SUBJECT REVIEW

2020 EDITION

Contents

Preface

By now, you have probably ascertained that you may want to be an actuary. But what must one learn to become an actuary? A quick Google search for "actuarial science" will bring up this Wikipedia definition:

> Actuarial science is the discipline that applies mathematical and statistical methods to assess risk in insurance, finance and other industries and professions.

Perhaps this suggests a predominant study of mathematics, statistics, and finance. Nevertheless, this gives no headway as to what exactly an Actuarial student may encounter in their university studies. As it turns out, the path to becoming an actuary is arduously complex, and the Actuarial Students' Society has recognised this.

This publication is the product of the society's efforts to create greater transparency regarding the subjects studied as part of an *Actuarial Studies* major under the *Bachelor of Commerce* degree. Through this, we hope that students hoping to graduate from the major may gain, not only greater insight into the content studied in these subjects, but also general tips and advice that past students have provided based on their own experience. With authors coming from a range of different backgrounds, we hope to highlight the obstacles and challenges in each subject so that students may prepare themselves better for their studies.

Invariably, each review will be an expression of opinion — we urge readers to be conscious of this fact, as the subject experience may differ from individual to individual. Please take note of the year and semester of each subject review. Subject content, structure, and personnel undergo continuous change, and it is important to recognise whether the reviewed curriculum has since been superseded. Such reviews will, however, still serve as a reliable reference for the general direction of the subject.

If you are interested in submitting a subject review for the next edition of this guide, please contact the Actuarial Students' Society at contact@melbourneactuary.com.

Updates to the 2020 Subject Review

Additional Core ACTL Subjects

The 2020 edition of the *Actuarial Students' Society Subject Review* has compiled 60 brand new reviews, with updates for all core subjects of the Actuarial Studies major and other relevant subjects that contribute to the accreditation process; this includes subjects from the *Bachelor of Commerce* as well as some core graduate-level subjects from the *Bachelor of Commerce (Honours)*, *Master of Commerce (Actuarial Science)* and *Master of Actuarial Science* programs.

The updated professional accreditation curriculum with the new *Foundation Program* and *Actuary Program* finally saw itself fully implemented at *the University of Melbourne*. The drive for a more data-oriented major was enabled by the introduction of **five** new Actuarial subjects — ACTL20003, ACTL20004, ACTL30007, ACTL30008 and ACTL90019 — alongside the revision of two existing core subjects — ACTL20001 and ACTL30003.

Additional breadth and elective subjects

The change in the accreditation curriculum also meant that full-major Actuarial students seeking postgraduate study are only allowed one breadth/elective subject (if the student chooses not to take ACTL10001) and two non-math breadth subjects. With this in mind, the *Actuarial Students' Society Subject Review* will continue to include a range of breadths and electives available to our members. The inclusion of **ten** never-before-seen reviews will assist all Actuarial students in deciding the right breadth or elective for them; whether they wanted a subject to broaden their study options, to learn concepts to complement their developing actuarial skillset or to have a "bludge" subject.

Finally, the *Actuarial Students' Society Subject Review* has always been a publication by Actuarial students for Actuarial students. Whilst the majority of our members have been pure *Actuarial* majors, a significant portion of our membership and committee alike undertake the *Actuarial* major with another. Therefore, we have expanded the 2020 edition of the *Actuarial Students' Society Subject Review* to include subjects relevant in obtaining double majors with *Actuarial* and the *Economics* or *Finance* majors — written by students taking double majors themselves. Ultimately, their experiences can relate to many other first or second year Actuarial students standing at this crossroad; we hope that these reviews will help facilitate the making of this decision.

About the Actuarial Students' Society

Founded in 1989, the Actuarial Students' Society has established itself as the University of Melbourne's official society for students undertaking actuarial studies, with the support of the University of Melbourne Centre for Actuarial Studies. Our aim at the society is to expand our members' career opportunities by bridging relationships between students and professionals alike, and by developing their actuarial skill sets.

By connecting our student members with like-minded peers, experienced lecturers and sponsorship representatives, we enable our members to get head starts in their actuarial careers. To achieve this, our society holds multifarious events, both social and professional. The Actuarial Students' Society's social calendar includes events like Trivia Night and Poker Night; they emulate a warm and amicable atmosphere that encourages students to mingle with other students and ask sponsors meaningful questions. Our professional calendar includes events like our flagship Contact Night, where students can network with and learn from working actuaries in a more formal setting.

The Actuarial Students' Society's didactic workshops in Excel and R equip our members with fundamental skills for the profession and the fiercest tools for job-seeking. Employers have favoured candidates who are proficient in such areas; we take pride in helping our members take real strides in their career development early on. Through the coalescence of constant exposure to the actuarial world, our members will learn to love the actuarial degree and profession. Your first step starts with us—the Actuarial Students' Society.

For more information, including how to become a member, please visit our website or Facebook page:

www.melbourneactuary.com

www.facebook.com/actuarialstudentssociety

Subject Reviews

Acknowledgements

The Actuarial Students' Society would like to extend its sincere gratitude to the following people for their kind contributions to the 2020 edition of the *Actuarial Students' Society Subject Review*. Note that some contributors have asked to remain anonymous:

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Disclaimers

All opinions and observations expressed herein remain the views of the individual author and do not necessarily reflect the views of the Actuarial Students' Society or the University of Melbourne.

Whilst the Actuarial Students' Society has made every effort to ensure the reliability and validity of any information presented herein, the Actuarial Students' Society does not guarantee accuracy, relevance, or completeness of any information provided. The Actuarial Students' Society and the University of Melbourne do not assume legal responsibility for any decisions made or actions taken as a result of information available in this guide.

The impact of COVID-19 on the *Actuarial Students' Society Subject Review*

In light of the recent COVID-19 situation, the Actuarial Students' Society have endeavoured to bring value to our members throughout 2020 with our adapted workshops, information sessions and the *Actuarial Students' Society Subject Review*.

Please note that all the subjects reviewed in 2020 reflect the individual author's educational experiences in an online environment. Whilst the authors have kept this in mind as they composed their reviews, undoubtedly the aspects of some reviews — including assessment details and specific advice given — hold only for the online delivery of these subjects. Nonetheless, with off-campus based learning still being delivered in 2021, we hope that the 2020 edition of the *Actuarial Students' Society Subject Review* can continue to provide valuable information for our members hereafter.

First-Year Subjects

Contents

ACCT10001 Accounting Reports and Analysis [SM1] (1)

Exemption status	Not an exemption subject, but it is a prerequisite for ACCT10002 *Introductory Financial Accounting* (CB1 *Business Finance*).
Lecturer(s)	Mr Noel Boys
Weekly contact hours	1 × 2-hour lecture 1 × 1-hour tutorial
Assessments	Completion of pre-tutorial quizzes 4% Assessable tests 4 × 1.5% = 6% Individual assignments 2 × 10% = 20% 3-hour end-of-semester exam (hurdle) 70%
Textbook recommendation	Birt, J, Chalmers, K, Maloney, S, Brooks, A, Oliver, J & Bond, D 2020, *Accounting: Business Reporting for Decision Making*, 7th edn, Wiley, Australia ✗ Not necessary. Boys' lectures were very thorough and covered all the textbook readings
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Contents

Accounting Reports and Analysis (ARA) is one of the five core subjects in the *Bachelor of Commerce*. It gives an accountant's view of how a business should be run and evaluated. It introduces the core components of the reports that businesses must produce and how to interpret them. The first few weeks are very similar to Accounting in high school.

All in all, ARA is an enjoyable and very achievable course. By keeping up with the lectures and attending the tutorials, the exams and other assessments will be achievable without much studying throughout the semester.

Subject content

The course is split into two. The first section consists of topics 1–6 exploring 'financial accounting', which is the preparation of reports. The second section covers topics 7–10 which discusses 'management accounting', how various information can inform decision making about the business and investors.

1. **Regulatory and Conceptual Framework**:
   - Introduces accounting and how it is used by stakeholders and legal authorities to analyse a business. It also presents the basic qualities that accounting information must contain.
2. **Transaction Analysis and Financial Statements**:
   - Establishes the main reports produced by businesses and their presentation.
3. **Assets**:
   - The first lecture in a two-part introduction into the balance sheet. It presents the different asset classes and how to measure assets in the balance sheet.
4. **Liabilities and Equity**:
   - This second part of the balance sheet preparation introduces the liability and equity classes and their respective measurement issues. It also investigates business financing and the weighted average cost of capital.
5. **Income and Expenses**:
   - This topic presents another report, the profit and loss statement. It also investigates the measurement and categorising issues involved in its preparation.

6. **Statement of Cash Flows**:
   - The last of the general-purpose financial reports is introduced in this topic. Boys also covers earnings management techniques which are used to manipulate financial reports.
7. **Financial Statement Analysis**:
   - This begins the second half of the course investigating the management accounting aspects of accounting. Trends and ratios are calculated, and their relationships investigated.
8. **Budgeting**:
   - Instead of looking into the past, this section tries to predict the future earnings and position of the business. The different styles of budgeting are also examined.
9. **Cost-Volume-Profit Analysis**:
   - Another management accounting technique, this type of analysis is the most mathematical part of the course, with much emphasis put on interpreting the results you calculate.
10. **Sustainability in Accounting**
    - This topic is held by a guest lecturer. It examines the emerging area of sustainability accounting and introduces theories to explain business' actions. There will likely be a question on the exam in this vein.

If you have done accounting in high school (like I did) be careful to still pay attention in the first few weeks. Even though there is a large amount of overlap, ARA focusses on large firms and their regulatory requirements rather than small firms.

Lectures

Noel Boys is a humorous and logical lecturer. His lectures were enjoyable to listen and made the dense content interesting.

At the beginning of the semester, there was four streams each held by Boys. As the university transitioned to online learning, the four streams were merged into one. He would release unfinished slides prior to the lecture and then fill them in as the lecture progressed. I didn't find that to be the optimal way to watch his lectures as theory plays a large part in the course. Instead, I suggest that you make your own notes paraphrasing the theory.

Tutorials

Every week there was a 1-hour tutorial. This tutorial was hosted over Zoom and examines the edge cases of the theory covered in the lecture in the previous week. This was very helpful in extending and challenging my understanding of the material beyond the detail covered in the lectures. Participation is encouraged with a judgement-free environment expressed. Although attendance is not compulsory, I highly recommend attending and participating.

Additional Resources

There are additional resources available to help with the material. The tutors are very helpful in answering any questions sometimes referring to an online consultation session, which run often. There is also an online tutor facility, which was a useful tool which many students used to ask questions. These questions are resolved promptly (within a day) with complete answers.

Assessments

Part of the assessment was completing the pre-tutorial quizzes. The score of the quiz does not contribute to the assessment, just the completion of it. The quizzes were of an introductory standard, basically a recap of what basic concepts were introduced in the lecture. I recommend preparing by reviewing you notes for that lecture.

In the same style were the four multiple-choice assessable quizzes. They are of various lengths and times and are a slightly harder standard than the pre-tutorial quizzes. However, attending the tutorials should be ample preparation for the quiz.

The two assignments were completed on Excel, which was then computer-marked against an answer key. The first assignment was completing a balance sheet and income statement, and the second assignment was analysing a financial

report. These were not of a particularly difficult standard. By modelling off the sample illustrations from the lectures, the assignments should be very doable.

The final exam is significantly more difficult than the preceding assessments. It had two parts, a 80-question multiple-choice and preparation of the three financial reports from a list of balances. The preparation material provided was not in the form of practice exams rather investigating edge case situations. This shocked me into studying as there was a lot of emphasis placed on the theory over the practical, which surprised me. In the exam, the preparation of the financial reports was difficult and of a much harder standard than any of the material provided. However, the multiple-choice questions were of a similar standard to the assessable quizzes. Completing the practice material and attending tutorials should provide ample preparation for the exam.

ACCT10001 Accounting Reports and Analysis [SM1] (2)

Exemption status	Not an exemption subject, but it is a prerequisite for ACCT10002 *Introductory Financial Accounting* (CB1 *Business Finance*).
Lecturer(s)	Mr Noel Boys
Weekly contact hours	1 × 2-hour lecture 1 × 1-hour tutorial
Assessments	Tutorial participation and preparation quizzes 10% 2 Individual assignments 20% 3-hour final exam (hurdle) 70%
Textbook recommendation	Birt, J., Chalmers, K., Maloney, S., Brooks, A., Bond, D. & Oliver, J. (2020). *Accounting: Business Reporting for Decision Making* (7th Edition), John Wiley and Sons Australia. ✓ Highly recommend for those of you seeking further detail beyond lecture material. Absolute dense beast of a textbook.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Subject content

ARA focuses on the preparation, presentation and analysis of financial statements of companies. The subject is presented with each lecture presenting a general concept, with the first seven lectures focusing on the perspectives of investors and lenders and the remainder exploring management's use of reported information.

1. **Conceptual Framework**
   The Conceptual Framework underpins the thought process and justifications behind everything in the financial statements. The content covered here is relatively simple and reinforced well in tutorials. Understanding the Conceptual Framework thoroughly will make the four next topics flow much more logically, so I would most definitely be spending a bit more time here.
2. **Transaction Analysis and Financial Statements**
   Transaction Analysis involves recording the financial impacts of business events to then be aggregated and presented in financial statements. For the most part, the entire processes covered in the chapter are very intuitive. The only detail that is easily missed is that expenses have negative balances. The first assignment covers this area of the topic.
3. **Balance Sheet**
   This section of the topic is split into two parts, "Assets" and "Liabilities and Equity". The key here is being able to explicitly identify why each class of asset and liability falls within the definitions given by the Conceptual Framework. Understanding assets and liabilities well makes Financial Statement Analysis make much more intuitive sense.
4. **Income and Expenses**
   The Income and Expenses section of the subject primarily deals with how the accrual accounting method deals with the income and expenses of the company. Understanding how accrual accounting works can save you hours of studying on this topic as much of the lecture is simply applying it to various situations.
5. **Statement of Cash Flows**
   The Statement of Cash Flows covers the blind spot of accrual accounting. Focusing on the inflows and outflows of cash after focusing on accruals for so long can be tricky, but it's a very commonly quizzed/examined distinction to

make. Tutorials made this very easy to understand the first time around. Reconciling the cash flow statement and the income statement also takes a bit of extra attention.

6. **Financial Statement Analysis**
   Financial Statement Analysis explores how information from the financial statements can be interpreted through ratios and other simple types of analysis. This section of the topic is filled with formulae but understanding the purpose behind the ratios and how they interconnect is more important for examination. In terms of calculations, take care understanding when to use average values or end of year values.
7. **Budgeting**
   Budgeting deals with projected cash flows and profit from an internal managers perspective. The lecture content is easily sufficient for this topic as its relatively straightforward.
8. **Cost Volume Profit (CVP) Analysis**
   CVP analysis is almost like the theory of the firm, a concept that overlaps with Introductory Microeconomics. The formulae are intuitive, and calculations are simple. The only additional detail here relates to rounding and weighted contribution margins. Boys covers this very briefly during the lecture, but the textbook offers a bit more information.
9. **Sustainability**
   Sustainability was very interesting. The guest speaker gave some interesting insights but the main examined section of this pertained to the different theories explaining why corporations adopt sustainable practice. The textbook is a helpful resource for this.

Lectures

Lectures formed the backbone of this subject upon which tutorial gave flesh and the textbook added skin. For most students this is an introduction to accounting, so the subject is taught without any assumed knowledge and lectures focus on the core examinable content of each unit. Lecture content often seems quite straightforward and dry when its taught but handling each topic in tutorials makes it come to life.

Boys makes the content more than bearable with his wit and sense of humor. As an example, I vividly remember the implications of certain cash flow characteristics thanks to his acting it out. Even though his enthusiasm has dwindled slightly in the online recorded lectures, Boys was easily the most buoyant lecturer of my semester. Recorded lecture quality was great.

Tutorials

Tutorials were critical to understanding how to apply certain concepts in specific curveballs situations, taking the more basic content of lectures into discussion and extracting nuance. Participating in discussions was very helpful in my handling of the content. There were many occasions in the first couple of weeks where my misunderstandings were corrected by the tutor. Often many students are more confused and lost than they let on, so don't be afraid to just say whatever in tutorials as many other students would have similar questions. The tutors were responsive and great at sparking discussion.

Assessments

Tutorial preparation quizzes are great to find out and fix what you don't know while it isn't assessed so I'd strongly trying hard on them. There are also easy points to be obtained just for completing them (the mark obtained is irrelevant). Online assessed quizzes follow a similar format and style of questions, but spanned a broader range of topics with a strict time limit of 60 minutes. This is typically ample time to complete the quiz.

Assignments are relatively straightforward and correspond well to content from lectures (transaction analysis and financial statement analysis). The first was to record transactions and present them in an income statement and balance sheet. This was due on the 30 of March and only takes an hour or so to complete. The second was due on the 22 of May and pertained to calculating ratios from information given.

Revisiting the lectures on transaction analysis and ratio analysis would be ample preparation for assignments 1 and 2

respectively.

End-of-semester exam

This semester, the exam for ARA this semester took place online. A specified 3-hour timeframe is opened up on Canvas for this to take place without supervision. The exam was 120 marks total, 40 for preparing a full set of financial statements from given data and 80 multi-choice questions worth 1 mark each. It was open-book and a calculator was required.

In terms of content, the financial statements were more straightforward as statements that don't balance instantly reflect that an error has been made. The multi-choice questions were more varied and theory focused, testing all the details of covered content. I thought this was a great exam in terms of difficulty. It was very easy to get tripped up on some of the nuances involved in definitions and figures, so in terms of preparation I'd recommend at least revisiting all the tutorial recordings, particularly those on the balance sheet.

Additional Readings

The textbook is packed with content. I read most of it and the extra depth helps you see past the more boring content that is covered in lectures. For those of you that plan to major in accounting or anyone wishing to invest in businesses, it's a great read.

Concluding Remarks

This subject is easily the most practical in the semester. It's not too hard, although sometimes dry. The level of detail equips students with the ability to scour through financial reports of real companies and conduct basic analysis. For those of you into investing in shares, it's a great eye-opener and springboard into the whole commerce world.

ACCT10002 Introductory Financial Accounting [SM2]

Exemption status	CB1 *Business Finance*, in conjunction with FNCE10002 *Principles of Finance*. An average mark of 73 across both subjects is required.
Lecturer(s)	Mr Warren McKeown
Weekly contact hours	1 × 2-hour lectures 1 × 1-hour tutorial
Assessments	Individual written assignment 5% 5 × Online quizzes 10% Individual Xero assignment 15% 3-hour end-of-semester exam 70%
Textbook recommendation	Carlon, S., Mitrione, L., Kirk, N., Palm, C., Wong, L., & McAlpine-Mladenovic, R. (2016). *Financial Accounting - Reporting, Analysis and Decision Making (5th ed.)*. Milton, AU: John Wiley & Sons Australia. ✗ Not essential. The only use made of this textbook was on the topic on Bank Reconciliations which was skimmed over in the lecture. Otherwise, the materials provided by Warren were sufficient to grasp this subject well.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 2

Overall Comments

While ARA provided a broad view of accounting and its applications as a whole for students who may not pursue further accounting studies, IFA introduced more niche accounting concepts, particularly with a strong focus on T-accounts and the general journal treatments of transactions. Overall, the subject was well organized, coherently delivered, and generally straightforward to offer insight into the preparation of financial statements from an internal perspective.

Subject Content

IFA focused on the effects of transactions on the General Journal, individual ledger accounts, and ultimately the financial statements. Many concepts were familiar from ARA, this time extended with further details. The topics covered in each week are:

1. Introduction
2. Double Entry Accounting
3. Adjustments
4. Inventories
5. Receivables
6. Non-current Assets
7. Liabilities
8. Equity
9. Share Issues
10. Statement of Cash Flows
11. Accounting for GST

After the initial introductory content, Week 2 introduced the foundational concepts of IFA including T-accounts, debits, and credits. Familiarizing yourself with these processes is straightforward but essential, as the remainder of the subject relies

on it. The following weeks discussed the debit and credit impact of various transactions on the accounts, separated into categories. Week 10 summarizes a lot of the content of the subject in the preparation of cash flow statements, which requires a thorough grasp of the interaction between accounts as the ultimate test of your understanding — this is a heavily examined topic, but also easily studied in the provided questions. The final week of the content pertains to the GST treatment of transactions in the accounts, which can be confusing initially but manageable with practice.

