester 2, 2014</th>
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<tbody>
<tr>
<td>Course URL</td>
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<tr>
<td>Mode of Delivery</td>
<td>On campus</td>
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<tr>
<td>Prerequisites</td>
<td>STAT1008 – Quantitative Research Methods OR STAT1003 – Statistical Techniques</td>
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<tr>
<td>Course Convener</td>
<td>Mr Abhinav B Mehta</td>
</tr>
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<td>Office Location:</td>
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<td>Email:</td>
<td><a href="mailto:Abhinav.Mehta@anu.edu.au">Abhinav.Mehta@anu.edu.au</a></td>
</tr>
<tr>
<td>Consultation hours:</td>
<td>TBA</td>
</tr>
<tr>
<td>Bio and research interests</td>
<td>Abhinav is an Associate Lecturer in RSFAS and an Associate of the Institute of Actuaries of Australia. His research interests are in the field of Medical and Biostatistics. He is also pursuing his PhD in Statistics from RSFAS.</td>
</tr>
<tr>
<td>Tutor(s) (optional)</td>
<td>TBA</td>
</tr>
<tr>
<td>Student Administrators</td>
<td>Maria Lander</td>
</tr>
<tr>
<td></td>
<td>Level 4, ANUCBE Bldg. 26C</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:Maria.Lander@anu.edu.au">Maria.Lander@anu.edu.au</a></td>
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COURSE OVERVIEW

Course Learning Outcomes
On satisfying the requirements of this course the student will have the knowledge and skills to:

1. Define and describe the use of cash flow models, simple and compound rates of interest and discount as well as compare and distinguish between nominal and effective rates of interest and discount.
2. Describe various types of annuities and perpetuities and use them to solve financial transaction problems.
3. Describe equations of value and various tools like linear interpolation & annuity tables.
5. Analyse basic fixed interest financial transactions like Loan Valuation, Fixed Interest securities (eg. Bonds) and employ the skills developed in this course to evaluate such transactions. Incorporate the effects of taxation on such financial transactions.
7. Define interest rate risk in terms of duration and convexity of fixed interest products. Define immunisation and assess its use in mitigating interest rate risk.
8. Illustrate the basics of stochastic interest rate models and use it to evaluate simple cash flow models.

Research-Led Teaching
Wherever possible the examples used in this course will reflect real world situations to emphasize the use of the techniques covered.

Continuous Improvement
We use feedback from students, professional bodies and staff to make regular improvements to the course. In response to this feedback, design improvements from the previous version of the course include:

- Introduction of Quizzes to provide continuous assessment
- Use of technology (in particular Excel) to illustrate the concepts and its application

Technology, Software, Equipment
All course notes and materials will be provided via Wattle. You will need access to a computer to get the materials necessary for the course. There is a limited use of MS Excel in this course. Some in class work will be illustrated using MS Excel. Students will have an option to complete their assignment using MS Excel.

Student Feedback
All CBE courses are evaluated using Student Experience of Learning and Teaching (SELT) surveys, administered by Planning and Statistical Services at the ANU. These surveys are offered online, and students will be notified via email to their ANU address when surveys are
available in each course. Feedback is used for course development so please take the time to respond thoughtfully. Course feedback is anonymous and provides the Colleges, University Education Committee and Academic Board with opportunities to recognise excellent teaching and to improve courses across the university. For more information on student surveys at ANU and reports on feedback provided on ANU courses, visit http://unistats.anu.edu.au/surveys/selt/students/ and http://unistats.anu.edu.au/surveys/selt/results/learning/

### COURSE SCHEDULE

<table>
<thead>
<tr>
<th>Week</th>
<th>Summary of Activities</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Access to Wattle site for all enrolled students</td>
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</tr>
<tr>
<td>1</td>
<td>Cash-flow models. Simple and compound interest. Accumulated and present values.</td>
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<tr>
<td>2</td>
<td>Nominal and effective rates of interest and discount. Force of interest.</td>
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<tr>
<td>3</td>
<td>Introduction to annuities and their valuation.</td>
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<tr>
<td>4</td>
<td>Perpetuities. Continuous, increasing, decreasing and indexed annuities.</td>
<td>Quiz A to be completed online</td>
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<tr>
<td>5</td>
<td>Equations of value. Introduction to linear interpolation and annuity tables. Dealing with inflation.</td>
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<tr>
<td>6</td>
<td>Loan valuation and payments. Capital budgeting including NPV, IRR and DPP.</td>
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<tr>
<td>7</td>
<td>Measuring investment performance. TWRR and MWRR.</td>
<td>Quiz B to be completed online</td>
</tr>
<tr>
<td>8</td>
<td>Valuation of fixed interest securities, with and without tax on interest and capital gains.</td>
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<tr>
<td>10</td>
<td>Arbitrage and valuation of forward contracts. Yield curve and term structure of interest rates. Calculating forward and spot rates.</td>
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<tr>
<td>11</td>
<td>Interest rate risk: duration, effective duration and convexity. Conditions for and determination of immunisation.</td>
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<tr>
<td>12</td>
<td>Introduction to stochastic interest rate models.</td>
<td>Assignment Due 24 October</td>
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<tr>
<td>13</td>
<td>Revision</td>
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## COURSE ASSESSMENT