Heavy emphasis was placed on definitions of words from the Accounting Standards. These must be remembered as short answer questions often relate to these definitions.

Lectures

Lectures were the primary method of teaching in this subject and covered all of the examined topics in great detail, apart from bank reconciliation. I found the pacing appropriate, which allowed each important topic to be discussed with sufficient depth. Revising with the lecture recording and slides was effective as content that was emphasized in lectures tended to be more frequent in the assessment as well. The slides were very comprehensive with ample detail and examples are given to attempt questions afterwards.

Warren was a great lecturer as he presented with clarity and an engaging tone. Lecture recordings were conveniently released at the start of the week.

Tutorials

Zoom tutorials did not have marked attendance, but I still recommend attending. While the questions and solutions were both provided, I found it helpful listening to the tutor break down the process of approaching a problem. It was also nice to be able to get instant answers to any questions I had during the tutorial. Some tutorial questions were designed to be completed prior to the tutorial (strongly recommended). Additional questions were also provided for additional revision.

Online Quizzes

Five online quizzes were taken the semester approximately every two weeks beginning from Week 2. For students who attended tutorials, these were easy marks as the form and content were similar to tutorial questions. Each quiz covered content taught starting from the week of the prior quiz. This was a good incentive to keep up to date with the lectures and content for IFA. Quizzes were one hour each, which was a decent time to finish all the questions.

Assignments

The main assignment given this year was to be completed on Xero, which I thought was very practical since the software is often used in small businesses. Students were given a collection of source documents to put in the software and ultimately produce a set of financial statements. The tricky part was the quiz afterwards which was the majority of the marks. Be very careful reading the questions on this quiz, some students (or maybe only me) fell prey to carelessness here.

A small written assignment was also given as practice for short answer questions on the final exam. Questions were of varying difficulty at the whim of your tutor, but most likely a good response would have been discussed in either lectures or the tutorial. A good response could have been given in a paragraph or two. Remembering definitions of keywords and accounting concepts was very important.

End-of-semester Exam

A specified 3-hour time frame was available on Canvas for the exam to take place, without Zoom supervision. The exam had multiple-choice questions, one cash flow statement, and ten short answer questions. It was an open-book exam and a calculator was required. Most questions could easily be expected as the topics covered would have been emphasized in lectures. For the most part, revisiting and potentially redoing tutorial questions would place you in a good position to do well. This year, an ethics question popped up in the exam, so I would recommend not to overlook these questions in the tutorial sheets. I found the timing to be quite tight this year, but previous papers weren't as long.

ACTL10001 Introduction to Actuarial Studies

Exemption status	None
Lecturer(s)	Prof Benjamin Avanzi
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial
Assessments	Two Group assignment 2 × 10% Mid-semester exam 10% End-of-semester exam (Hurdle) 70%
Textbook recommendation	Dickson, D. C. M., & Atkinson, M. E. (2011). *An Introduction to Actuarial Studies (2nd ed.)*. Cheltenham, UK: Edward Elgar Publishing. The text is mainly used as a source of supplementary questions to the provided tutorial questions. I found this useful for further revision on tricky topics in the latter half of the subject.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 2

Overall Comments

Introduction to Actuarial Studies was an interesting opener to the world of actuarial work. The subject introduced actuarial notation, life tables and many interesting concepts to prepare us for the *Actuarial* major in the future. Whilst it was a fun enough subject — having introduced ideas that would likely follow us in the years to come — it was also quite polarizing and thus served its purpose of helping students make the final decision to commit to the *Actuarial* major.

Subject Content

1. **Simple Interest and Simple Discount**
   Reminiscent of the first weeks of *Principles of Finance*. This was mostly straightforward material, but it is important to pay attention to the relationship between the interest and discount rate.
2. **Compound Interest**
3. **Annuities**
4. **Bonds and Loans**
   The contents of Weeks 2–4 overlapped heavily with POF. Doing it again using actuarial notation and slightly different formulae yielded new insights for me, so definitely still pay close attention.
5. **Demographics**
   This topic introduced the features of populations through ratios and population pyramids. The analysis is simple but interesting to interpret.
6. **Life Tables**
   We covered the basic features and functions of a life table in this topic. The usage of life tables is heavy in the following topics, so it is important to become familiar with the notation and calculations involved.
7. **Mortality, Fertility and Population Projections**
   This week contained a lot of scattered content focusing on analysing populations. These were all interesting to learn about but formed little of the final examined content.
8. **Contingent Payments**
   Week 8 focuses on valuing future cashflows that are uncertain. I found this topic particularly challenging and found the textbook to provide some helpful additional practice.
9. **Life Insurance**

A quick introduction to common life insurance products and how to approach related calculations.

10. **Premiums and Reserve**
    This week combined the material from Weeks 8 and 9 focusing on work in the life insurance industry. This week was full of tedious calculations where questions could get especially grotesque with changing interest and mortality rates.
11. **General Insurance**
12. **Superannuation**
    The final two weeks contained no quantitative content, and the remainder of the subject simply discussed the features and products of the General Insurance and Superannuation practice areas. This content is still examinable, but much less time-consuming to cover and prepare for.

The subject begins with content resembling the financial mathematics portion of *Principles of Finance*. Since these concepts of present values, accumulations and interest rates were frequently applied in the subject, I found the first few weeks to be a good opportunity for revising these essential foundations. Actuarial notation is also introduced here, which students should familiarize themselves with as soon as possible.

The following weeks introduce interesting ideas of demographics and life tables, with heavy emphasis on probabilities of survival and mortality. Later on, this was combined with the financial mathematics from the initial weeks to calculate expected present values and insurance premiums. With my weak foundation in probability, I found this section of the course to be a bit confusing but manageable with practice.

Aside from these theoretical topics, Benjamin also gave us an insight into the actuarial industry, including discussions of professionalism and broad overviews of insurance types and superannuation. This was scattered throughout the semester in the form of interview recordings and analysis of related current events.

Lectures

Lectures were separated into chapters as covered in the textbook, and usually added up to two hours of material each week. Benjamin's lectures were well organized and structured intuitively. However, the delivery is sometimes clunky and hard to follow — especially in explaining the derivations of equations. Luckily, the detailed slides were able to somewhat make up for this, since I could pause the recording and work through the slides before continuing. Otherwise, the lecture quality was good. My favourite part of lectures were the example questions, where Benjamin made the rationale behind each solution very clear. This was very helpful in my study.

Tutorials

Attendance in tutorials were not marked this semester and the classes were held over Zoom. While I still found value in discussing in breakout rooms, the solutions provided on the LMS were easily detailed enough to study individually. The practice questions were all provided, supplemented by a collection of past exam questions and a further list of textbook questions.

In tutorials, the tutor began by recapping the lecture material the assigning us into breakout rooms to discuss the week's tutorial questions with each group being responsible for different questions. We reconvened at the end tutorial to share answers. Attending the Zoom tutorials was useful in cases where you may want to pursue further detail than what was provided in the solutions, but I rarely found this to be the case, primarily because the practice questions were all of adequate difficulty with comprehensive worked solutions. As the group assignment was made many times easier with a cohesive group, another benefit of attending the zoom tutorials this semester was to meet potential group members for the assignment.

Mid-semester Exam

The mid-semester exam covered the first half of the content in this subject. Despite it being multiple choice and open book, the exam was deceptively difficult. My advice for this exam would be to familiarize yourself with the calculator and

formulae, as the 30-minute time frame was by no means generous. While the calculation questions were familiar from the tutorial sheets, there were also a significant portion of theory questions that required some careful reading and revision of lecture material.

Assignments

Two group assignments were completed this semester, with the groups being allocated randomly and remaining the same for both assignments. The first assignment was to analyse the cashflows and returns of an investment property, while the second was to analyse the premium amounts of contents insurance on the property. Supposedly, the word count of both assignments together was to be 1,500; however, many groups exceeded this estimation significantly due to the volume of work required. The tasks themselves were straightforward enough, so provided that the groups split the work well and maintained weekly contact, it was easily completed without requiring too much work from any individual.

A team contract was required from each group in an effort to build coordination and cohesion in teams. We were required to draft this and submit it early on in the assignment.

End-of-semester Exam

The exam for Introduction to Actuarial Studies this semester took place online without Zoom supervision. The exam consisted of multiple-choice questions and essay-styled questions. Of the 60 marks of the exam, Benjamin provided a table detailing the mark allocations for each topic, as well as the type of question to be asked for the topic. Owing to the large proportion of long answer questions in the exam, it was especially important to review even the topics that seem un-examinable, such as Professionalism. Whilst I found the exam challenging to prepare for given the lack of past and practice exams, overall, it was reasonable.

ECON10003 Introductory Macroeconomics [SUM]

Exemption status	Not an exemption subject, but it is a prerequisite for ECON20001 Intermediate Macroeconomics (CB2 *Business Economics*).
Lecturer(s)	Dr Graham Richards
Weekly contact hours	2 × 2-hour lectures 2 × 1-hour tutorials
Assessments	Tutorial Participation 10% 2 × multiple-choice tests due in week 3 and week 6 10% Online assignment due in week 5 20% 2-hour end-of-semester exam 60%
Textbook recommendation	Bernanke, B., Olekalns, N., Frank, R., Antonovics, K., & Heffetz, O., 2019. *Principles of Macroeconomics*. (5th edition), McGraw Hill The textbook should serve as a source for alternate explanations of concepts should the lecture slides fail to hit the mark. Regardless, I do not believe the textbook to be necessary as the lecture slides are rather lengthy and detailed. ✗ Do not recommend.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Summer Term

Comments

For many students, ECON10003 Introductory Macroeconomics provides an introduction to the many 'big picture' ideas of economics, and critically analyses these concepts using mathematical models of the macroeconomy. Students are exposed to a number of topics ranging from economic growth to the balance of payments and are expected to understand the intricacies of both the theory and the underlying mathematics. Ideas from ECON10004 Introductory Microeconomics reappear commonly throughout the subject, so ensure that you come well-equipped with knowledge from the previous semester.

Given that this is a summer subject, there are a number of noticeable differences when compared to its regular semester counterpart. Most prominent is the teaching and examination style of the lecturer in the summer term. For the most part, students can get away with purely rote learning the content from the lecture slides and still perform well in the final exam. The assignment is also vastly different over the summer term, a point which I will touch on later.

Subject content

- **Week 1**: National Accounting & Inflation
  - This topic looked at how we can obtain statistics to measure the health of our economy and introduced the idea of a general price level.
- **Week 2**: Labour Market, Wealth and Savings & Economic Fluctuations
  - The topic analysed labour market dynamics, in addition to how savings can contribute to the long-term growth of an economy. Short-run fluctuations are also explored.
- **Week 3**: Keynesian Model & Monetary Policy
  - The first macroeconomic model is introduced, and we analyse how it can be used to describe various economic phenomena. This week also explores how the RBA conduct monetary policy and the economic goals that the RBA attempts to achieve through its use.
- **Week 4**: Money and the RBA, AD/AS Model & Introduction to Economic Growth

  - The function of the RBA is explored further in this week. We also extend the Keynesian model to incorporate price level and introduce the basics of long-term economic growth.
- **Week 5**: Solow-Swan Model & Balance of Payments
  - The Solow-Swan Model is developed to model long-term growth of an economy. This week also explores the transactions between countries in what is known as the balance of payments.
- **Week 6**: Foreign Exchange
  - Finally, the last topic covers foreign exchange and specifically what drives currency exchange rates.

Overall, the content in this subject is definitely manageable in terms of difficulty. What makes the subject hard is the excruciating detail in each of the lecturer's slides, which is expected in your responses come the final exam. I found that the Solow-Swan Model was the most conceptually challenging topic of the course, although I believe that after taking some time to digest the model, it is also fairly easy to understand and apply.

Lectures

Every week over the 6-week term, there are two 2-hour lectures run by Graham Richards. I attended the first lecture in Week 1 and stopped attending thereafter for a number of reasons. Firstly, his lecture slides were anything but condensed, filled to the brim with lines of writing. This would not have been an issue if he had actually gone over the content of the slides, but unfortunately this was not the case. It was often that he would ramble on something unrelated to the slides, before quickly skipping through a few in quick succession.

My advice would be to watch his lectures over Lecture Capture, pausing wherever necessary so that you are able to digest the slides in full. Understanding all of the content in the lecture slides is the best way to succeed in this subject, so much that watching the actual lecture is not even necessary as long as you fully comprehend the content on the slides.

Tutorials

Tutorials start in the very first week of the Summer Semester, right after the first lecture in Week 1. As with most other first-year *Commerce* subjects, the tutorial comprises 10% of your final mark and is determined by your tutor according to your attendance and participation in the tutorial. There is a pre-tutorial sheet that is expected to be completed prior to the tutorial. My tutor did not check whether we had actually completed it or not, but I found that the questions he asked were similar in style to the final exam, so I found it worthwhile to do regardless.

I found the tutorials to be very useful overall. My tutor would start the class off by doing a summary of all the concepts learnt in the previous lecture, which served as revision for those who had bothered to read the slides, but also introduced the bare minimum level of knowledge for those who had not watched the lecture. Either way, these were very useful as it drew our attention to the main ideas at hand, which was easy to lose track of amongst the copious amounts of information in the lecturer's slides.

Afterwards, the tutor would work through a tutorial sheet, with questions similar to those asked on the pre-tutorial sheet. These questions demanded a deeper understanding of the subject content, so it is advised that you have at least read through the slides before coming to the tutorial. Note that while solutions to the pre-tutorial tasks are provided on Canvas, the solutions to the in-tutorial tasks are not, so it up to you to take notes during the tutorial.

Online tests & Research assignment

Throughout the 6-week semester, there are two online tests which make up 5% each towards your final mark. They each cover material up to their respective weeks and are multiple choice. The questions in these tests demanded that you both understand the content but are also able to apply the content in various situations. It was uncommon that students scored full marks on these quizzes.

The assignment over the summer term is very different to those over the regular semester. While the assignment over Semester 2 tested the theory learnt in lectures in the form of short-response questions and mathematical calculations,

the assignment over the Summer Semester is more of a research task. Students were required to identify a number of leading economic indicators, analysing their recent behaviour to then ultimately predict the behaviour of the Australian economy and US economy. Very little content from the course is actually tested in this assignment. I would definitely recommend doing the assignment in a group as the research can become very intensive, especially when combined with the data processing and analysis that is required to properly present economic forecasts. The tutors were fairly lenient in the marking of this assignment, with marks commonly ranging between 15/20 and 17/20. Nonetheless, it is definitely more work-intensive compared to assignments in the regular semester.

End-of-semester exam

The final exam was out of 100 marks and this year's format was extremely different to that of ECON10004 Introductory Microeconomics and that of the regular semester exam. There were four questions, each worth 25 marks. Within each question, there were either two or three sub-questions, meaning that sub-questions worth 10 or 15 marks were very common. Because of this, it was very difficult to identify what the examiners were looking for in terms of responses and it is for this reason that reading the slides is imperative. For these questions, I would write everything that I could remember from the slides onto the page in the hopes that I covered the points on the marking criteria. The nature of these questions makes it extremely hard to score well, but a diagram is almost always required in each question so you can use that as a general guide for answering the questions. There were also two sub-questions each worth 5 marks that are easier to score on, as it was abundantly clearer what to discuss in your response.

Concluding Remarks

Overall, the subject content is most definitely interesting and teaches you to think about current economic issues in a more analytical and in-depth manner. However, I would strongly advise against doing this subject in the summer, mainly due to how the lecturer examines the material and also the tricky assignment. What makes it worse is that, despite a very high fail rate over the summer, marks are not scaled, making it even harder to score well in this subject. So, unless you absolutely must do this subject over the summer, try to do it over Semester 1 or Semester 2; you'll find the content much more enjoyable and also perform a lot better.

ECON10003 Introductory Macroeconomics [SM2]

Exemption status	Not an exemption subject, but it is a prerequisite for ECON20001 *Intermediate Macroeconomics* (CB2 *Business Economics*).
Lecturer(s)	Dr Lawrence Uren
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial
Assessments	Tutorial attendance and participation 10% 2 × Online multiple-choice tests 10% 2 × Individual written assignments 20% 3-hour end-of-semester exam 60%
Textbook recommendation	Bernanke, Olekalns, Frank, Antonovics and Heffetz, MacGraw Hill, 2019, *Principles of Macroeconomics Fifth Edition* This textbook is ✗ not recommended. It was not used very often throughout the semester, it served more as an additional resource for extra readings if anything was not explained well during the lectures, however, questions could also be posed during tutorials to be clarified.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 2

Overall Comments

ECON10003 Introductory Macroeconomics was a good subject building upon the high school economics concepts, mainly introducing the Keynesian Model of the Macroeconomy and the Solow-Swan Model. The other concepts explored were covered in more depth, looking at how economies work on a global scale. This subject relies on a good understanding of *Introductory Microeconomics*, so knowing concepts from that topic will be enough to understand and follow the topics introduced in *Introductory Macroeconomics*.

Subject Content

1. **Introduction to GDP**: The first week of this topic introduces economics on a global scale, looking at GDP and how it is used to measure economic activity, as well as a comparison tool between economies.
2. **Inflation and Interest Rates, Savings and Investments**: This topic makes a start by introducing the Government goals for the economy and introduces price levels and responses made by the Reserve Bank of Australia, and the effects of these changes on the components of GDP.
3. **The labour market and short-term economic fluctuations**: The content in this week's lectures was quite simple, building upon the simple supply and demand market, with the labour market. This week also introduces the different types of unemployment and methods of measuring and categorising unemployment.
4. **A Keynesian Model of the Macroeconomy**: This topic is the first topic where new content is introduced on top of high school economics. There are many concepts covered including the background of the model, and how to effectively use the model to look at current economic outcomes. This model is heavily assessed throughout the semester, so learning the Keynesian Model is vital to doing well in this subject.
5. **Fiscal policy, Financial markets and Intermediation**: This topic introduces Government policy and intervention methods to sustain the economy as changes occur. This week also introduced concepts such as stabilisers, self-correcting the economy depending on the level of output.
6. **RBA and monetary policy, aggregate demand and supply**: This topic builds further on the interest rates set by the Reserve Bank of Australia, looking at how their decisions are made and the impact of changes in the interest

rates on the economy. This is also the week where aggregate demand and aggregate supply are consolidated, studying their components in depth.

7. **Solow-Swan Model**: The Solow-Swan Model is the second model explored in this topic and is another key component to the assessments in this subject. This model looks at the long term economic growth by considering capital accumulation, population growth, and technological advances.
8. **International trade and exchange rates**: This topic introduces international trade as well as how the exchange rate for each currency is determined, looking at the supply and demand for the currency. This topic also makes a start to looking at the trilemma, where only two of a fixed exchange rate, free capital movement, and independent monetary policy, can be employed.
9. **Balance of payments**: This is the last topic covered in this subject, which looks at the overall Government Spending and transactions on a global scale.

Lectures

The two 1-hour lectures were very easy to follow, and content was introduced gradually, which made the content very easy to understand and digest. The lectures were split into multiple sections, each with different sub-headings, which made catching up very easy. Lawrence's explanations were very thorough and he discussed each topic in depth, and all assessment questions could be answered through his explanations.

The lecture slides were used very well, especially in conjunction with Lawrence's additional annotations, which made the slides very easy to refer to when completing tutorial questions.

Tutorials

The tutorial participation made 10% of the total grade. Every tutorial had a pre-tutorial quiz to be completed, with the top nine scoring weeks counted to the 10% of the total grade. The tutorials were mainly a time to discuss tutorial questions with peers, having those questions discussed with the tutor, ad finding a solution. The questions discussed in each week's tutorials were thorough enough to be similar to the difficulty of the exam questions. These questions were made available just prior to the tutorial and were completed in class with other students.

Assignments

The two online multiple-choice tests were relatively easy and straightforward, where answers could easily be found in the lectures if they had been watched. These multiple-choice questions were quite simple, and did not require much in-depth thought into the concepts taught in the lectures.

The two individual written assignments were a bit more challenging, where topics such as the Keynesian Model and the Solow-Swan model were explored in more detail with questions regarding current events. These assignments, although not too difficult, took a substantial amount of time to complete.

End-of-semester Exam

The end of semester exam was a three-hour Canvas exam, where the knowledge of all topics covered were challenged. The questions posed at the end of semester exam reflected a mix of those presented in the mid-semester exam and individual written assignments. The exam had a significant portion dedicated to seeing the understanding of the two models covered in the lectures, so having a good understanding of both the Keynesian Model of the Macroeconomy and the Solow-Swan model is beneficial to the exam.

The exam this year was similar to those from the previous years, where questions were mostly updated to reflect the current events in the global scene. The questions were mostly theory-related and only had a couple of questions where calculations were required. Overall, the exam was relatively more difficult than the mid-semester tests, however, the questions were not too challenging if the lectures and tutorials had been studied.

ECON10004 Introductory Microeconomics [SM1] (1)

Exemption status	CB2 *Business Economics*, in conjunction with ECON20001 *Intermediate Macroeconomics*. An average mark of 73 across both subjects is required.
Lecturer(s)	Prof Tom Wilkening Mr Jonathon Thong
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial

Assessments

Pre-tutorial quizzes	5%
Online multiple-choice test	5%
Written assignment 1	15%
Written assignment 2	15%
3-hour end-of-semester exam (hurdle)	60%

Textbook recommendation

I would ✗ not recommend the provided texts. I did not require extra reading from these textbooks to solidify the content covered during lectures, as the lectures and tutorials were comprehensive.

- Gans, J., King, S., Byford, M., Mankiw, N. G. (2014). *Principles of Microeconomics: Australia and New Zealand Edition* (6th ed.). South Melbourne, AU: Cengage Learning Australia.
- Borland, J. (2016). *Microeconomics: Case Studies and Applications* (3rd ed.). South Melbourne, AU: Cengage Learning Australia.

Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Comments

ECON10004 provided us with a good fundamental for economics, with some overlap with high school economics. The topics presented were all very engaging and interesting to see as many of the topics covered can be found from real life firms.

Subject content

The first couple weeks' worth of content from ECON10004 closely follows that of high school economics, so a lot of content is similar, however is sometimes explained differently and offers a new perspective on some concepts.

1. **Perfectly Competitive Markets**
   - This topic introduced us to one type of market seen in the real world and introduces the basic supply and demand graph which will be used throughout the semester, with more graphs added later on.
2. **Government Intervention and Market Failure**
   - This topic went through the positive and negative externalities from company actions and methods that can be implemented by the Government to correct these externalities. This topic also introduced graphical interpretations of Government intervention and externalities.
3. **Theory of the Firm**
   - This lecture begins on talking about firms and the decisions they make in different circumstances and markets. This is also where cost, revenue, and profit come into play, and we are introduced to a more sophisticated

graph to interpret data and make decisions for the firm based on it.

4. **Price Discrimination**
    - This topic presented ways that firms can act with differing amounts of information about buyers available to them, showing us the decisions firms would make to maximise profits by determining what prices to set, given a buyer's willingness to purchase.
5. **Game Theory**
    - Game theory involves many concepts which help determine outcomes in an oligopolistic market. A notable example of a concept similar to this is the *prisoner's dilemma*, and game theory just shows us how firms would act in an oligopoly in these circumstances.

Lectures

The two 1-hour lectures are easily digested. It may be a little difficult to grasp jargon used by the lecturers without previous economic knowledge, however it isn't very hard to catch up and understand the content. Both lecturers provided good recordings and explanations, but despite being in Tom's lectures, I watched Jonathan's lectures when we moved to an online experience, as I felt his explanations were a little more in depth and he took a little more time to flesh out concepts beyond what was required as knowledge for the exam.

Tutorials

Tutorial attendance was not marked this semester, however, given a normal semester, there would have been marks allocated to both attendance and participation. Tutorials provided a good way to be exposed to economic questions related to the content taught, however some tutorials were not as interactive as expected. The tutors were generally all very knowledgeable and helped in questions where was required.

Tutorials also had a pre-quiz, which was marked this semester. This gave the tutors a good knowledge of where each student landed in terms of content so they could help each student the right amount to make the tutorials meaningful.

Assignments

There were two assignments for the semester, the first covering weeks 1-–6 and the second covering weeks 6—10. These assignments were structured so that the first couple of questions were relatively easy, and the questions towards the end of the assignment required some more deeper thinking into how to answer the question, or illustrate the answer on graphs. These assignments helped to show where we needed to be more familiar with the content, and having a couple of peers to discuss questions were a valuable asset to completing the assignment. The assignments required some graphs to be drawn which I would suggest PowerPoint to be used, to make the illustrations less painful to create. Noting down the questions, and their respective content, helped me a lot with preparing for the exam, as it allowed me to focus on the areas which I was not the most familiar on.

End-of-semester exam

The final exam was not much more difficult than previous years, and questions on the exam were expected to show and did not pose too much of a challenge. A couple of questions were worded awkwardly, leading to some confused after the exam concluded, however, did not impact any other question in the exam. The online exam did not require any diagrams which made the exam very relaxed in the time allocated to us.

ECON10004 Introductory Microeconomics [SM1] (2)

Exemption status	CB2 *Business Economics*, in conjunction with ECON20001 *Intermediate Macroeconomics*. An average mark of 73 across both subjects is required.
Lecturer(s)	Prof Tom Wilkening (Morning Stream) Mr Jonathon Thong (Afternoon Stream)
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial
Assessments	Completion of weekly preparation quizzes 5% Online Multiple-Choice Test (Week 4) 5% Written Assignment 1 (Week 6) 15% Written Assignment 2 (Week 10) 15% 3-hour final exam (Hurdle) 60%
Textbook recommendation	1. Gans, J., King, S., Byford, M., Mankiw, N. G. (2014). *Principles of Microeconomics: Australia and New Zealand Edition* (6th ed.). South Melbourne, AU: Cengage Learning Australia 2. Borland, J. (2016). *Microeconomics: Case Studies and Applications* (3rd ed.). South Melbourne, AU: Cengage Learning Australia. Generally, ✗ would not recommend. These textbooks are useful if you want another perspective on certain concepts and/or you are curious on other real-life applications not covered in lectures. Otherwise the lectures and tutorials are sufficiently comprehensive.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Subject content

1. **Introduction to Microeconomics:**
   The topic begins by introducing some key themes in microeconomics. Although most are just different ways to express relatively intuitive concepts, the notion of opportunity cost is critical to grasp as it always seems to creep into assignments and exams.
2. **Perfectly Competitive Markets:**
   This section introduces supply and demand curves in the most basic form, as well as simple analyses of supply and demand diagrams. Nuance and complexity are added to these diagrams in following topics.
3. **Government Intervention and Market Failure:**
   The following topic of market failure introduces the failings of perfectly competitive markets, adding some sparkle to the straightforward diagrams of the previous topic. Thinking of this topic in the context of real life helps to round out understandings of this topic. The case studies textbook might be helpful here.
4. **Theory of the Firm:**
   Here the subject shifts perspective, zooming in on individual firms and their pricing and production decisions. This contrasts quite starkly from the straight lines and uncluttered diagrams from the first half of the subject looking at markets, and it becomes really important to understand how the costs and revenue curves of firms work. Calculations can get a bit more involved from here on in.
5. **Price Discrimination:**
   Price discrimination presents some very interesting insights into the behavior of real-life companies and explores

the ways in which firms with market power can squeeze money out of consumers. This isn't too hard of a topic, but it's useful to carefully distinguish between each type of price discrimination to apply the right kinds of analysis.

6. **Game Theory:**
   This is banger of a topic and makes you feel like you've got a 200 IQ. It's surprisingly not too difficult and you can get by just knowing the algorithms involved. Tutorials for this topic is very helpful to get used to the notations and algorithms.

Lectures

Lecture provided all the content required for the subject in a suitable level of detail. The two streams available are both pretty good. I did end up changing from Wilkening's morning stream to Thong's afternoon stream due to the better clarity of Thong's lectures.

Both lecturers explain concepts quite well, but they do enjoy the use of some roundabout language every now and again, so it takes a while to get what they mean. Compared to other lecturers this semester, their delivery style tended to be a bit clunkier, so I had to play recordings slightly slower than for other subjects. The slides given were great, and my notes for this subject was just annotations on the slides.

Tutorials

This semester, tutorial attendance was not marked. Tutorials are a hit or miss. If you've got a tutorial where people talk, it might be worth rocking up. However, the tutorial sheets and questions were all doable solo so you wouldn't miss much if you did the questions and watched the tutorial recording.

The completion of tutorial preparation quizzes is marked, and I'd recommend trying hard on these quizzes as they're great feedback on your progress. The assessed multiple-choice test is of the same format and style of these quizzes, with a similar level of difficulty.

Assignments

Assignments in this subject were a decent challenge and required some clever logic to finish, but definitely within the coverage of lecture content. Assignment 1 covered up to Week 6, and Assignment 2 covered the content of Weeks 6 to 10. Definitely start on these early, as whipping up the diagrams involved might take some time. If there's no explicit template given, I'd do everything on Microsoft PowerPoint as you can construct diagrams pretty quickly and there's also space to type up your answers right next to it.

End-of-semester exam

The final exam was an appropriate difficulty, and comprehensive of all the topics covered in the subject. You can familiarize yourself with the style of question through the practice exams supplied, and that will most likely be enough practice. Since it was online, you don't need to draw diagrams and that makes the time frame very forgiving. You could probably watch half a lecture during the exam time and finish within the limits!

Question involving theory of the firm tended to be quite involved in terms of calculations. Spending an extra while revising this content would be wise. Otherwise, a quick revisit of tutorial sheets would be ample preparation for the final exam.

Concluding Remarks

From the final address Thong gave us, Introductory Microeconomics helps give you some new perspectives on how we can think about buying decisions. I personally think it is some great content, and applying the rationales and thought processes used in this subject in your own lives may prove to be valuable.

FNCE10002 Principles of Finance [SM1] (1)

Exemption status	CB1 *Business Finance*, in conjunction with ACCT10002 *Introductory Financial Accounting*. An average mark of 73 across both subjects is required.
Lecturer(s)	A/Prof Asjeet Lamba
Weekly contact hours	1 × 2-hour lecture 1 × 1-hour tutorial
Assessments	Individual Homework Assignment 14% 1-hour mid semester exam 23% 2-hour final exam (hurdle) 63%
Textbook recommendation	Graham, J. R., Smart, S.B., Adam, C. and Gunasingham, B. (2017). *Introduction to Corporate Finance: Asia-Pacific Edition*(2nd ed.). Cengage Learning Australia, Southbank.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Comments

Principles of Finance introduced us to many different aspects of finance, the practical use of finance fundamentals, and a 2-page formula sheet to use for the future. The first half of the semester was slightly dry, however, a good mathematical background should make it very easy to understand and apply. The second half of the semester was where the subject became very relatable and anyone with any slight interest in risk or methods to determine returns from investing in the stock market would be glad to see that this subject covers those topics in depth. The content taught in this topic is very easily applied to real life, and ideas from valuing stocks can be immediately used for stocks listed on the ASX. This gave a lot of us motivation to keep studying as our application of the knowledge resulted in a significant return on efforts taken to understand it.

Subject content

Principles of Finance covers a lot of fundamentals for finance and has some concepts that overlap slightly with ACCT10001.

1. **Introduction to financial mathematics**:
   - These lectures covered the calculations required for finding the present or future value of cashflows, which the first half of this subject is reliant on. This lecture also covered many of the types of cashflows and how to calculate their values at different points in time.
2. **Valuation of debt/equity securities**:
   - This topic introduced us to shares and bonds issued on the public stock exchange, such as Commonwealth bonds. This topic showed us how to calculate, the present and future values of bonds, and also taught us to compare differing pricings, cashflows, and profits to choose the right security to invest in.
3. **Portfolio Theory and Asset Pricing**:
   - This topic extended our knowledge on shares by introducing the probability distribution approach, the risk and return measure for securities as well as the effects of risk diversification. This topic also covered new topics such as the variance, covariance and correlation of returns; and included the steps to calculate the expected return and risk of a portfolio.
4. **Capital Budgeting**:
   - This topic lead us to a broader view of finance, showing us the capital budgeting process and learning how to use different methods to analyse projects with resource constraints.

5. **Capital Structure and Payout Policy**:
    - These lectures examined the relevance of financial leverage and its implications on business and financial risk. These lectures also brought up the Modigliani-Miller propositions, which played a large role in the final exam.
6. **Stock Options**:
    - This topic introduced us to options such as call, puts, and the effects of stock prices on these options.

Lectures

The 2-hour lecture held weekly were easily managed. Some lectures felt very content heavy and very long, however, Asjeet would often crack a joke to keep the lecture lively and attentive. The lectures consisted of Asjeet working through various formulae required for the assessments, as well as showing us real life examples of the topics we were covering. He usually introduced two relatable experiences that we could explore ourselves in our spare time. This made the lectures a lot more understandable, and the examples were examined very thoroughly by Asjeet.

Despite having to clarify some points that were touched on, the lectures he presented to us were easily understood and working through the tutorial questions helped to solidify the content and formulae presented through the lectures.

Tutorials

The weekly 1-hour tutorials were very helpful to solidify the previous week's material through the practical use of the content to solve problems. Worksheets for tutorials were to be completed before the tutorial itself, so that time spent during the tutorial was used wholly for marking and discussing solutions. This allowed us to save time during tutorials and only required extra time on questions when someone didn't understand the solution to a question. Going through the worksheet questions in our own time by ourselves—or occasionally with a friend—helped a lot more than going to tutorials without having attempted the questions. This is especially useful as the questions posed some challenges and implored us to work back through the lectures and slides to find the relevant methods needed to work through them.

Mid-semester test

The mid semester exam consisted of 15 multiple-choice questions. These were fairly easily completed in the 1-hour we were given, as long as tutorial questions were attempted previously.

End-of-semester exam

The final exam was a little bit of a surprise to many of us; it tested topics that many of us didn't really expect and required most of the time allocated to the sections. The exam consisted of 15 multiple choice questions, 1 question that consisted of true or false sub-questions that required explanations, and four other extended response questions which required in depth calculations. The final exam was organised very well and operated very smoothly. As this semester's exam was held online, Asjeet and his team gave us a 6.5-hour window to complete both sections of the exam, which made taking breaks a viable option between the sections.

FNCE10002 Principles of Finance [SM1] (2)

Exemption status	CB1 *Business Finance*, in conjunction with ACCT10002 *Introductory Financial Accounting*. An average mark of 73 across both subjects is required.
Lecturer(s)	A/Prof Asjeet Lamba
Weekly contact hours	1 × 2-hour lecture 1 × 1-hour tutorial
Assessments	Individual Homework Assignment 14% 1-hour Mid Semester Exam 23% 2-hour Final Exam 63%
Textbook recommendation	Graham, J. R., Smart, S.B., Adam, C. and Gunasingham, B. (2017). *Introduction to Corporate Finance: Asia-Pacific Edition*(2nd ed.). Cengage Learning Australia, Southbank. Textbook readings are ✓ recommended for pre-reading. These readings are not strictly necessary as the lectures are quite exhaustive, however the framework established in the reading is built on in the lectures. I would recommend purchasing this textbook.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Comments

This subject is one of the five core subjects in the *Bachelor of Commerce*. It demystifies the concept of finance which is often heard, but not learnt, in high school. Strong mathematical understanding is somewhat advantageous which is used in tandem with the conceptual understanding of the models and frameworks of markets and company structure.

Do not be afraid of the seemingly heavy use of mathematical proof in a commerce subject. This subject is challenging, with the lectures using difficult examples and the tutorials not offering any reprieve. However, this makes for all the more satisfying and educationally stimulating completion. Asjeet is very accommodating for those interested in extending their knowledge beyond the course material, even up to recommending finance movies and TV shows to completely immerse you in finance.

Subject content

Topics 1–3 introduce annuities and perpetuities and the applications of these in valuing equity and debt securities.

1. **Introduction to Financial Mathematics**
2. **Valuation of Debt Securities**
3. **Valuation of Equity Securities**
4. **Modern Portfolio Theory and Asset Pricing**
   - Introduction to portfolios containing equity and debt securities and the risk and return associated with them.
5. **Capital Budgeting**
   - Establish how companies select which projects to invest in internally.
6. **Capital Structure and Payout Policy**
   - This topic introduces the firm's decision between funding by debt or equity, and how to pay out to shareholders. This topic was the most difficult for me, as many confusing formulas (which were not used or mentioned again) were used to explain unfamiliar concepts.
7. **Introduction to options**

- This topic facilitates a brief introduction to derivative securities, the most interesting part of the course in my opinion.

Lectures

At first, there were four identical lecture streams all held by Asjeet. However, as it moved online, these four streams merged into one. His lectures were extremely detailed beyond the lecture slides. He used a tablet and stylus to record his lecture, however he was constantly touching the microphone, making a very uncomfortable learning experience, especially when wearing headphones.

He often goes on tangents, sometimes relevant but often not. Some may find this a welcome break to the dense content, but others may find it unnecessary and irrelevant. I did not find Asjeet to be a particularly succinct lecturer, however he did often completely illustrate his point, working thoroughly through each example in every permutation. Although the explanations were extensive, in my view, he was unclear and rambling, inciting confusion in almost every lecture.

Tutorials

At first tutorial participation was part of the assessment, however this was later removed. I strongly recommend going to your tutorials as this is where most of the confusion was cleared up. The tutorial questions are a mixture of textbook questions and past exam questions. My tutor's explanations of the concepts prior to tackling the questions were excellent and well worth attending the tutorial just for the summary.

The tutorial questions are released prior to the tutorial. Although you have time to go through up to half the questions in breakout rooms on Zoom, the tutor going through the questions without having a prior attempt is not very useful. I found when I did the tutorial questions prior to attending was the most effective use of my time, while maximising my understanding.

Additional Resources

There were many extra Zoom sessions held by both Asjeet and other tutors to answer any extra questions. I did not attend any of these sessions, however they were regular and well-advertised. There was an online tutor environment which was a useful tool that I used. Many students will post questions similar to the ones that you will have, so the online tutor can be used as a frequently-asked-questions section.

Assignments

There was an individual homework assignment of 15 multiple-choice questions. If you attend the tutorials and the lectures, this assignment should be a breeze. The submission is through the quiz function in the LMS. I found this assignment very achievable.

Mid-semester test

The mid semester exam also consisted of 15 multiple-choice questions. Asjeet provides surplus practice materials which all accurately represent the difficulty level and the type of questions. Again, this assessment was quite achievable. The cohort average was around 70

End-of-semester exam

The final exam was administered in two parts, a multiple-choice segment and an extended response part. Asjeet again provides ample preparation material and information about how the assessment will proceed, including a video tutorial walking through the systems used to enter the material (the LMS for the multiple-choice and Gradescope for the extended response). The exam is a hurdle requirement for the subject. The end of semester exam was the most challenging of the assessments and the most satisfying to complete. Upon completion, I felt academic accomplishment.

MAST10006 Calculus 2 [SM2]

Exemption status	Not an exemption subject, but it is a valid prerequisite for ACTL20001 *Introductory Financial Mathematics* (CM1 *Actuarial Mathematics I*) and the *Actuarial* major (see *Mathematics Requirement*).
Lecturer(s)	Dr Anthony Morphett Dr Alysson Costa Dr David Gepner Prof Arun Ram
Weekly contact hours	3 × 1-hour lectures 1 × 1-hour tutorial
Assessments	9 individual assignments (6 written, 3 webwork) total 20% 3-hour end-of-semester exam 80%
Textbook recommendation	✓ Make sure to get the green lecture book and exercise book on your first day of class from the Co-Op store.
Lecture capture	Full (both audio and video).
Year and semester reviewed	2019 Semester 2

Comments

Calculus 2 explored many topics similar to Specialist Mathematics in high school, with a few additional topics being introduced. Since it is more of an extension from Specialist, if you have performed relatively well in it, you would find Calculus 2 to be fairly easy to pick up. Otherwise, you would have to put in more effort and consistently revise on the subject so that you don't lag behind. I personally prefer this subject over *Linear Algebra* as it is more closely related to what we have been learning in high school.