### Assessment Summary

<table>
<thead>
<tr>
<th>Item</th>
<th>Title</th>
<th>Value</th>
<th>Due Date</th>
<th>Linked Learning Outcomes (optional)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Quiz A</td>
<td>5%</td>
<td>Week 4</td>
<td>LO1</td>
</tr>
<tr>
<td>2</td>
<td>Quiz B</td>
<td>5%</td>
<td>Week 7</td>
<td>LO2</td>
</tr>
<tr>
<td>3</td>
<td>Assignment</td>
<td>20%</td>
<td>24 October</td>
<td>LO3 – LO7</td>
</tr>
<tr>
<td>4</td>
<td>Final Exam</td>
<td>70%</td>
<td>Exam Period</td>
<td>All</td>
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</table>

### Assessment Task 1 & 2: Quizzes A & B

#### Details of task:

The quizzes are to be attempted online on Wattle. The quizzes are worth 5% each of your overall score in the course. You will get at least 45 minutes to complete each quiz. Both the quizzes are compulsory. Under no circumstances will you be able to attempt the quiz outside of the allocated time period. Announcement will be made during lectures and on the Wattle course site regarding the availability of the quiz.

There will be a mix of multiple choice questions and numerical evaluation questions. Quiz A will cover LO1 of the course. Quiz B will cover LO2 from the outcomes mentioned above.

### Extensions and Penalties

No extensions will be granted. This is a compulsory assessment and each quiz is worth 5% of your overall mark for the course.

### Returning Assignments

Feedback via Wattle

### Assessment Task 3: Assignment

#### Details of task:

The assignment questions will be provided to all students at the relevant time on the course Wattle page. The assignment is designed to assess the students’ application of the various topics covered in this course. The students are expected to complete this assignment individually. Students will have the option to complete their assignment in one of these three forms:

- Hand written submission
- Answers can be typed and then submission to be completed via Wattle
- Use Excel to complete the assignment and submission via Wattle

More details will be provided during the lectures and on Wattle.

The assignment is compulsory and is worth 20% of your overall mark for this course.

### Assignment Submission

All students must hand in an assignment of their own writing. The assignment is to be submitted online on Wattle at the pre-specified location or hand-written assignments need to
be dropped off in the assignment box at the RSFAS office on level 4 of ANUCBE Building. You must attach a coversheet with your assignment.

The ANU is using Turnitin to enhance student citation and referencing techniques, and to assess assignment submissions as a component of the University's approach to managing Academic Integrity. For additional information regarding Turnitin please visit ANU Online.

**Extensions and Penalties**
In general, no extensions will be granted. Although if there is a genuine medical reason then an extension or redemption may be granted you provide the relevant documentation.

**Examinations**
The final examination will be 3 hours long and will cover the entire syllabus. Specific details regarding examination conditions and the time and location for this examination will be provided on Wattle and in lectures once confirmed.

Examinations are closed-book and you are not permitted any course material in the exam hall. A formula sheet will be provided. You are also allowed to bring in a non-programmable calculator and a dictionary (these must not contain any material added by the student, and will be subject to random checks during the course of the examination).

**Scaling**
Your final mark for the course will be based on the raw marks allocated for each assignment or examination. However, your final mark may not be the same number as produced by that formula, as marks may be scaled. Any scaling applied will preserve the rank order of raw marks (i.e. if your raw mark exceeds that of another student, then your scaled mark will exceed or equal the scaled mark of that student), and may be either up or down.

**READING LISTS**
All course material will be provided via the course Wattle page. There are no prescribed textbooks for this course. Although there are some supplementary material that can enhance student learning.