Subject content

The topics covered are:

- Limits, Continuity, Sequences and Series
- Hyperbolic Functions
- Complex Numbers
- Integral Calculus
- First Order Ordinary Differential Equations
- Second-Order Ordinary Differential Equations
- Functions of Two Variables

I found *Limits, Continuity, Sequences and Series* and *Integral Calculus* more challenging than the rest. There were many rules and properties associated with sequences and series, and it can be difficult to determine which rule to choose when answering questions at times. For Integral Calculus, the difficult part to me was simplifying an integrated answer. However, by repeatedly solving similar types of questions from the green question booklet, you will definitely get accustomed to it and be able to solve integrations more easily.

This review was previously published in the 2019 end-of-year edition of the *Actuarial Students' Society Subject Review*.

Lectures

The lecture stream that I attended for the semester was taught by Prof. Arun. He has a habit of writing down the solutions on the whiteboard instead of the papers that were being recorded on the doc-cam. As a result, it was hard for the people sitting at the back to catch up and copy down the solutions during the lectures. Not writing the solution down on the papers also meant it was almost useless watching his lecture recordings. I ended up having to re-watch the recordings from Dr. Anthony even when I was still attending Prof. Arun's lectures. Though the lecturers conduct their lectures at slightly different speeds, I definitely feel that you would be able to do well and understand the subject content by watching Dr. Anthony's lecture recordings as he writes down the solutions on the tablet.

The lecture slides are given in the green lecture book which you are expected to buy at the beginning of the semester. If you prefer taking notes digitally on your tablets, you can also download the digital version of the lecture slides from the LMS.

Tutorials

Since no marks are awarded for tutorial participation in Calculus 2, it is totally fine even if you do not show up to your tutorials. However, it is highly recommended to attend them as you get to practise solving the questions with the assistance of your tutor and classmates. By exchanging your understanding with your classmates while approaching tutorial questions, you will be able to reinforce your knowledge. You can also easily go for a make-up tutorial if you missed your original one as well.

Tutorials commence on week 1 and start off with a revision on the topics you are expected to be familiar with from Specialist Mathematics or MAST10005 *Calculus 1*. Tutorials in the subsequent weeks then cover the contents taught in the previous week's lectures, so it is extremely important to catch up on each week's lectures before attending your tutorial.

Assignments

There are 9 weekly individual assignments in total, with 6 written and 3 online ones, with each contributing 2.22% to your final grade. They are released each Monday starting from week 3 and due on the following Monday. The questions on the assignments were sometimes more difficult than the ones shown in lectures and tutorials. I performed badly in the first two written assignments as I was not aware of how strict my tutor was with the notations used in the solutions. You will also get penalised heavily if you do not include the specific theorem or rules used when answering questions from the first topic.

A good tip is to always check your marked assignments against the solutions that would be posted on the LMS as sometimes your tutor might mark you wrongly due to you answering the question with a different approach. There was a time when I felt that my answer was correct, even though the method I used was slightly different from the solutions given. I emailed the subject coordinator and explained that I was just following my lecturer's method. The subject coordinator then awarded marks accordingly and updated my grade for that assignment.

End-of-semester exam

We were provided with four past exam papers and solutions to prepare for the 3-hour final exam. I recommend starting your revision and attempting the past exam papers early so that you can fully utilise the consultation hours during SWOTVAC and the exam period. A formula sheet is provided during the exam so try to familiarise yourself by using it while doing revision.

The end-of-semester exam is a 3-hour long paper that consists of topics that are covered throughout the entire semester. The exam for this semester was definitely easier than the paper from Semester 1 in 2019 but was of similar difficulty compared to other past exam papers. Questions that I found challenging during the exam were the ones related to convergence and divergence of the series, while questions from the latter topics were relatively easy and straightforward.

Concluding Remarks

Overall, it is definitely not impossible to score well for this subject! Just keep in mind to work consistently hard throughout the entire semester and you will most likely be fine. All the best!

MAST10007 Linear Algebra [SM1]

Exemption status	Not an exemption subject, but it is a valid prerequisite for ACTL20001 *Introductory Financial Mathematics* (CM1 *Actuarial Mathematics I*) and the *Actuarial* major (see *Mathematics Requirement*).
Lecturer(s)	Prof Paul Norbury Dr Binzhou Zia A/Prof Craig Hodgson
Weekly contact hours	3 × 1-hour lectures 1 × 1-hour tutorial 1 × 1-hour computer lab session
Assessments	9 × individual weekly assignments 10% 45-minute written computer laboratory test in the last week of semester 10% 3-hour end of semester exam 80%
Textbook recommendation	Anton, H., & Rorres, C. (2013). *Elementary Linear Algebra,* 11th edn, Wiley ✗ Not necessary Textbook was not mentioned throughout the semester. The lecture notes are sufficient material, so the textbook is not recommended. Ensure that you get the hard copy printed course guide in the first lecture as this contains all the set work and course materials.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Subject content

Each topic builds and is dependent on the topic prior, gradually building in complexity. Do not be fooled by the speed and complexity of Topics 1 and 2 as these are used to acclimatize from high school mathematics to university level courses.

1. **Linear Equations**:
   - Introduced the system of equations and writing them in matrix form. This topic introduced fundamental skills such as row reduction to solve systems of equations, which was used a great deal throughout the rest of the subject.
2. **Matrices and Determinants**:
   - Extended the manipulation of matrices to include basic matrix operations as well as finding determinants and how these apply to linear systems.
3. **Euclidean Vector Spaces**:
   - This topic will be the most familiar for those who did advanced mathematics in high school. This topic introduced vectors and quickly expanded beyond the scope of the high school to more practical applications of vectors, such as finding volumes and areas. It began to show how vectors are used to describe geometric features that are already familiar, such as lines.
4. **General Vector Spaces**:
   - In this topic, the quite abstract concept of vector spaces was reduced to a more useful notion of a subspace. Personally, I found that the first part of the topic is quite confusing, seeming quite arbitrary, however, the usefulness became apparent as the topic continued into describing different sets of vectors.
5. **Linear Transformations**:
   - The introduction of linear transformations, translating one vector space to another, ties into the previous material

in topic 4.

6. **Eigenvalues and Eigenvectors**:
   - The concepts of eigenvalues and eigenvectors were introduced in this topic. Most of the emphasis is on how to find these vectors and values, with some exploration at the end for applications of this seemingly stand-alone unit to broader linear algebra.
7. **Inner Product Spaces**:
   - This topic briefly introduced inner product spaces by extending the properties of the dot product to a wider implication. This is used for the only application that is explicitly examinable, fitting a line to a set of points.

Lectures

At the beginning of the semester, with face to face teaching, there were three lecture streams. The lectures were all well recorded, with no use of whiteboards, so they were quite accessible online. Consequently, the transition to fully online teaching was smooth. The three lecturers rotated weekly and I found that, although their methods of delivery differed (some using a tablet, others using a document camera), it was a seamless learning experience.

However, I did find that all three sometimes had unreadable handwriting, with little explanation to what was written. Also, although proof is not the emphasis of the course, the lecturers would sometimes talk through a proof, which I found very difficult to follow.

The lecture slides were released on the LMS, and the students were encouraged to attend and fill in the slides as the lecture progressed, as completed slides were not released.

Tutorials

Every week there was a 1-hour tutorial, followed by a 1-hour computer lab. Attendance at these is not mandatory. I attended in person for the first few weeks of semester, and found the group work to be adequate, although not that helpful. However, it is well worth attending the computer labs, as the tutors are well versed in MATLAB beyond the scope of the course, increasing efficiency in your learning.

As the university transitioned online, so did the tutorials. I did not attend these tutorials, however the tutorial sheets and solutions are released on the LMS. The solutions are very detailed and the tutorial questions very achievable — at a similar standard to the homework problem sheets.

Assignments

Throughout the semester, the assignments were released at midday on a Monday and due by midday the next Monday. Each assignments' difficulty was similar to that of the homework problem sheets. I recommend doing the homework problem sheets in addition to the tutorial sheets.

Of the nine assignments, three were online, facilitated through WebWorks. This system was intuitive and easy to navigate, three attempts for each question and revealing if your solution is correct. The written assignments were submitted through Gradescope and Canvas. However, the marking scheme was not well communicated nor were the comments very forthcoming.

End-of-semester exams

The MATLAB test was also facilitated through WebWorks. A practice test was also provided. I found the standard of the practice test to be similar to the final exam in difficulty and timing.

The end of semester exam was Zoom-supervised. The communication about this new type of examination was very detailed and precise. The setup had to meet a few requirements. The process was easy to navigate, with exam setup checks prior to the exam and the Gradescope system working as planned. Notes were able to be taken into the exam and the timing was generous to account for any technical difficulties, leaving a more than generous amount of time to complete the exam. The practice exams of past exams were of a similar difficulty to the actual exam.

To prepare for both these assessments, completing most of the practice material provided should be adequate.

Concluding Remarks

The organisation for Linear Algebra was very clear, with weekly emails to keep students up to date with what is expected of them. I found this subject to be constantly evolving with enough complexity to keep mathematically strong students interested while in small enough chunks that everyone can follow. Keeping up with the lectures and doing most, if not all, the homework problem sheets gives a very rounded view of linear algebra.

MAST10008 Accelerated Mathematics 1 (1)

Exemption status	Not an exemption subject, but it is a valid prerequisite for ACTL20001 *Introductory Financial Mathematics* (CM1 *Actuarial Mathematics I*) and the *Actuarial* major (see *Mathematics Requirement*).
Lecturer(s)	Dr Alexandru Ghitza
Weekly contact hours	4 × 1-hour lectures 1 × 1-hour tutorial 1 × 1-hour lab workshop (using MATLAB)
Assessments	3 × individual online assignments (completed through WebWorks) 6% 3 × individual written assignments 9% 1-hour online MATLAB test 5% 3-hour end-of-semester exam 80%
Textbook recommendation	Anton, H., & Rorres, C. (2010). *Elementary Linear Algebra* (10 ed.). John Wiley & Sons ✗ Do not recommend.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Subject content

1. **Linear Equations, Vectors, Matrices**:
   The fundamentals of the Linear Algebra content all rely on a good understanding and ability to work with vectors and matrices. Although linear equations are not as prevalent as the other two topics throughout the subject, it is also required through some interpretation methods and is useful for calculus.
   Vectors were worked through from a 2D and 3D perspective as well as linear equations, which was the only real new topic introduced in MAST10008. Other topics such as orthogonal projections and the dot product was knowledge carried over from high school.
2. **Proofs**:
   This topic personally was one of the more difficult topics to learn well as the method of thinking about a proof must be very specific to each circumstance-thinking about it in a different way would create a lot of chaos and lead to dead ends. The topic starts by exploring Number Theory and understanding sets, then moves onto common proof techniques, which was thoroughly explored in the first written assignment of the semester. The best way to become familiar with this topics is to expose yourself to numerous examples to see how common proofs are handled.
3. **Vector Spaces**:
   Vector spaces was the most content-heavy topic, taking a couple of weeks to work through all of the subject matter. Some may find it awkward working with vector spaces as it is not a concept we are very familiar with and takes a little getting used to.
4. **Linear Transformations**:
   This topic leads on from vector spaces and brought the subject into a world where it is a little less arbitrary, and can be imagined (in 2D or sometimes, even 3D). This topic worked through the idea of eigenvalues and eigenvectors, and also leads into transformation matrices and change of base matrices.
5. **Inner Product Spaces**:
   This topic is very similar to the existing idea of dot products, however there are more rules to abide by.

6. **Functions in 2 Variables**:
   This topic officially closed the linear algebra section of the subject and started the Calculus 2 content. Functions in 2 variables is really just an extension from high school knowledge, with a couple more steps. It clicks very quickly and is fairly easy to pick up.
7. **Complex Numbers**:
   This topic was covered very quickly, due to most of the content overlapping with the complex numbers topics taught in high school. The only extension was learning about differentiation and antidifferentiation where it is possible to 'piggyback' off complex number ideas to solve harsh real number problems.

Lectures

The four, 1-hour lectures, spread over Monday, Wednesday, Thursday and Friday, were pretty manageable, since they were all bite-sized and gave ample time to process what was taught during that lecture. The lectures consisted of Alex explaining a mathematical concept and then moving onto a number of examples of varying nature, which let us better understand the topics. Lectures are fully recorded and the working out made by Alex can also be seen which made re-watching lectures (or in our case, just watching) very useful.

Tutorials

Tutorials are run weekly in 1-hour sessions where worksheets are given out (also uploaded onto canvas) and the questions are worked through individually, in groups, or altogether, under the supervision of a knowledgeable tutor. The last question on each worksheet usually posed a challenge to most of us, making us work hard to finally manage a solution. Tutorial attendance and participation is not required for MAST10008, however is highly recommended to solidify the content learnt from the previous week's lectures.

There are also weekly 1-hour MATLAB sessions, where directly after your tutorial, you will head to a computer lab and work on learning MATLAB syntax and learning to interpret your results. MATLAB skills are examined in a 1-hour test towards the end of the semester, so the MATLAB sessions are strongly recommended to quickly learn the functions and how to effectively use commands to solve a problem.

Assignments

The assignments were spread out across the semester and alternated between WebWorks assignments and written assignments. There were 3 of each type this semester, with WebWorks assignments being more easily completed relative to the written assignments. The WebWorks assignments were a handful of questions that required straight forward calculations which tested on whether we were able to apply the content learnt in previous weeks and were quite easy to complete as long as you understood the lectures beforehand. The written assignments were a little more difficult as they required more lateral thinking rather than blindly applying the things we learnt in the lectures. The questions posed some difficulty and gave us the chance to realise where we needed to know the content at a deeper level.

End-of-semester exam

The final exam was much easier than the written assignments throughout the semester, acting as a test, instead of a learning opportunity. This gave a lot of us relief once we saw the questions and felt a sense of home as we recognised all of the problems and knew broadly how to work through them. The time management was very relaxed; having 3 hours to complete the exam was more than enough.

Resources

All of the resources required and recommended for this subject are available on Canvas. I did not open the recommended textbook at all, instead I relied on re-watching lectures and Google to hold my hand through questions I was not familiar with. Lectures, tutorial worksheets, MATLAB instructions, MATLAB software are all available through Canvas to download and to use.

Concluding Remarks

MAST10008 is a very content-heavy subject and is taught at a fairly fast pace compared to some other mathematics offered. However, the content covered logically moves from one area to the next and the examples and information Alex fed us is very useful for both in a mathematical sense and for real-life applications (sometimes).

MAST10008 Accelerated Mathematics 1 (2)

Exemption status	Not an exemption subject, but it is a valid prerequisite for ACTL20001 *Introductory Financial Mathematics* (CM1 *Actuarial Mathematics I*) and the *Actuarial* major (see *Mathematics Requirement*).
Lecturer(s)	Dr Alexandru Ghitza
Weekly contact hours	4 × 1-hour lectures 1 × 1-hour tutorial 1 × 1-hour practical MATLAB session
Assessments	3 × individual online (WebWorks) assignments 6% 3 × individual written assignments 9% 1-hour online MATLAB test 5% 3-hour end of semester exam 80%
Textbook recommendation	Anton, H., & Rorres, C. (2010). Elementary Linear Algebra (10 ed.). John Wiley & Sons ✗ Not necessary. I have rarely used this textbook as other, much better resources such as Khan Academy can be found online. For those of you who enjoy doing questions, you'll find a lot here, but the lectures are much more succinct and easily digested.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Subject content

The subject covers all content in MAST10007 and touches on a couple of topics from MAST10006.

1. **Linear Equations, Vectors and Matrices:**
   - The subject begins with the discussion of linear equations and matrices. It introduces processes such as row reduction and determinants to explore the behavior of systems of linear equations as represented by matrices. The behaviors and arithmetic of matrices is central to the entire subject and therefore should be studied thoroughly.
     The vector topic turned to then focus on lines and planes in 3 dimensions, finding angles, distances and projections between them. This topic is relatively detached from the rest and should be a basic extension of vectors in high school for most students. The concept of orthogonal projection is revisited later on.
2. **Proofs and Numbers:**
   - There is a brief detour into proofs and numbers, which explores basic set theory as well as common proof techniques. This was a huge part of the first written assignment, which nearly all the students found to be the most challenging assignment. A bit more time spent studying this topic to familiarize yourself with the types of proof would be hugely beneficial.
3. **Vector Spaces:**
   - Vector spaces is by far the bulkiest topic in AM1, covering a wide range of content beginning with the nature of vector spaces and subspaces, linear transformations and eigenvectors. This is the most heavily examined topic as well as being the most conceptually foreign and difficult. Despite this, it's quite good fun and definitely worth spending a bit more time to understand and visualize. Being able to prove that something is a subspace or linear transformation is commonly tested. The section on changing bases, and eigenvalues is also utilized heavily across the whole topic and is therefore an important aspect to grasp.

4. **Inner Product Spaces:**
    - Inner Product Spaces deals with the broader concept of inner products as an extension of the dot product in Topic 1 and using them to explore orthogonality and projection. A key algorithm to learn here is the Gram-Schmitt Process. This and being able to prove that an expression represents an inner product is central to the topic.
5. **Functions in 2 Variables:**
    - Here begins the Calculus 2 content in AM1, beginning with the behavior and computations involves with functions of 2 variables, as well as the calculus techniques that can be applied to them. Optimization questions cropped up very frequently with the topic.
6. **Complex Numbers:**
    - The complex numbers topic rehashes and extends some of the content from IB and VCE Specialist Mathematics (or equivalent A-level high school mathematics). The more difficult content involves applying complex numbers to perform differentiations and integration, which often involves some creativity to solve questions.
7. **Applications:**
    - This was a non-examined topic during the last week of teaching covering some applications of linear algebra explored in tutorials. Even though it's not examinable I'd recommend listening in as it is pretty interesting and adds a bit of color to the more theoretical content during the majority of AM1 lectures.

Lectures

Lectures explored each topic in a logical order, primarily focused on **linear algebra**. Alex covers content many times faster than high school, so it's often beneficial to sit down and ruminate over certain topics. Throughout the subject, I have found it useful to understand algebraic equations and intuitive visualizations of certain topics. For example, being able to visualize **linear transformations** and bases in 2 or 3 dimensions makes working with more complicated vector spaces easier.

The provided lecture slides were often filled with blanks so it's good to print them off and fill them in while following the lecture to get a feel for executing calculations and proofs yourself. Alex had adapted seamlessly to the new online format of lectures, with great audio and video quality.

Alex is an enjoyable lecturer, so much so that students in my cohort now want to defect to doing Pure Mathematics and enrolling in his third-year algebra subject. The content is presented in logical succession with most of the explanations of topics being on point.

Tutorials

Tutorials for AM1 consisted of a 1-hour tutorial followed immediately by a 1-hour practical MATLAB session.

Tutorials are 100% worth going to, and they make me wonder why high school math didn't implement a similar system. Attendance is not assessed, and question sheets can be found online, but the process of working with other smart math kids has helped me understand concepts from different perspectives and it has saved me from hours of pondering over questions by myself. Usually, the last question of each tutorial is a good challenge and a good sign of having grasped all the content.

Practical MATLAB sessions, on the other hand, can be done solo from the worksheets provided. For those of you that tend to demand more clarifications beyond the tutorial sheets, it might be worth attending labs in person to consult with your tutor.

Assignments

Assignments in this subject are encouraged to be collaborated upon (by the faculty) but are mostly doable solo. This semester we had a surprisingly difficult first written assignment, but other written and online assignments were of a difficulty similar to tutorial questions and lecture material.

Written assignments were due often 1 to 2 weeks after they were released. WebWorks assignments were advised to be completed soon after they were opened but had due dates months in the future. Overall these are a good opportunity to harvest some easier marks and to correct any problems with presenting answers and using the correct notation.

The MATLAB test consisted of material similar to the weekly practical sessions, with questions in the style of the Webwork assignments. The 60-minute timeframe given was relatively tight, so it's important to be able to use the right functions at the right time as well as interpreting results quickly.

End-of-semester exam

The final exam was a bit underwhelming in terms of difficulty. The questions were easily recognizable from lecture content and easy to prepare for. The 3 hours to write and 15 minutes to read was ample time to complete the exam. It is a bit mentally taxing to be sitting for so long though so grab some food and water beforehand.

Concluding Remarks

There is a lot of content packed into this subject and presents a decent challenge for students to understand the new concepts, particularly in the vector spaces topic. While not being overly practical at the moment, the linear algebra topics studied crop up in later subjects and therefore constitute foundational knowledge. Understanding them well the first time around should prove to make future subjects more enjoyable.

MAST10009 Accelerated Mathematics 2

Exemption status	Not an exemption subject, but it is a valid prerequisite for ACTL20001 *Introductory Financial Mathematics* (CM1 *Actuarial Mathematics I*) and the *Actuarial* major (see *Mathematics Requirement*).
Lecturer(s)	Prof. Barry Hughes
Weekly contact hours	4 × 1-hour lectures 1 × 1-hour tutorial
Assessments	2 × Individual assignments 10% Mid-semester test 10% 3-hour end-of-semester exam 80%
Textbook recommendation	*MAST10009 Accelerated Mathematics 2 Textbook*, Barry Hughes, 2020. This textbook contains all material from every lecture covered in the semester and provides many additional learning problems to be completed after each lecture. As the lectures and tutorials are based upon this textbook, this text is ✓ highly recommended.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 2

Overall Comments

MAST10009 Accelerated Mathematics 2, builds on MAST10008 *Accelerated Mathematics 1*, to cover prerequisites for 3 mathematics subjects, being MAST10005 *Linear Algebra*, MAST10006 *Calculus 2*, and MAST20006 *Real Analysis*.

MAST10009 Accelerated Mathematics 2 was a very difficult subject to keep up with given its amount of content, however, as you follow the lectures throughout the weeks, the content becomes very interesting and requires deep thinking to fully understand the concepts and methodology used. Keeping up to date was a challenge, however, given the structured manner Barry employs, was very easy to catch up.

Subject Content

1. **Sequences**: This topic builds on topics touched in high-school mathematics, looking at the idea of limits in a more formal method. The lectures cover concepts of convergence, divergence, asymptotic behaviour, and limits. These topics were covered in-depth with definitions required to be known for the assessments throughout the semester.
2. **Functions, limits and continuity**: This topic builds on the idea of limits and sequences, looking at various theorems for continuous functions. These concepts are assessed throughout the semester, so definitions and methodology should be closely followed from the lectures.
3. **Differential calculus**: This topic builds upon high-school calculus, looking at various rules while differentiating, and introducing new theorems such as L'Hopital's Rule, and the Mean Value Theorem. On top of these theorems, hyperbolic trigonometric functions are also covered, looking at identities and alternate methods of denoting these functions.
4. **Integral calculus**: This topic reviews integration and introduces new ideas such as Riemann sums, and Darboux integrals. These lectures are very content heavy and required additional time to process these ideas. The last couple of lectures in this topic covers techniques such as integration by parts and looks are different substitution integrals.
5. **Differential equations**: This topic looks at various types of differential equations and methods on how to approach and solve these equations. Some differential equations include population growth, motion and drag, and RC and LR electric circuits. These differential equations are assessed throughout the semester, so gaining a solid idea on

how to approach these questions are required.

6. **Improper integrals**: This topic revisits integrals, specifically the idea of an indefinite integral, looking at where a function may be undefined or where a terminal for the integral is infinity. This topic explores the improper Riemann integral as well as various tests in assessing improper Riemann integrability.
7. **Infinite series**: This topic is the last topic covered in this subject and looks at infinite series of both numbers and functions. This topic focuses more on conceptual understanding and works on looking at determining the convergence or divergence of the series using number tests. This topic also contains various definitions, which will need to be recalled during assessments throughout the semester.

Lectures

The content throughout the semester was covered rather quickly, delivered through four 1-hour lectures throughout the week. During each lecture, topics are introduced by Barry and he works through some textbook example questions to solidify the concepts. This method of delivery was very useful, as we could clearly see how answers were meant to be set out and solved. The lectures are required to do well in the assessments as they cover each topic in-depth, however, as each lecture was very structured and was kept in order by the textbook, finding a specific lecture on topics that were missed is quite easy.

Tutorials

The tutorials for MAST10009 Accelerated Mathematics 2 were not compulsory, however, were a good source of time to clarify any questions for the problems from the textbook. These tutorials were mostly a time for students to discuss these queries, however, these tutorials worked out to be quite unnecessary as any questions could be brought up during consultation hours to be clarified. The tutorials were mostly used to work through questions from the textbook from the week, however, is quite repetitive if you had no trouble working through and answering the questions on your own.

Assignments

There were two assignments spread over the semester, each worth 5% of your total grade. These assignments were relatively difficult compared to the examples covered in class and problems in the textbook, and as Barry requires a high level of rigour and precision, the assignment is difficult to wholly complete. Each assignment was due within two weeks, and given the difficulty of some questions, leaving the assignment to the last couple of days is not recommended.

The mid-semester test was a 45-minute supervised test which was worth 10% of the final grade. These questions in the test were easier compared to the questions posed in the assignments, however, the same degree of rigour and precision was expected to be displayed in the responses. The test also contained questions requiring specific definitions to be recalled, so having a good understanding of definitions of all concepts covered beforehand is recommended.

End-of-semester Exam

The end of semester exam was out of 124 marks this year and followed closely in the structure of the mid-semester test, however, contained a couple of questions that required longer responses regarding series and proofs. The exam was mostly similar to past MAST10009 exams, except there were fewer differential equation questions presented this year. Again, definitions and theorems were required to be recalled for the exam and made a significant portion of the exam.

Second-Year Subjects

Contents

ACTL20001 Introductory Financial Mathematics (1)

Exemption status	CM1 *Actuarial Mathematics I*, in conjunction with ACTL30003 *Contingencies*. Satisfactory performance across both subjects is required.
Lecturer(s)	Dr Ping Chen
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial
Assessments	2 × Individual ssignments 2 × 15% = 30% 3.5-hour end-of-semester exam (hurdle) 70%
Textbook recommendation	No textbook is explicitly mentioned. However, selected problems were given as additional questions from: Fitzherbert, R., & Pitt, D. (2013). *Compound Interest and its applications*. Melbourne, AU: University of Melbourne Custom Book Centre. It may be worth while to borrow a copy.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Subject content

1. **Data and Basics of Modelling:** Completely theoretical but an important part in the new CM1 syllabus. This section touches upon the different steps and procedures required to conduct data analysis and a basic introduction into big data.
2. **Principles of Actuarial Modelling:** Introduced the concept of models and why they are used, discussing their advantages and limitations in full.
3. **Cashflow Models:** Another short topic but one that finally starts to get into the core of the subject through the introduction of zero-coupon bonds and fixed-interest securities.
4. **Fundamental Concepts:** Expounds upon different interest rates that you have met in ACTL10001 (if taken) and builds upon them. It is essential for you to be able to calculate the present value and accumulation using different types of interest rates. It maybe worth your time to solidify your understanding on $i_h(t)$ in particular, as this is a new concept that isn't touched upon in ACTL10001.
5. **Valuing Cashflows:** Introduces the different types of annuities that you should have already touched upon in ACTL10001. The only new concept is annuities of payment subject to linear variations. It is pretty straight forward so remembering the formulae might be your only challenge. This semester however, since the exam was open book, we did not face this issue.
6. **Financial Analysis of Loan Contracts and Business Projects:** Again, identical to the loan repayment topic studied in ACTL10001. This chapter also discusses various project evaluation methods. Methods such as NPV and IRR may ring a bell from your FNCE10002 course.
7. **Characteristics of Major Asset Types:** This is a straightforward theoretical chapter which gives a brief introduction into major asset classes. Personally, I appreciated this chapter as actuarial students in general lack basic financial literacy and jargon understanding in comparison to the average finance major student.
8. **Applications in Asset Markets:** Introduces the concept of immunisation and assessing bond prices adjusted to inflation in depth. The latter half explains the different interest rates available in the bond market structure and discusses their respective yield curves.

Lectures

We only had one lecture stream, with two 1-hour lectures in a week. Ping released all the lecture slides at the beginning of the semester and would occasionally upload supplementary slides onto Canvas if needed. Besides that, Ping tends to use examples to convey concepts across which I found easy to understand. When attempting tutorial questions, I would use Ping's examples as a reference as they set the foundational understanding to solving more complex problems.

Tutorials

Tutorials were recorded from the start of the semester and uploaded onto lecture capture even before COVID-19 affected on campus learning. As you could assume this hindered tutorial participation from the onset. I personally attended about 7 out of 11 and would recommend attending all even though this subject does not encompass tutorial participation marks. I found my self watching tutorials at twice the speed if I missed it but grasped concepts more solidly if I attended in person via Zoom. What I valued most about the Zoom tutorials was the after-tutorial discussion of questions between the tutor and students.

Assignments

There are two individual assignments each worth 15%. The first assignment was a straight-forward application of the formulae covered in topics 1–5. I found the second assignment more interesting and was the highlight of this subject for me. It required us to act as consultants and provide financial advice to a client regarding a house mortgage. Whilst there was not any real math in the assignment, it required us to find facts from the internet and compile a document outlining our recommendations for various situations. I suggest breaking your time spent into sections when attempting this assignment. Firstly, give your self-time to research before starting to write your assignment. I found it much easier to comprehend what was asked and complete the assignment while I had the facts and numbers in front of me. Only then should you attempt to write your assignment. Once you are done, I would suggest you re-read and ensure that your proposal has a flow in suggestions. Also, do not forget to mention any assumptions you make.

End-of-semester exam

There was a 6-hour window to complete an upload the 3-and-a-half-hour exam. The paper was worth 70% and has a total of 70 marks, effectively meaning that each mark contributed to one percent of the final grade. The first section consisted of 10 multiple-choice questions worth 2 marks each. However, to get full marks we had to select all the correct answers, otherwise no marks would be awarded. I found this section harder than expected as we were never really exposed to such questions, and the only exposure we had was through the sample paper. Personally, I feel like they should have tested us with similar questions either through the assignments or tutorials. There were 10 remaining questions, each with subsections with a similar format to those in tutorials. I found the question paper much tougher than the tutorial questions and would have preferred more similar-styled questions to attempt.

Concluding Remarks

In terms of content understanding, Introductory Financial Mathematics is one that is fairly easy to understand. The questions that they test us on the other hand are much more difficult in nature. I would suggest solidifying your understanding of the concepts and particularly how the formulae are derived. While questions never explicitly ask to derive formulae, I think the best way to solve complex questions is to go back to the basics of how we derived the formulae in lectures. I say this because more often than not there isn't any direct application of the formula. Hence, your understanding is critical in helping you secure your exemption.

ACTL20001 Introductory Financial Mathematics (2)

Exemption status	CM1 *Actuarial Mathematics I*, in conjunction with ACTL30003 *Contingencies*. Satisfactory performance across both subjects is required.
Lecturer(s)	Dr Ping Chen
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial
Assessments	Individual assignment 1, due in Week 7 — 15% Individual assignment 2, due in Week 12 — 15% 3-hour 30-minute end-of-semester exam (hurdle) — 70%
Textbook recommendation	None
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Comments

ACTL20001 Introductory Financial Mathematics (IFM) covers the basics of modern financial mathematics. The subject starts off by giving us an overview of data analysis and actuarial modelling. After that, the fundamental concepts, such as: the different types of interest rates, present and discounted values, and the time value of money were introduced. This is then followed by valuing cashflows in different time units as well as solving equations of value, which is similar to the content taught in FNCE10002. Not only that, IFM also covers financial analysis of loan contracts and introduced a few major asset types such as property, ordinary shares and securities. Lastly, Ping introduced the theory of immunisation for interest rates, where a small change in interest rate would not cause an adverse effect if certain conditions are met.

Even though most of the content from the beginning were introduced in ACTL10001, I found some latter topics quite challenging—especially the content in week 11. I think it would be helpful to understand the intuition behind the formulas used and learn to alter and apply the formulas to different questions. Other than that, my favourite part of the subject was the second assignment, as answering the questions required us to think logically when setting the underlying assumptions. Overall, the subject was enjoyable, and Ping's concise slides made it easy to understand the concepts taught.

Subject content

- **Week 1**: Introduction to data analysis; Principles of actuarial modelling
- **Week 2**: Cashflow models; Simple and compound interest rate
- **Week 3**: Present value; Nominal interest rate
- **Week 4**: Varying interest rate; The force of interest
- **Week 5**: Valuing cashflow: the notations for the annuity-certain
- **Week 6**: Valuing cashflow: the techniques
- **Week 7**: Equations of value
- **Week 8**: Loan contract
- **Week 9**: Project evaluation; Allowing for inflation
- **Week 10**: Asset classes; Pricing of bond product
- **Week 11**: Understanding duration, convexity and immunisation of cashflows
- **Week 12**: The term structure of interest rate

Lectures

At the beginning of the semester, Ping uploaded the full lecture slides onto Canvas. Most of the time, especially when many formulas were introduced in a particular topic, she would draw a timeline or a mind-map on a separate piece of paper to illustrate the connections between the formulas. All of these supplementary notes were also uploaded onto Canvas right after the lectures, so there was no need to copy them down.

Although the lecture slides and supplementary notes were comprehensive, there were a few instances when Ping used certain uncommon abbreviations on the slides to save space. Therefore, it was helpful to jot down the additional explanations given by Ping on the lecture slides to aid in a deeper understanding of the topics.

Tutorials

As with all the other subjects, the tutorials were moved online this semester. The tutorial sheets were released progressively throughout the semester and solutions were uploaded every Friday. The teaching team also made the tutorial recordings available on the Lecture Capture. During the first couple of weeks when tutorials were still conducted on-campus, my tutor would typically review the concepts taught in the previous week's lectures before proceeding with the discussion of the tutorial questions.

Although I did not attend any of my Zoom tutorials and solely relied on the recordings each week, I do believe that it would be beneficial to attend them as you would get a chance to clarify your doubts with your tutor at the end of the class.

Assignments

There were two individual assignments, due in weeks 7 and 12 respectively. Both of the assignments contributed 15% to the final grade and we were given around two weeks to complete each of them.

The assignments were a combination of our own research and calculations used in the lectures. Assignment 1 simply required us to solve questions. Whereas for assignment 2, we had to answer questions from a customer based on different scenarios as a consultant. In assignment 2, we also had to list down any assumptions we made to justify the numbers we used in our calculations. When I received my feedback for the assignments, I was told by my tutor that it was important to give reasons for the underlying assumptions made as well as elaborate more for research-based questions.

End-of-semester exam

The final exam was three and a half hour long, which included reading the questions, writing, scanning and uploading our workings onto Canvas. The exam contributed 70% to our final grade and was separated into two parts, 10 multiple-choice questions and 10 short or long answer questions. Each multiple-choice question was worth 2 marks, totalling up to 20 marks for 10 questions. We were expected to choose all the correct options to obtain the full 2 marks, otherwise no marks would be awarded. Total marks attainable for the short or long answer questions were 50 marks out of the total of 70 marks for the final paper.

Since this was the first semester IFM was introduced, no past papers were available, and we were only provided with a practice exam with structures and formats very similar to the final exam. Even though no formula sheet was provided during the exam, we were allowed to refer to the subject materials since the exam was open book. This meant it was not necessary to memorise all the different formulas, theories or definitions. However, I would still recommend students familiarise themselves with the definitions or generally know where to look for them to save more time for the more challenging questions.

In my opinion, the most challenging questions from the final exam were related to increasing and decreasing annuities. These annuities would often be coupled with other concepts such as finding the loans' convexities, and such calculations required extended working out. Due to this, I wish I had more practice on solving questions for such annuities and attempted the extra exercises available on Canvas.

ACTL20003 Stochastic Techniques in Insurance (1)

Exemption status	Not an exemption subject, but it is a prerequisite for Actuarial Modelling I, Actuarial Modelling II and Actuarial Modelling III (CS2 *Risk Modelling and Survival Analysis*).
Lecturer(s)	Prof Shuanming Li
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial
Assessments	2 × group assignments 2×15% 2-hour end-of-semester exam 70%
Textbook recommendation	None
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 2

Subject Content

1. **Three types of random variables and their characteristics**:
   - The first few lectures are a summary and recap of important concepts from MAST20004 *Probability*. These include discrete and continuous random variables along with their *pdfs, cdfs, mgfs, pfgs* and more. A key topic in this section is mixed random variables and its application in reinsurance. You will be introduced to proportional reinsurance and excess of loss reinsurance. Unit 1 ends with key inequalities for probabilities and expectations most of which you should have already met in *Probability*.
2. **Characteristics of sum of i.i.d. random variables**:
   - This is a short unit in which you will be introduced to two methods to find the distribution of a given sum of i.i.d random variables. They are the *moment generating function* method and *direct convolution* method. Convolution is further expanded upon and then compared against recursive formula as a means of finding the distribution of sum of i.i.d. r.v.s. Finally, you will touch upon the *Law of Large Numbers* and the *Central Limit Theorem* with their application to actuarial science.
3. **Conditional Probabilities and Conditional Expectations**:
   - Expounds upon conditional probabilities, conditional expectations and conditional variances. At a glance it might seem as if these topics were already covered in *Probability*, which is partially true. They in fact advance on the contents learnt.
4. **Ordinary Differential Equations (ODE)**:
   - A very brief unit that explains how to solve first and second order differential equations while inferring how annuities can be interpreted by an ODE.
5. **Generating transform (function) and applications in solving difference equations**:
   - Introduces the concept of *generating transform* and how to use *generating transform* to solve difference equations (recursive formula).
6. **Laplace transform (LT) and applications**:
   - Another short unit in which the concept of Laplace transforms is presented. Thorough definition and its properties are given and proved. Lecturers illustrate how to employ Laplace transforms to solve for ODEs, integral equations and integral-differential equations.
7. **Poisson Process**:
   - This section introduces *Stochastic processes* and the *Poisson Process*. Three key different definitions of Pois-

son process are explained in detail. This is followed by a key application of the poisson process in actuarial science, the *discounted aggregate claims process*.

8. **Brownian Motions and Geometric Brownian Motions**:
   - The *Brownian motion stochastic process* is thoroughly explained and defined along with its properties. The second section of this unit introduces *Ito's integral*, outlining key differences from Riemann integral. The subject ends with *Ito's differentials* and *Ito's formula* to differentiate functions of Brownian motion.

Lectures

There were two one-hour lectures a week, and each lecture was broken up into to two sections of roughly 30 minutes in length. Shuanming made it a habit to release lectures onto lecture capture prior to the beginning of the week, which gave plenty of time to watch lectures and prep for tutorials. Shuanming goes into a lot of detail and depth in his lectures. Having pre-recorded lectures allow for pausing which in my opinion makes it easier to comprehend and keep up with note taking. Majority of the content of this subject is just a continuation of Statistics, so you might expect it necessary to look back at your notes from *Probability*. I feel that Shuanming's explanations, albeit dense, are comprehensive and explains fundamental concepts from *Probability* which is a great refresher.

Tutorials

Tutorials were recorded and uploaded onto lecture capture at the end of the week like other actuarial subjects in 2020. However, I strongly discourage missing your live tutorial and watching the recording, as attending your tutorial helps you in keeping up with the pace of the subject. Ideally, you should attempt all questions before attending your tutorial to grasp the most out of it. At the beginning of each tutorial the tutor would give a summary of key content learnt in lectures. The tutor present the solutions, allowing more time allocated for explanations.

Assignments

There are two group assignments each worth 15%. Although can opt to attempt the assignment individually, I personal would not recommend this as they were undoubtedly the hardest part of this subject. The assignments will take you days if not weeks to complete, so do not leave it to the last moment. Most questions require a lot of proofs, so understanding of concepts are essential. I suggest solidifying your understanding by thoroughly going through lectures before attempting assignments.