**Supplementary Reading (Not Compulsory)**


- J.J. McCutcheon and W.F. Scott (1986) An Introduction to the Mathematics of Finance, published for the Institute of Actuaries and Faculty of Actuaries by Heinemann

- Formula and Tables for Actuarial Examinations, 2002, ACTED Australia

- Course Material for CT1: Financial Mathematics, ACTED Australia
TUTORIAL AND/OR SEMINAR REGISTRATION

Students will be expected to attend a one hour tutorial per week from the second week of semester. The tutorials in this unit serve two functions. Firstly, they provide students with the opportunity to seek assistance concerning lecture material. Secondly, practice problems will be assigned each week and the solutions will be discussed in the tutorials. Generally the questions will relate to the lecture material of the previous week. Students are expected to have attempted the questions prior to the tutorial. Solutions to the tutorial questions will also be placed on the course website.

If there is a particular question that you wish to discuss in the tutorial (that is not one of the questions assigned for the tutorial), then please inform your tutor in advance in order to allow them time to adequately prepare solutions.

Enrolment in tutorials will be completed online using the CBE Electronic Teaching Assistant (ETA). To enrol, follow these instructions:

1. Go to http://eta.fec.anu.edu.au
2. You will see the Student Login page. To log into the system, enter your University ID (your student number) and password (your ISIS password) in the appropriate fields and hit the Login button.
3. Read any news items or announcements.
4. Select "Sign Up!" from the left-hand navigation bar.
5. Select your courses from the list. To select multiple courses, hold down the control key. On PCs, this is the Ctrl key; on Macs, it is the key. Hold this key down while selecting courses with the mouse. Once courses are selected, hit the SUBMIT button.
6. A confirmation of class enrolments will be displayed. In addition, an email confirmation of class enrolments will be sent to your student account.
7. For security purposes, please ensure that you click the LOGOUT link on the confirmation page, or close the browser window when you have finished your selections.

IF YOU EXPERIENCE ANY DIFFICULTIES, PLEASE CONTACT THE SCHOOL OFFICE (SEE PAGE 1 FOR CONTACT DETAILS).

COMMUNICATION

All communications with students will be done via Wattle or one on one consultation (times will be advised in Week 1) and student email.

Email

If necessary, the lecturers and tutors for this course will contact students on their official ANU student email address. Information about your enrolment and fees from the Registrar and Student Services' office will also be sent to this email address.
Announcements
Students are expected to check the Wattle site for announcements about this course, e.g. changes to timetables or notifications of cancellations. Notifications of emergency cancellations of lectures or tutorials will be posted on the door of the relevant room.

Course URLs
More information about this course may be found on:

- Programs and Courses (http://programsandcourses.anu.edu.au/2014/Catalogue )
- the College of Business and Economics website (http://cbe.anu.edu/courses) and
- Wattle (https://Wattle.anu.edu.au), the University's online learning environment. Log on to Wattle using your student number and your ISIS password.

POLICIES
The University offers a number of support services for students. Information on these is available online from http://students.anu.edu.au/studentlife/

ANU has educational policies, procedures and guidelines, which are designed to ensure that staff and students are aware of the University's academic standards, and implement them. You can find the University's education policies and an explanatory glossary at: http://policies.anu.edu.au/

Students are expected to have read the Student Academic Integrity Policy before the commencement of their course.

Other key policies include:

- Student Assessment (Coursework)
- Student Surveys and Evaluations

ACTUARIAL PROFESSION INFORMATION

Exemption from Actuarial Professional examination
The Australian National University is accredited by the Actuaries Institute to provide students with exemptions from the Part I professional examinations of the Institute. Exemptions are recommended subject to obtaining sufficiently high grades in designated courses. This course closely follows the syllabus of Subject CT1 of the IAAust.

To qualify for an exemption from the IAAust professional examination CT1, students are required to receive a mark of 60% or greater in this course. The standard required by the Institute of Actuaries of Australia for an exemption will be upheld and thus no quota applies to the percentage of students receiving each grade in this course.
University subscription to the Institute of Actuaries

The Institute of Actuaries of Australia (IAAust) allows students to become IAAust University Subscribers free of charge. Full time undergraduates studying at an Institute accredited university who are members of a university student actuarial society are eligible.

To sign up, go to: http://www.actuaries.asn.au/Membership/MembershipoftheInstitute/Subscriber.aspx

The University Subscriber offer is not a membership of the IAAust but a subscription to receive information on career opportunities, invitations to selected IAAust events and online publications. You might also consider joining the IAAust – there are advantages in doing so while a full-time student.

For membership information, go to http://www.actuaries.asn.au/Membership/MembershipoftheInstitute.aspx