End-of-semester Exam

The paper is worth 70%, with the first eight questions consisted of multiple-choice questions while the remaining questions were of similar to tutorial questions. In Week 12, Shuanming gave an in-depth explanation of the structure of the paper which was extremely helpful. The final exam was not as tough as the content would suggest. Overall, I found ACTL20003 to be the toughest subject in terms of content from my two years in university. It is important that you don't fall back on lectures and you understand the content. Since many units are continuations of *Probability*, I believe that your success in STI is heavily dependent upon how well you perform in *Probability*. If you struggled with the prerequisite knowledge, I would strongly recommend revising its content and solidifying your understanding over the winter break.

ACTL20003 Stochastic Techniques in Insurance (2)

Exemption status	Not an exemption subject, but it is a prerequisite for Actuarial Modelling I, Actuarial Modelling II and Actuarial Modelling III (CS2 *Risk Modelling and Survival Analysis*).
Lecturer(s)	Prof Shuanming Li
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial
Assessments	Assignment 1 (Group) due in Week 6 15% Assignment 2 (Group) due in Week 12 15% 3-hour end-of-semester exam (Hurdle) 70%
Textbook recommendation	None
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 2

Overall Comments

ACTL20003 is a new subject introduced under the redesigned *Actuarial* course. It contains a mix of contents from a variety of preceding subjects, with the majority coming from the discontinued ACTL30005 Models for Insurance and Finance. Before the semester started, Shuanming distributed a file named *Mathematical Preliminarie*" which was a list of topics and mathematical ideas assumed to be prior knowledge. However, even if you see the file and go "uhh...?", like how I did, do not stress too much — you will survive.

The subject, as the name suggests, is heavily related to probability and often involves applying ideas and derivations from it. With that being said, knowledge from MAST20004 *Probability* is crucial, and hence a good idea would be to really get your head around the prerequisite concepts. Additionally, whilst this subject is not part of the accreditation exemption, much of the content is important and provides prerequisites for your third year actuarial studies. I guess that means don't slack off :) (cough).

Subject Content

1. **Random Variables and characteristics**: This was the longest unit covered in the subject, touching upon discrete, continuous, and mixed random variables and their applications in insurance/reinsurance. Some theoretical work also covered theorems related to expectations and inequalities of these variables. Concepts from *Probability* are often used in this unit. I would say strong persistence is required, as this unit takes up almost five weeks' worth of content.
2. **Convolution (Sum of i.i.d random variables), LLN and CLT**: I personally found this unit surprisingly easy to follow conceptually, and also mathematically, once you find the patterns in the calculations. You also solidify your understanding of the *Law of Large Numbers* and *Central Limit Theorem* once again within the context of actuarial studies.
3. **Conditional Probabilities and Conditional Expectations**: This covers conditionality with more in-depth discussions and results. Of course, they are studied in conjunction with applications to insurance settings. Shuanming likes to test students on this topic and related questions have appeared multiple times throughout the semester in assessments.
4. **Ordinary Differential Equations**: Yes, it is the *ODE* that you've learnt and practised in your previous mathematics subjects. This topic is nothing too much to worry about and provides good way to re-cap the ideas and skills learnt

if you're rusty.

5. **Generating transform functions and applications (solving difference equations)**: This unit was taught in conjunction with Unit 4 and was new to many students. Whilst the calculation of the questions may be relatively easy, the concept behind it is quite difficult to get your head around.
6. **Laplace Transforms and Applications**: The concepts from this unit would have been lightly touched upon in *Probability* but its properties and application were new to many of the students including me. I completely forgot what they were, but did not have too many issues catching up on the concepts. I would say this unit was relatively easy compared to the other units.
7. **Poisson Process**: In ACTL20004 *Topics in Actuarial Studies*, you will also learn about *Stochastic Processes*. The *Poisson Process* is a type of *Stochastic Process*, and the idea behind it is pretty simple to comprehend. You do need to be somewhat mathematically rigorous, however, to gain full marks for related questions.
8. **Brownian Motion and Geometric Brownian Motion**: The concept is similar to that of the previous unit. Understanding of *Normal/Log-Normal* distributions and their properties is key to tackling this unit.
9. **Ito's Integral and Ito's Formula**: The unit takes us back to the building blocks of what we know as 'integration' and builds what is called *Ito's Integral* or the *Stochastic Integral*. Whilst it may seem daunting at first sight, its concepts and applications (including differentials) are fairly straightforward in my opinion.

Lectures

Two lectures are uploaded on to LMS at the beginning of each week with the slides — Shuanming divided a single one-hour lecture into two parts, which I personally enjoyed as it was easier to navigate through different topics (especially considering how the slides were not separated lecture-by-lecture). Whilst the slides included a detailed explanation on the theory, the derivations and example application questions were left empty to be completed within the lecture.

Tutorials

Just like your other *Actuarial* subjects, ACTL20003 does not consider attendance and participation as part of your assessment criteria. Tutorial questions are provided on LMS, and whilst the answers for these are uploaded at the end of every week, the explanation/working-out provided in these answer sheets tend to be very brief and only go through the mathematical methods without much explanation; I would highly recommend you attend the tutorials to really understand what is going on. Luckily this year, all tutorial sessions were recorded and available on LMS. The tutors generally begun with a brief summary of the content studied (very handy as it helps you pin down the essential skills and knowledge) then went through the tutorial questions for the rest of the class.

Assignments

The two group assignments consisted of 7–8 different questions from the topics studied, with a few of them requiring excel usage (for simulations and such). Most of the questions tend to follow the example questions studied in the lectures, but with a twist or two. Things do get very confusing sometimes and that is why you need your teammates. Whilst you are able to do it on your own, I — and Shuanming — encourage you to definitely form a group (max. four) as the questions are quite time-consuming and fairly difficult. Gather as many brains as you can and attempt these as a team.

End-of-semester Exam

Being a newly introduced subject, no past papers were available. However, students were provided with two problem sheets and a practice exam (which was VERY similar to the final exam itself). Shuanming was also very helpful and advised the students on which questions to complete from the tutorial questions, assignments, and the problem sheets. This really helped as I had limited time to study for the exam. The exam was conducted online and open-book, to be completed within 3.5 hours including reading and scanning/uploading time.

ACTL20004 Topics in Actuarial Studies

Exemption status	CM2 *Financial Engineering and Loss Reserving*, in conjunction with ACTL30006 *Intermediate Financial Mathematics* and ACTL40004 *Advanced Financial Mathematics*. Satisfactory performance across all three subjects' end-of-semester exam is required.
Lecturer(s)	Dr Zhuo Jin
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial
Assessments	2 × Individual assignments 2×15% 3.5-hour end-of-semester exam 70%
Textbook recommendation	None
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 2

Overall Comments

The nature of this subject felt like a continuation from ACTL20001. Nonetheless, there was still a lot of new concepts introduced. It is not overly math-heavy but quite content-heavy; my recommendation is to try and understand the concepts quickly. Each unit stands on its own, so it is easy to forget what you learnt in prior topics, so it is important to keep revising.

Subject Content

1. **Measures of investment performance**: Introduces different concepts to measure the performance of investments. These include *money weighted rate of return*, *time weighted rate of return*, *linked internal rate of return*, *Hardy's approximation* and more.
2. **Valuing with defaults**: In ACTL20001 you learnt how to calculate present values of different cash flows. This chapter incorporates the *probability of default* to expound upon the concept of *expected present value*. This unit also discusses analytical moment derivations via recursion. You will also learn how to run simulations on Excel on calculating accumulations.
3. **Dependent interest rates**: You will be introduced to stochastic process namely *autoregressive processes* and *moving average processes*. Both these concepts are new so I would suggest spending time trying to understand key terminology like *autocovariance*, *stationarity* and *autocorrelation*.
4. **Chain Ladder Method**: This unit uses a deterministic approach to determine outstanding claims. Three methods are taught: the *chain ladder method*, *average cost per claim method* and *Bornhuetter-Ferguson* method. These methods are somewhat tedious to compute but are not complicated.
5. **Definitions of ruin**: The *Poisson process* is introduced, and the *adjustment coefficient* and *Lundberg's inequality* are utilised to find *ruin probability* in reinsurance. This was the most difficult unit in the subject for me, mainly because there is a lot of new jargon. So, it is important to understand key concepts such as *adjustment coefficient* and *Lundberg's inequality* to better your understanding of ruin probability.
6. **Basic derivative securities**: This chapter might feel like a continuation of the final chapter in ACTL20001. You will be introduced to futures and options, the concept of arbitrage and how the *principle of no arbitrage* and *law of one price* is used to derive the price of a forward contract. Again, the key to being successful in this section is understanding the financial jargon.

Lectures

We had two 1-hour lectures in a week, which were uploaded onto lecture capture a day or two before the date of the lecture. Each lecture was broken up into individual topics. This made it easy to follow what was being discussed. The lecture slides give sufficient information and additionally, to introduce and explain concepts, Zhuo made annotations. Concepts involving calculations are followed by examples which were thoroughly explained in the lecture slides.

Tutorials

Tutorials were recorded and uploaded onto lecture capture at the end of the week like other *Actuarial* subjects in 2020. I found Zhuo's explanations a bit hard to follow despite lectures being pre-recorded but attending tutorials and attempting the questions helped solidify my doubts. The only questions available for practice were tutorial questions so I would suggest understanding the solutions at it core. At the beginning of each tutorial, tutors would go through a small recap of the content discussed in the lectures. These summaries helped clarify most of the uncertainties I had.

Assignments

There are two individual assignments each worth 15% and to be completed on Excel. The assignments were straight forward and often a similar question would have been discussed in the lectures. You should aim for maximum results in these. You should have a basic understanding of how to use Excel before taking this subject, however key functions were explained in the lecture.

End-of-semester Exam

The paper is worth 70%, had a total of 70 marks, with two multiple-choice questions worth 5 marks each. Yes, that's 10% of your grade on two multiple-choice questions! The remaining questions had a similar style to your tutorial questions. This subject certainly requires you to understand the theory. So, it is essential for you to understand these concepts quickly to do well. We had to upload our scanned solutions as a PDF onto the Canvas quiz, where three hours was allocated with 30 minutes for scanning.

ECON20001 Intermediate Macroeconomics [SM2]

Exemption status	CB2 *Business Economics*, in conjunction with ECON10004 *Introductory Microeconomics*. An average mark of 73 across both subjects is required.
Lecturer(s)	Dr Yusuf Mercan Dr Faisal Sohail
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial
Assessments	2 × online multiple-choice test 2 × 5% = 10% 2 × assignments 2 × 15% = 30% 3-hour end-of-semester exam 60%
Additional Information	This subject is a core subject to double major in *Economics* with *Actuarial Studies*
Textbook recommendation	Olivier Blanchard (2017). *Macroeconomics*. Seventh Global edition. Pearson. ✗ Do not recommend.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 2

Overall Comments

Content-wise, similar to *Introductory Macroeconomics*, you spend time developing these seemingly strange models that attempt to explain economic activities. The main difference is that in this course, you begin to appreciate the effectiveness of these models a bit more and consider how particularly important variables were determined (endogenous vs exogenous). Overall, ensure you understand the purpose of each model in terms of how they fit together and how to derive them as this will ensure you truly comprehend their purpose and are ready for any complications posed by exams and assignments.

Subject Content

The course is separated into 2 main broader themes:

1. In the short-run, the macroeconomy experiences cyclical ups and downs (booms and recessions). To understand short-run fluctuations, the focus will be on changes in aggregate demand.
2. In the long-run, the underlying or trend rate of economic growth dominates. To understand long-run growth, the focus will be on changes in aggregate supply. The course commences with a focus on the short-run fluctuations which naturally lends itself to a discussion of short-run monetary and fiscal policy. The course then turns to issues of macroeconomic adjustment and explores how the economy responds to shocks and long-run economic growth. Finally, it ends with a brief introduction to open-economy macroeconomics and a discussion of macroeconomic policy.

Detailed breakdown:

- **Weeks 1–4**: IS/LM Model
  This is very similar to what is taught in the introductory subject. This highlights the relationship between output and inflation by way of action taken by the government (fiscal) and reserve bank (monetary). This is extensively covered in the first multiple choice test, so ensure to comprehend how the curves are derived and the effects of different policy mixes.
- **Week 4**: Unemployment Model
  Week 4 is where the difficulty begins to ramp up. This is heavily tested during the first assignment and requires a

deeper level of understanding than the previous topic. There are a lot of different formulas covered here, however the key notions are the Beveridge Curve and Job Creation Curve. As long as you know the origins of these, all the other formulas should come intuitively.

- **Weeks 5–7**: Dynamic AD/AS Model
  The Dynamic AD/AS model goes further than previous models of the macroeconomy in that it includes an array of variables beyond inflation and output. There is an extensive derivation process that originates from 5 key formulae. Whilst it is viable to simply memorise how these fit together to find the relevant aggregate supply and demand curves, this will not be adequate for assignment nor examination purposes when they you have to show that you understand the intuition. Accordingly, try and tell a story with each stage of the derivation to prove to yourself that you understand each part's role, and only memorise the final formulas if anything at all.
- **Weeks 8–10**: Solow-Swan and Growth Models
  An introduction of more models that map economic growth. Often these are the target of multiple choice questions as there are certain niched details in the models that really test how well you understand them (look out for trick questions, such as when they ask you to calculate the steady state of the AK Model!).
- **Weeks 11–12**: Open Economy IS/LM Model
  This is a return of the first topic, however with additional levels of complexity as it now caters for an open economy (and therefore the effect of exchange rates on net exports). Often the effects will be intuitive, however it is important to think about things logically and ensure your resultant net income shown by your model is consistent with that. If you have a good understanding of the foundation concepts and the influence of exchange rates, you will be fine.

Lectures

Yusuf lectured for the first 6 weeks and then Fasail took over. Each lecture involved the introduction of a new model or elaboration on ones covered previously. Both lecturers also complimented their teachings with empirical evidence and real-life examples, which was really helpful for framing the content as the models could at times seemed overly abstract and general. At the end of every section, there would also be a practice exam question that they went through. This is quite good for ensuring a link between the new content and approaching questions, however these are often the most basic of questions you will be asked. Beyond laying the foundations of your understanding, the practice question will not be useful for assignments or exams.

Tutorials

These ran in a typical way with economics subjects. We were given pre tutorial and in tutorial work to do. Types of questions included true/false, short answer and extended response. They were excellent for testing your understanding and making sure you are across the niches of the model. True/false prepared you well for the multiple-choice quizzes, whilst the extended responses were very helpful when it came to exams and assignments. The extended questions revolved around the introduced model, whilst introducing additional levels of complexity. I would highly recommend going to a few different tutors at the start of the year to see if there are particular ones that explain the content particularly well. You will quickly notice the level of engagement can differ greatly between individuals.

Quizzes

There were two quizzes in the form of multiple-choice questions. Administered over Canvas, these were particularly focused on the models introduced. Both gave you 30 minutes to do 15 questions, so time was not an issue most of the time. Whilst you need to understand the models, most of the questions can be done mentally, so do not stress about doing the fiddly calculations introduced in tutorials. The second quiz was a bit more theoretical, so ensure to have lecture slides easily accessible.

Assignments

The assignments were both capped at a maximum of 1500 words, however the bulk of the work came from Time Series Analysis in excel. Again, these were not hard to do well in. It is often a matter of finding the right formulas to apply, making

appropriate adjustments and then elaborating in explanations to demonstrate your understanding. It can be a little bit pedantic with the sheer number of graphs you have to include, so I would encourage you to get an early start on setting up the spreadsheet, however the actual write-up can be done quite quickly.

End-of-semester Exam

The typical structure of the exam is as follows:

- Section A: 12 Multiple-Choice Questions.
- Section B: 3 Short Answer Calculation and Explanation Questions. (Pick 2)
- Section C: 3 Short Answer Calculation and Explanation Questions. (Pick 2)

For the multiple-choice questions, these are very similar year to year, so ensure to get an early start on past papers. Additionally, I suggest using mid-semester quizzes as a resource to revise on this front.

Section B is generally similar to tutorial questions with process-driven calculations based on the standard models. In contrast, Section C is where you must display your understanding of the models as they will give you certain adjustments that you have not been exposed to before. This year, perhaps given the circumstances, the calibre of questions between Section B and C were very similar. However, in future years, I would say it is integral to do past paper from 2019 (& prior) to expose yourself to the tweaks that can trip up a lot of students. It is important to have a broad understanding across all the potential topics and there is no standard pattern of content covered across parts B and C. Accordingly, being selective and only learning certain topics you think will be tested (given you will only be picking 2 out of the 3 from each section) is a flawed idea.

MAST20004 Probability [SM1] (1)

Exemption status	CS1 *Actuarial Statistics I*, in conjunction with MAST20005 *Statistics* and ACTL30004 *Actuarial Statistics*. Satisfactory performance across all three subjects is required.
Lecturer(s)	Dr Sophie Hautphenne Dr Mark Fackrell
Weekly contact hours	3 × 1-hour lectures 1 × 1-hour tutorial 1 × 1-hour MATLAB session
Assessments	4 × Individual Assignments 4 × 5% = 20% 3-hour end-of-semester exam 80%
Textbook recommendation	Ghahramani, S. (2005). *Fundamentals of Probability, with Stochastic Processes (3rd ed.)*. Upper Saddle River, US: Pearson Education. ✗ Not necessary This textbook was never explicitly used, so I ✗ do not recommend purchasing it.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Subject content

1. **An introduction to probability and its axioms:**
   - This covered basic high-school probability and formalised the use of axioms heavily. Besides defining the axioms of probability, topics such as independence and the law of total probability were touched upon here. I would recommend having the 3 axioms of probability, formula for law of total probability and Baye's theorem formula on your cheat sheet.
2. **Probability distribution functions and Random Variables**
   - You've probably touched upon pdfs and cdfs of random variable (RV) in high school, particularly binomial, poisson and normal distributions. Regardless everything is taught from scratch with no prior knowledge assumed. Additionally, you also come across many more distributions and explore each of these in depth. This is probably where the intensity of the subject starts to kick in. It is important that you understand how to calculate the expectation and variance of these RVs but I haven't explicitly seen this on previous exams. You will, however, need to have the formula for variance and expected value for each RV on your cheat sheet.
3. **Bivariate Random Variables and Correlation**
   - Personally, this section was the most challenging topic in the subject. Particularly different types of transformations and the importance of understanding double integration and its three-dimensional representation. The easiest way in solving such questions is via drawing it and shading the regions. What I found difficult was determining the limits for the double integration using the shaded diagram. The best way to understand this is through doing past paper questions.
4. **Generating Functions, Limiting Distributions, Branching and Stochastic Processes**
   - The sums themselves that make up the generating functions aren't particularly difficult, understanding the concept however may take some time to wrap your head around, as these concepts were somewhat abstract in nature. Again, the best way to understand concepts would be to dive straight into the past paper problems. It would be wise to have the different formulae for this section on your cheat sheet.

Lectures

We started of with two lecture streams, one with Mark and the other with Sophie. I found Mark's explanations more in detail and easier to understand, but his notes were somewhat unpleasant to read. Sophie's notes on the other hand were much easier to read and follow. However, we didn't get much choice in deciding which stream to select after week 3. Once everything went online the two lecturers alternated between weeks and avoided the repeat lecture.

It's best to stay on top of lectures as always, but that doesn't mean it's impossible to binge them all during SWOTVAC.

Tutorials

I only attended the one online tutorial, as I found it awkward to socialise once we were broken into break-out rooms and it was mainly just silence or one person writing up the answers while others watched. If I were stuck on a concept or question, I would utilise the zoom consultations instead. Those were easy to use and often only few people would turn up.

With regards to the MATLAB component of the tutorial, some prior knowledge is assumed. Prior to your first tutorial a basic MATLAB manual is put up on the LMS. MATLAB was tested in the assignment and final paper so it would be beneficial to attend the lab session. I, however, noticed trends on all the MATLAB questions in past papers. Hence figuring that component of MATLAB was sufficient enough to answer questions of the final exam. Moreover, MATLAB questions were weighted much lower compared to the rest of the paper, so you should not worry if you struggle with this section.

Assignments

Assignments usually had four to five questions of which two would randomly be marked and the rest were given a mark for attempts. The assignment questions often are very similar to past paper questions, so I'd suggest having a flip through them when you get stuck. Assignments were submitted onto Gradescope so once marking was completed, we could see a clear breakdown of where we scored marks. Assignments were each worth 5% and I would recommend scoring at least 4+% in each to show good progress.

End-of-semester exam

As someone who did Calculus 2 instead of Accelerated Mathematics 2, I did find a considerable jump in terms of difficulty. Your best bet in acing the final exam is to do the past papers over and over again. Questions follow similar patterns and trends, and the key to acing this subject is identifying those questions and ensuring that you're able to solve any variation of them. When creating your cheat sheet, I'd recommend going through each slide during SWOTVAC and writing down all the formulae that's explicitly highlighted. Finally, I'd suggest not to fall back on this subject, it's probably (pun-intended) the hardest second year first semester subject.

MAST20004 Probability [SM1] (2)

Exemption status	CS1 *Actuarial Statistics I*, in conjunction with MAST20005 *Statistics* and ACTL30004 *Actuarial Statistics*. Satisfactory performance across all three subjects is required.
Lecturer(s)	Dr Sophie Hautphenne Dr Mark Fackrell
Weekly contact hours	3 × 1-hour lectures 1 × 1-hour tutorial 1 × 1-hour MATLAB session
Assessments	4 × Individual assignments 4 × 5% = 20% 3-hour end-of-semester exam 80%
Textbook recommendation	Ghahramani, S. (2005). *Fundamentals of Probability, with Stochastic Processes (3rd ed.)*. Upper Saddle River, US: Pearson Education. This textbook was never explicitly used, so I ✗ do not recommend purchasing it.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Comments

Probability is an extremely content-heavy and rapidly moving subject. I personally thrive in being able to clearly compartmentalise different segments of subjects, before forming my own links between topics to consolidate understanding. I struggled immensely with doing this for Probability however, which is perhaps a testament to the accumulative nature of the subject. By this, I mean that any knowledge taught along the way will be required in future topics, aside from maybe the content taught in Stochastic Processes (although this is extremely relevant third year actuarial subjects). Accordingly, you must be diligent and keep up to date with content in this subject, and you will struggle to grasp later topics if you are unfamiliar with the foundations. A good thing about this subject is that there is a huge amount of online resources that teach concepts in a similar way. I watched some videos from Harvard's Statistics 110 YouTube series when I was feeling particularly demotivated by the normal lectures, but there are always classics in Khan Academy and 3Blue1Brown which can offer some concise and complementary insights.

Subject content

1. **Introduction to Probability**:
   - The foundation of probability articulated through its core axioms and familiar concepts such as independence, conditional probability and mutual exclusion. Ensure you are familiar with partitioning the sample space and being able to form mutually exclusive sets for axiomatic proofs. There is a very consistent trend in exams, so definitely start these as soon as possible in your revision efforts.
2. **Probability Distribution Functions and Random Variables**:
   - This continues the expansion of high school probability. You will encounter some familiar concepts in Binomial, Poisson and Geometric distributions; however, these are all taught as new. The fun then begins as they start piling on a range of different distributions and their traits. Once you reach the Weibull and Erlang random variables, you may start questioning everything, however, do not stress too much about understanding each one intimately. Be sure to put all of this on your formula sheets and have a general understanding as to the traits of each, but there is no need to practice extensively with all 14 discrete and continuous distributions.
3. **Bivariate Random Variables**:
   - If you thought dealing with one random variable was fun, just wait until you start grappling with two. The

key to this topic is figuring out how to represent the relevant probability areas via a diagram. Once you can visualise this, choosing the relevant bounds can be done rather intuitively. Also introduced into concepts around correlations and covariance. Have a clear understanding of these relations and make sure to put the relevant formula in your exam notes.

4. **Generating Functions**:
   - Generating Functions are a culmination of prior teachings, with some extra strange happenings on top of it. It is not something many would have grappled with in past math subjects, so be sure to comprehend the rationales behind using these and the value they provide. Consider how they complement past topics on expected values and variance.
5. **Stochastic Processes**:
   - Quite a simple and digestible topic compared to those above. Highly recommend starting to work through past exams as a way to learn this topic, as they are quite consistent year on year and are more helpful than the convoluted lecture examples.

Lectures

Like all math subjects, you have three lectures a week and each of these are very full-on. Ensure you have a copy of the blank lecture slides so you can follow along with content and examples. Because content is covered quite rapidly, definitely utilise the pause and rewind features of Lecture Capture to ensure you are actively listening and not just mindlessly annotating slides. I personally started by watching Sophie's lectures, and then transitioned to Mark's as I felt he cut to the core a bit better and covered the necessary details. I soon switched back to Sophie as in Mark's brevity, he ended up skipping steps during his worked solutions or failing to flesh out the intuition very deeply. Sophie was extremely solid, and I would definitely recommend tuning into her lectures if given the choice. A big grievance throughout the cohort was the lack of examples for each topic, and if provided, they would be quite simplistic or bare. As a result, you must be diligent in keeping up with content provided in the problem booklets or other sources of examples (covered below). An insane amount of derivations and proofs are covered; however, I have never seen an exam question asking for these explicitly so do not feel obliged to memorise all of these or cram each of them onto your formula sheet. It is definitely a good idea to have a general understanding of the process, regardless.

Tutorials and MATLAB sessions

Two hours at a time, the first hour is allocated to working through content covered in lectures the previous week and then the second hour is devoted to a lab covering MATLAB content. Given the fact that there was no explicit MATLAB test, many people neglected the lab component and simply used the extra hour to workshop the questions a bit more. The benefit of tutorials in an online forum can vary hugely from person to person and depended on your group and tutor. I personally had a very open and helpful tutor, however his obligation to move from room to room evidently meant that my facetime with them could be limited at times. Accordingly, I would encourage you to attend multiple tutorials each week if you do not feel you grasped the content the first time around and require further explanations. If you do find yourself struggling to learn in this setting however, there are alternatives in consultations, or equally, try and reach out to your tutor individually. They are generally understanding of the circumstances and therefore willing to offer additional support if needed.

Ultimately, make sure you are at least doing the tutorial questions either in the tutorial or in your own time, as these offer some good questions to confirm your understanding. Definitely redo them during SWOTVAC as a further point of revision. You do not necessarily have to worry about the MATLAB labs, however, do ensure to use the marked solutions of these to assist you when doing Assignments, if needed. I didn't look at the content beyond the second week, so I am not in a position to assess their usefulness.

Assignments

You have four assignments worth 20 marks each, contributing to 20% of your total mark. Only 2 questions were marked in full, with the remaining questions given a single mark for making a valid effort. These are randomly selected however

so you must give place effort into every single question. These often go beyond what is covered in lectures and tutorials, so ensure you have a solid base understanding otherwise you may struggle when approaching the assignments. There will be MATLAB components in the later editions, and if you are struggling, try and refer to the market solutions of labs as a guide. A good thing about the online submission (aside from not having to crowd around submission boxes) was that tutors were able to clearly mark and annotate any errors you made. Be sure to note their comments and down and seek clarification if ever uncertain, as similar questions can arise in your exams. A particularly wholesome I received: "This has been a common error and do not be disheartened, much better now than the exam! Please revise Q4 of tutorial set 9." A simple red cross could never be this reassuring.

End-of-semester exam

You get access to an obscene number of past papers and you soon notice similar trends between these. The structure is very consistent, and you will begin to identify the main pillars that they test. Questions are pretty evenly distributed across the topics, aside from Stochastic Modelling given it is quite a small topic. Start these as soon as they are released, or if you do not feel ready, at least have a flick through so you are familiar with what to look out for. I cannot say this enough, there are many similarities between exams so note these down to make sure you can secure the easiest of marks. Q1a) is always a fun one—definitely look out for that. We were permitted to bring in four sides of notes (I think it is typically only two sides), and definitely make the most of these. Definitely put down the various distributions and their properties in relation to expected value and variance. Also, consider putting in traits of Generating Functions and Bivariate Random Variables. Finally, fill the remainder with potentially nasty questions you come across from past exams or tutorials, as there tends to be some repetition of the general concepts.

MAST20004 Probability [SM2]

Exemption status	CS1 *Actuarial Statistics I*, in conjunction with MAST20005 *Statistics* and ACTL30004 *Actuarial Statistics*. Satisfactory performance across all three subjects is required.
Lecturer(s)	Dr Xi Geng
Weekly contact hours	3 × 1-hour lectures 1 × 1-hour tutorial 1 × 1-hour computer lab session
Assessments	4 × individual written assignments 20% 3-hour end-of-semester exam 70%
Textbook recommendation	The lecture slides refer to the following textbook: • Saeed Ghahramani, *Fundamentals of probability with stochastic processes*, 3rd Edition,Pearson, 2005; and further reading may aid in developing key concepts: • Sheldon Ross, *A first course in probability*, 8th Edition, Pearson, 2010; However, neither of these texts were mentioned in lectures are were ✗ not essential
Lecture capture	Full (both audio and video), using a mixture of typing and tablet annotations
Year and semester reviewed	2020 Semester 2

Overall Comments

Overall, the material in Probability was definitely a step up from *Linear Algebra* and *Calculus 2*. Thinking probabilistically does not come naturally to many, so sometimes the material feels very unnatural (although it is all based on a set of very "natural" axioms).

The material in lectures did not appear very complex at face value, however, was sometimes applied in odd or unusual ways in assessments, so requires practice to see how the theorems can be applied in the question. All the topics were linked together, so it is necessary to try to understand most of the content especially in the first few weeks, as this is fundamental theory. Some of the theory is based on techniques learnt in prerequisite subjects. Especially *binomial theorems*, *series manipulation* and *Taylor series* are used often.

With three lectures a week, tutorial work and assignments, Probability is a theory-heavy subject. Xi does an excellent job in introducing the concepts with examples and most of the questions are based on a real life scenario. Probability is difficult at first, but will leave you with a greater appreciation of risk.

Subject Content

1. **Axioms of Probability**
   - This topic introduces the building blocks of probability such as outcome spaces and events, as well as how probabilities are assigned.
2. **Conditional Probability and Independence of events**
   - This section establishes what a probability is and introducing the notion of independence and conditional probabilities.
3. **Random Variables and distribution functions**
   - This topic introduces the definitions of *random variables*, *probability mass functions*, *probability density functions*, *expected value* and *variance* , establishing the basis of Topic 4.
4. **Special Probability distributions and their properties**

- This topic takes the bulk of the course, and is split between *continuous* and *discrete distributions*. First, *discrete distributions* including *Bernoulli, Binomial, Geometric, Negative Binomial, Hypergeometric, Poisson and Uniform* are introduced. This is then followed by the *continuous distributions* including *Uniform, Exponential, Gamma, Beta, Pareto, Normal, Weibull, Cauchy and Log-normal*. The section finishes by exploring the transformation of random variables.

5. **Bivariate random variables**
   - This topic introduces the notion of random variables that depend on two variables. It also investigates the correlation between two random variables and the transformation of bivariate random variables.
6. **Generating functions, transforms and limit theorems**
   - This section starts to bring in some of the calculus theory learnt in prerequisite courses, including the *Taylor series* and other sums to define different types of generating functions. It also looks at convergence of distributions in *the Law of Large numbers* and *the Central Limit Theorem*.
7. **Stochastic processes**
   - The course concludes by exploring the probability distributions dependent on another variable. Only *Markov chains* are examined in the subject, but the *Poisson process* is also investigated briefly in lectures.

Lectures

Lectures were held by Xi Geng, using a combination of iPad slide annotations, handwritten notes and typing on his computer. The 1-hour lectures were held live via Zoom, however they also were recorded and put on Canvas. The lectures were held at odd times: 12pm Monday, 9am Tuesday and 1pm Friday, so I attended some live and caught up on others by watching the recording. One advantage of attending live was the ability to ask questions immediately. I found I would be more likely to stay to the end when attending the live lectures, rather than pausing the recordings and getting distracted doing something else.

Xi's teaching was exemplary. He was clear and precise in his language, and worked very logically to a conclusion and flagging where his particular proof is going. He released slides available at the start of semester on Canvas. However he did not follow these slides exactly, switching between annotating the slides to typing up notes on his computer. Early on in the course, Xi recommended to solely watch the lecture and not attempt to take notes, and check the lecture by lecture notes after the lecture.

At first, I did not heed this advice, and found the lectures confusing and hard to follow; as I was trying to find the slide he was talking about. However, I later adopted his technique and found that to be far more successful. The lecture-by-lecture notes were extremely thorough, thus I recommend to just watch the lecture without taking notes or trying to annotate the slides, and then studying from the lecture by lecture notes, creating personal summaries to properly digest the content.

Tutorials

There was a 1-hour tutorial which was then followed by a 1-hour MATLAB session. I attended in Week 1, but found the technology to be sub-optimal, which made the experience more about troubleshooting than focusing on the probability theory. From Week 2 onwards I did the tutorial work independently as the results are released on Canvas every week. I used the tutorial work as a problem set which had worked solutions. This was good as exam preparation.

The MATLAB problems are also quite self-explanatory. Most sessions comprised of downloading an *m-file* and trying to understand how it worked, rather than any coding. There are also no MATLAB questions in the assignments or exam.

Assignments

There were four assignments due throughout the semester, roughly spaced three weeks apart. These assignments all had five questions, with three semi-randomly chosen to be marked. I found that most of the assignment was quite doable without needing to dive into StackExchange. However, there was always one quite difficult problem, but this never seemed to be marked. All the questions needed to be attempted though, with a two-point penalty for questions with no or a poor

attempt.

When the assignments were released, often all or most of the content had yet to be covered in the lectures. I strongly recommend catching up on all the lectures that have occurred before the due date of the exam before you submit it.

End-of-semester Exam

The end of semester exam was three hours long and had ten questions. The exam is about the same standard as the assignments but more difficult than the tutorial sets. The allowed materials included a handwritten double sided notes sheet, which was extremely useful when it came to remembering the various theorems (for example *the Law of Total Probability* and *the various probability density functions*)

I prepared by redoing all the tutorial sets as well as the 223-question problem book. This took longer than I thought it would. I gave myself 4-5 days to get through it but was really pressed to the buzzer to get it done. Some of the exam questions are very similar to the problem book so this is worth doing, but not crammed towards the end of SWOTVAC. I recommend doing the previous year's exam as it is a good representation of what to expect and then focus on weak areas.

Resources

There are lots of resources provided by Xi and his team. They include tutorial material, the problem book, extremely thorough lecture-by-lecture notes, video consultations and live consultations. These are well worth checking out and using throughout the semester. The video consultations are especially useful, with the instructor's explanation thorough and clear, usually covering the most difficult tutorial question. You are also able to request for a question to be covered. I did not know this tool existed until SWOTVAC, but I wish I had found it earlier.

StackExchange is also a good resource. It is good for specific technical questions to do with the theory and algebraic manipulation. I found it useful when attempting the assignment to research similar questions when I got stuck, as often people get stuck in the same place. The problem book comes with solutions, but they are not worked through. Through some googling, I realised that a lot of the questions are from other books and resources, which do have worked solutions. So if you are stuck in regards to the problem book, it's worth googling the question.

Also, Xi and the tutors all hold consultation sessions, so these should be utilised for any questions as well!

MAST20005 Statistics [SM2]

Exemption status	CS1 *Actuarial Statistics I*, in conjunction wtih MAST20004 *Probability* and ACTL30004 *Actuarial Statistics*. Satisfactory performance across all three subjects is required.
Lecturer(s)	Dr Damjan Vukcevic
Weekly contact hours	1 × online learning module 1 × 1-hour tutorial 1 × 1-hour laboratory session
Assessments	3 × Individual assignments 20% 45-minute R computer test 10% 3-hour end-of-semester exam 70%
Textbook recommendation	Supplementary textbook written by the University of Melbourne for MAST20005. Textbook is freely available for download off the Canvas website but was never explicitly referred to. Nonetheless, it can form useful background reading if the lecture slides are insufficient. No harm in downloading for future reference — ✗ not essential.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 2

Overall Comments

MAST20005 Statistics follows on from MAST20004 *Probability* to build basic statistical concepts required for future study in actuarial studies or econometrics. The course was broken down into 11 modules, with each module being further split into individual topics.

Overall, I found MAST20005 Statistics to be more conceptually challenging compared to MAST20004 *Probability*. At first, it was difficult to fully grasp the meaning of various statistical concepts and it is vital that you consult other sources to build a strong understanding of these concepts. However, once these core concepts are mastered, one should find the assessment tasks to be very manageable, something that could not be said for MAST20004 *Probability*.

Subject Content

1. **Introduction and Review of Probability**
   - The first module was a very basic introduction to statistics and mainly a review of probability concepts from MAST20004 *Probability*. All probability concepts covered in this module were assumed knowledge, and it is vital that these concepts are well understood as many statistical ideas rely on them.
2. **Point Estimation**
   - This was the first time that students were exposed to formal statistical concepts. It formalises the idea of estimators. Ensure that you have a strong grasp of the difference between a sampling distribution and population distribution, and how estimators are ultimately random variables. In particular, *Maximum Likelihood Estimators* are used very often throughout the subject in various settings, so a good understanding of this concept is key.
3. **Interval Estimation (2 modules)**
   - This module followed closely from the previous module on *Point Estimation* and seeks to provide more information about a population through *confidence* and *prediction intervals*. Deriving a *confidence* or *prediction intervals* is very formulaic but it is crucial that one understands the subtle differences between the many formulas and is also aware of the situations where each formula is appropriate.
4. **Regression**

- *Regression* was found generally to be one of the more conceptually difficult modules in this course. While this is an idea that many of us have encountered before even in high school, this is the first time that you will learn the underlying concepts behind this widely used statistical method. Ensure that you completely understand the derivations behind the model and the assumptions that are made.

5. **Hypothesis Testing**
   - Overall, this was probably one of the easiest topics in terms of conceptual difficulty. It utilises the same ideas from *Interval Estimation* but in a slightly different context. Again, ensure that you understand when and why certain tests are one-sided or two-sided as this will appear in later modules.
6. **Distribution-free Methods**
   - This module introduced statistical concepts in situations where one does not want to make an assumption about the distribution of the population. Conceptually, this is one of the more challenging modules since it is unnatural to think about ideas such as the sample median in the ways that are being presented. Understanding the process behind the various tests is just as important as being able to carry out the test itself.
7. **Analysis of Variance (*ANOVA*)**
   - *ANOVA* is by far the trickiest module in the subject, both in terms of algebraic and conceptual difficulty. It is definitely worthwhile using various software demonstrations to visualise these concepts and to try some of the derivations yourself. Personally, I found that the two-way and interaction *ANOVA* tests were the most difficult, but manageable if you were able to connect the *ANOVA* tables back to the underlying ideas.
8. **Order Statistics, Quantiles and Resampling**
   - This module introduced sampling distributions for estimators such as the *sample median*, *maximum* and *minimum*. Overall, a fairly manageable topic with a few tricky concepts around approximate *confidence intervals*. For the most part, this topic was very computational and algebraic.
9. **Bayesian Estimation**
   - While *Bayesian Estimation* is inherently different from classical estimation, it is quite easy to understand and apply in the situations that you will be presented with. Understanding the process of using a *prior distribution* in conjunction with collected data to derive a *posterior distribution* is the most important idea.
10. **Asymptotics and Optimality**
    - The last topic was of intermediate difficult. Although some concepts were quite tricky to grasp, they were rarely assessed. The main ideas that needed to be well understood related to theory about the *MLE* and the *Cramer-Rao lower bound*, which was tested often.

Lectures

As mentioned previously, all lectures were held online this year. In addition to being a very good lecturer, Damjan would organise the recordings of each module to cover separate or related concepts. This was very beneficial when it came to revision for exams or for the lab test. Overall, the lectures were informative and Damjan did a great job of explaining the intuition behind each statistical method and concept.

The lecture notes were sufficient to perform strongly in this subject. They covered content to good detail but still left room for you to add your own annotations and notes to build your understanding.

Tutorials and Lab Sessions

As all classes were held online this year, the tutorial sessions took a slightly different structure where everyone would work in small groups collaborating on an online whiteboard. The tutor would roam around breakout rooms responding to help requests where necessary. With online classes as a whole, I found it quite difficult to work on the problems using an online whiteboard as it was not the same as working in person. As a result, I ended up using the tutorial problems during SWOTVAC as an extra source of revision material. The lab sessions were somewhat useful, but again, I found it more beneficial to work on these in my own time.

Assignments

The assignments in this subject were quite manageable overall but can take some time to do as they were a combination of standard calculation questions and R-based questions. More often than not, it was the R questions that took the longest to complete and format.

Lab Test

The lab test is usually held in the last week of the semester The questions are actually not that difficult to solve using R and are definitely easier than the lab questions. Performing well is a matter of knowing how to use R to shortcut as much working as possible and solve problems efficiently.

End-of-semester Exam

The final exam was held in strict Zoom-supervised conditions. Overall, I felt that the exam in 2020 was around the same difficulty as previous years (perhaps easier than 2019). The exam structures are quite similar from year to year so it is very important to become familiar with the type of questions that may appear. One question that many of us found particularly tricky this year (which was something that had not previously been tested before) was deriving estimators for a slightly different regression model. This question was not particularly difficult if you understood all the derivations in *Hypothesis Testing*, but it goes to show the importance of understanding concepts rather than being able to use the formulas.

MAST20026 Real Analysis [SM1]

Exemption status	Not an exemption subject, but it is a valid prerequisite for ACTL20001 *Introductory Financial Mathematics* (CM1 *Actuarial Mathematics I*) and the *Actuarial* major (see *Mathematics Requirement*).
Lecturer(s)	Dr Jesse Gell-Redman
Weekly contact hours	3 × 1-hour lectures 2 × 1-hour tutorials
Assessments	5 Individual assignments 20% 3-hour end-of-semester examination 80%
Textbook recommendation	None, a problem booklet of questions is provided. This is not necessary to print out but definitely ✓ recommend working through
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Comments

Real Analysis is subject I personally really enjoyed as it allowed me to develop an understanding of various proofing techniques and forge a mathematical intuition that will be extremely important in future higher-level math subjects. At times, it can seem unclear what the motivations are behind certain concepts or sections, however, satisfaction does come from eventually seeing links between topics and connecting it to past knowledge from your level 1 subjects like AM1/Calc2/LinAlg. While I would not say it is essential to complete all the questions in the problem booklet, if you are struggling to grasp certain topics or not absorbing content covered in tutorials, this is a good place to go. It is important to stick by the content and try and just expose yourself to as many variations of problems as possible. This will enable you to identify links across the subject and help your understanding come exams.

Subject content

1. Logic, sets, number and proofs
2. Sequences
3. Limits of functions and continuity
4. Differentiability
5. Integration
6. Series
7. Fourier Series

Lectures

Jesse was an engaging and thoughtful lecturer. Admittedly, he would sometimes lose his train of thought, but overall, he explained concepts clearly and concisely, and provided sufficient examples in tandem with some nice quips. He quickly adapted to the online forum by breaking lectures up into short topic videos instead of committing to the three 1-hour long lectures per week. Initially logging onto lecture capture after one week of inaction and seeing twelve unwatched videos was slightly alarming, however, I soon came to appreciate this style as it allowed me to compartmentalise each of the topics better and isolate worked examples and theory lessons. Additionally, because a lot of these were 10–15 minutes videos, it was less of a drag sitting through and would often take up less time than three 1-hour lectures. Additionally, Jesse soon released a brief description of every video he uploaded in their associated weeks, so it was easy to keep track of your progress and see what you had to prepare.

Tutorials

The tutorial experience was quite poor due to the online format. Zoom was not an effective platform and you would, more often than not, get through a maximum of one and a half questions in the time. It was really hit and miss with the tutors, and sometimes I found myself going to three of the same tutorials in an attempt to try and figure out what was going on.

Regardless of if you complete the subject online or in person, the questions covered in tutorial are quite good preparation for the exam and allow you to test your understanding. There is a good mix of computational and more "intuition training" type questions, so I would encourage you to work through these in your own time. There are some extra challenges questions included at the end, however these are not necessary to complete. It could be helpful to read through the solutions if you are interested, however. Seeing how proofs are structured and thinking processes for different types of questions is always helpful.

Assignments

The assignments were always pretty accessible provided you understood the intuition of what was being covered in lectures. There would always be a few little steps at the beginning that would take time to get your head around, however, grasping these allowed you to complete the rest of the question. You have to be extremely careful about any steps you take and ensure you justify things appropriately. This justification could be as small as simply referencing an axiom covered in lectures or requiring some decent thought in the form of a parenthetical proof. The most important thing is to ensure you do not give tutors an excuse to take marks off, and this includes being extra thorough with justifying each step. If you are ever unsure, do not hesitate to email Jesse asking for some clarification. He is extremely open and will often collate the most commonly asked questions and post them and his responses on Canvas.

You have two weeks to complete each assignment, and they are always be marked out 20. These serve as a very useful platform for practicing the layout of your proofs, so ensure you pay attention to the formatting and seek feedback where necessary.

End-of-semester exam

This year's final exam was probably one of the *fairest* exams that I have ever done in any subject. It had an assortment of questions based on past exams, extra proofs from lectures, and tutorials, as well as some challenging ones where you still had to demonstrate your ability and understanding. Accordingly, it is incredibly important that you have a read through all of the resources provided to you in the lead up to the exam as you will soon start to see similar themes and techniques.

Jesse uploaded 6 practice exams for us and each of them was sufficiently different to give you a broad insight into the nature of questions. There is typically a question from each of the main topics, so being unfamiliar with one concept won't punish you too badly, but it may also inhibit you from achieving an extremely high score. This year we were allowed to bring in two formula sheets which did take the burden off memorising certain abstract concepts, such as **Deleted Neighbourhoods** and **Compact Sets**. Many people I spoke to however stated that they only used the formula sheets to ensure they had copied down certain definitions correctly (for example, the epsilon-delta definition for continuity), as a lot of the questions are tests of understanding rather than the ability simply regurgitating processes and formulas. Overarchingly, the more proofs you are exposed to through the subjects, the better you will perform as some questions do require a bit of creativity in their approach as opposed to brute-forcing a solution.

Concluding Remarks

Compared to other math subjects such as Probability, I felt I was able to appreciate Real Analysis more through the semester as I started to see how each topic began to fit in together. The whole notion of proof writing is heavily emphasised given the nature of the subject, so the more you do, the more you start to see recurring themes. Jesse is an exceptional lecturer and genuinely cares about the course, shown by his adaptability and willingness to assist. He made himself available for an array of consultation sessions, and whilst I only took these up a few times in SWOTVAC, they were a great comfort to have in hand. Jesse is also great at responding to emails to make sure to utilise that with any questions!

MGMT20001 Organisational Behaviour [SUM]

Exemption status	None
Lecturer(s)	Dr Kim Goodwin
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial
Assessments	Active tutorial participation 10% Individual assignment 10% Group assignment 30% 2-hour end-of-semester exam 50%
Textbook recommendation	McShane et al. *Organisational Behaviour 6th Edition*.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Summer Term

Comments

For most actuarial students this will be their first experience with a writing-heavy subject. As your first and most likely only management subject, you may find it different. This is particularly due to its heavy reading and writing nature. One perk, however, is the fact that this is a core subject and resources are abundantly available. Doing this subject during the summer term means that the time period given to you for every assignment is halved, so it is important that you manage your time effectively.

Subject content

Micro topics:

1. Introduction
2. Perceptions and Attributions- This section further
3. Teams and Leadership
4. Values, Attitudes and Behaviour
5. Motivation in Organisations
6. Conflict

Macro topics:

1. Change – Model (why, who, what, which, how), 6 silent killers
2. Communication – Functional model, meaning centric model, metaphors
3. Culture – Integrationist, Differentiationist, Critical
4. Power – First, second, third degrees
5. Strategy and Structure
6. Ethics

Lectures

Kim's lectures were made relatable and interesting by having a range of pop culture and media references. Completing this over the, Summer term meant that content was taught twice as fast, resulting in us having two lectures and two tutorials in a week. The lecture slides seemed fairly light in content which is why I recommend going over the textbook for the topics that were discussed in the lecture. In all honesty, sitting through the lecture seemed like a waste of time so after Week

1, I watched everything online at double the speed. The content was broken into two sections, where Micro topics were covered in the first three weeks and Macro topics in the latter three.

Tutorials

Prior to each tutorial, we had to complete an online preparation quiz based on the prior lectures content. Tutorials were held on Tuesday and Thursday, whereas lectures were held on Wednesday and Friday. Wednesday's lecture content would be discussed on the Thursday tutorial and Friday's content on Tuesday. This meant that we had to cram Thursday's pre-tutorial/online quiz every week, for six weeks.

At the start of each tutorial, the tutor would spend time going through the content, making sure everyone was familiar with the concepts discussed at the lecture before moving onto the actual tutorial content. The later half of the tutorial is where we would discuss in groups certain questions that were very similar in nature to that of what was tested in the exam. Discussions would take place in groups of 4 to 5 students.

Make it a habit not to miss your tutorials. I say this because 30% of your final grade is calculated through your group assignment score. On top of this, 10% of your grade comes from tutorial participation. In my opinion, this mark is probably subjective from tutor to tutor and the class itself; it depends upon how "participative" the class is, and your performance may be judged relative to this.

Assignments

The first assignment was due in the second week. (Note that this is following a summer semester timeline.) It was a written case study analysis; this may come as a shock for some students who have done such assignments during their first year. Use the first individual assignment as a learning opportunity. At the end of the day, it is worth 10%, so utilise this as a chance to figure out what is expected for this subject. Draw upon the feedback and use this to build the foundation for your group assignment. Groups were decided by the teaching team and have usually been based on your personality. Tutors are generally more flexible, so I was able to pair up with two others I had already known. As mentioned earlier, because of the short time frame, it is crucial that you and your team cooperate to maximise the productivity of your meetings. Its typically convenient to have meetings either just before or right after your tutorial time.

End-of-semester exam

The final exam is 2 hours long, being worth 50% of your grade. My paper consisted of 4 questions with each being equally weighted. The first question was from a micro topic and the remaining three were from macro topics. I wouldn't spend too long studying the micro topics because of this topic breakdown scheme. The question on the micro topic was catered in such a way that we had to use our group assignment as the case study for the answer. Questions 2, 3 and 4 were on one case study that we had discussed during the tutorial. Try to plan your answers before you start writing and make sure to equally distribute your time for each question.

MGMT20001 Organisational Behaviour [SM1]

Exemption status	None
Lecturer(s)	Prof Bill Harley A/Prof Susan Ainsworth
Weekly contact hours	1 × 1-hour lecture 1 × 1-hour tutorial

Assessments		
	Individual assignment 1	10%
	Individual assignment 2	30%
	Weekly Online Tutorial Preparation (Quizzes)	2.5%
	3-hour end-of-semester exam	57.5%

Textbook recommendation	Organisational Behaviour 6E: Emerging Knowledge. Global Insights. Australia: McGraw-Hill. ✗ Not necessary. In some weeks' online quizzes, the contents were not sufficiently covered in the lecture slides. Referring to the textbook's required readings was helpful in completing the quizzes as well as supporting the arguments made in the individual assignments.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Comments

Since Organisational Behaviour (OB) is a core subject for Commerce, it is compulsory for most of us, unless you are not a Commerce student and looking to take this as a breadth subject. This subject introduces students to the "micro" and "macro" approaches which are used to understand how people behave in organisations.

Overall, I really enjoyed this subject as I found the subject interesting and very well structured. The lecturers were clear and concise in delivering the lecture contents, making most of the topics easy to understand. Not only did the tutorial participation served as an active way for me to test my understanding of the concepts, but the assignments also helped in consolidating some of the concepts and theories we learned.

Subject content

- **Topic 1**: Introduction to Organisational Behaviour
- **Topic 2**: Contrasting Management Approaches
- **Topic 3**: Perception, Attribution and Decision Making
- **Topic 4**: Teams and Leadership
- **Topic 5**: Values, Attitudes and Behaviour
- **Topic 6**: Motivation
- **Topic 7**: Conflict and Negotiation
- **Topic 8**: Ethics
- **Topic 9**: Organisational Culture
- **Topic 10**: Organisational Communication
- **Topic 11**: Power and Influence

Lectures

All lecture slides and recordings were made available on Canvas the week prior to their corresponding tutorials. Each week, a new topic would be introduced, with the first eight weeks focusing on the micro topics and the last four weeks

focusing on the macro topics.

Personally, I found OB lectures very well structured, with lecture slides starting off with the learning objectives and then followed by the lecture contents. For each topic, the lecture slides would be separated into subtopics, each typically discussing a new theory. While the lecture slides were clear and easy to understand based on first glance, both lecturers would normally extend on the contents by giving more definitions and explanations. Therefore, I definitely recommend watching the lecture recordings even if the lecture slides themselves were sufficient in answering the questions from the online quiz.

Tutorials

Tutorials were split into two components, one being the online preparation quiz and the other being a Zoom tutorial. To complete the online quiz, you would have to read the lecture slides and required readings as assigned by the lecturer. Towards the last four weeks when macro topics were introduced, we were also asked to read and analyse case studies to answer the questions in the quiz, testing our applications of the theories taught that week.

Although this semester's 7.5% from the in-person tutorial participation was removed from the final marks, the main reason my interest in the subject grew was due to the engaging nature of the Zoom tutorials. As I found myself constantly looking forward to attending my online tutorials, putting in time and effort to complete the preparation quiz well came naturally to me. Since the tutorial questions were revolved around the quiz, lecture and case study, preparing well beforehand would ensure that you could actively participate in the tutorial and make the most out of it. Hence, I would still strongly recommend you attend the online tutorials even if it may not contribute marks to the final grade.

Assignments

Different from the previous semesters, our group assignment was replaced by an individual assignment. Both assignments required us to analyse a case study, then answer questions using the required readings and a few additional peer-reviewed journal articles to support our arguments. In these assignments, several micro topics were discussed and applying them to the case studies helped me in gaining a deeper understanding of the topics.

Despite hearing mixed comments about the group assignment from my seniors, I was looking forward to it as I thought it would be interesting to put the theories surrounding teamwork and leadership into practice. In my opinion, changing it to an individual assignment definitely took off some stress of having to cooperate well with the teammates. However, the difficulty also increased as the word limit was decreased to 1500 from 5000. As a result it was more difficult to cover all the points while maintaining conciseness. At the same time, since the case study in the second assignment was significantly longer, analysing it alone was more challenging. I found it helpful to draw a mind-map, making it easier to point out the links between the evidence and arguments you might draw from the readings.

End-of-semester exam

In the past, OB's final exam was worth 50% and we would be given two hours to complete the exam. As the exam would take place in the Royal Exhibition Building, we would not be allowed to refer to any materials. Another point to take note would be the micro topic section of the paper, as in previous years, students were expected to apply the theories of a specific micro topic to their group assignment.

This semester, several changes were made to the final exam's format. We had 3 hours to complete the paper and it was worth 57.5% of the total mark for this subject. The teaching team also made the exam open-book, in the format of a quiz. Similar to the previous years, we had one question related to a micro topic and three questions related to a macro topic. However, we used the same case study for the micro and macro questions. Since the exam was open book, what I wished I did differently was to analyse all the case studies by applying the examinable macro and micro topics' theories beforehand. I believe this would be handy as it could save you time from reading and familiarizing yourself with the case study again.

Third-Year Subjects

Contents

ACTL30001 Actuarial Modelling I

Exemption status	CS2 *Risk Modelling and Survival Analysis*, in conjunction with ACTL30002 *Actuarial Modelling II* and ACTL30007 *Actuarial Modelling III*. Satisfactory performance across all three subjects is required.
Lecturer(s)	Prof Shuanming Li
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial
Assessments	Individual assignment due in Week 5 15% Individual assignment due in Week 11 15% 3-hour end-of-semester exam 70%
Textbook recommendation	None
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Comments

Despite the subject's difficulty in its mathematics, Actuarial Modelling I (AMI) is a very enjoyable subject with neat proofs and understandable concepts. I particularly enjoyed learning about life probabilities and the different mortality models. The subject features many extensions of topics in life insurance taught in Intro to Actuarial Studies in first year, and even on Markov chains taught in high school, where it expands upon these concepts and relates them to actuarial work.

Subject content

- **Unit 1: Survival Models and Life Tables**:
  - introduces actuarial notation for the probability a life aged "x" will survive any given number of years. Explores mortality rates and assumptions on fractional age.
- **Unit 2: Non-parametric Estimations of Survival Functions**:
  - delves into how to estimate the probability that a life will survive a given number of years, given censored and/or non-censored data, using a likelihood function. Introduces the Kaplan-Meier and Nelson-Aalen estimation methods.
- **Unit 3: Parametric Mortality Models**:
  - estimates mortality rates using three models of mortality: the two-state Markov model, Binomial model and Poisson model, and studies each of their pros and cons.
- **Unit 4: Continuous-time Markov process and applications**:
  - The heftiest of units in this subject. Looks into different models that are being used for human lives. For example, in a permanent disability model (lives can either be "Healthy", "Permanently Disabled" or "Dead"), looks at the probabilities of transitioning from one state to another.
- **Unit 5: Discrete-time Markov chains**:
  - Similar to high school Markov chains, where the probability of transitioning from one state to another follows discrete-time and is represented by a transition matrix. This unit also encompasses first-step analysis and some basic simulation by hand. This was my favourite unit, because it was intuitive and comparatively easy!

Lectures

Lectures were recorded by Shuanming, and as with other classes, these lectures were recorded and uploaded online in mp4 format. I enjoyed watching the lectures, as Shuanming made some difficult concepts easier to understand. Whilst the necessary content is all in the lecture slides, Shuanming expands upon many concepts with his own diagrammatic examples, so you must watch the lectures to gain a full, comprehensive understanding of the course.

Tutorials

Tutorials were also pre-recorded and in the form of an online video, where Shuanming demonstrates each question in the tutorial problem sets. The problem sets themselves are comprehensive and teach you about the content in the form of practice questions. Exam and assignment questions were like the tutorial questions; completing all tutorial questions gives a huge advantage for the completion of the exam.

I did not personally attend any of the tutorials on Zoom, as I knew that I could review any tutorial through the uploaded recording. My best tip for doing the tutorials is to complete the questions before you attend your tutorial or watch the tutorial recordings. The worked solutions are often very intuitive, so answers can be easy to understand, but doing the questions yourself is the best way to learn.

Assignments

Assignments were individual this year, with one due mid-semester and the other towards the end of the semester. These assignments were like a mathematics problem set, where each question would be somewhat similar to what you would expect from a tutorial problem set. Having completed tutorial questions throughout the semester, my experience with the assignments was very pleasant, as it gave me an indication of how thorough my understanding of the subject was. I completed the assignments on paper and uploaded them using an app called Genius Scan, which makes lined paper look very clean on camera. Some of the assignment questions required the use of Excel, which added an extra layer of difficulty.

End-of-semester exam

The final exam was quite long and challenging, but it was luckily quite similar to the practice exam. In order to prepare for the exam, I redid all the tutorial problem set questions, watched all the lectures on 2× speed and completed the online practice exam. The final exam was online, with a few multiple-choice questions and many short answer questions. The questions that were the hardest compared survival probabilities analogically with annuity streams, which required us to use our application skills. Although we had an additional 30 minutes due to this year's online format and I made the most out of the time I had, I still almost ran out of time. So make sure that your time management in this exam is tip-top!

ACTL30002 Actuarial Modelling II

Exemption status	CS2 *Risk Modelling and Survival Analysis*, in conjunction with ACTL30001 *Actuarial Modelling I* and ACTL30007 *Actuarial Modelling III*. Satisfactory performance across all three subjects is required.
Lecturer(s)	Dr Kevin Fergusson
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial
Assessments	Individual assignment 1 (Week 3) 15% Individual assignment 2 (Week 9) 15% 3.5-hour end-of-semester exam 70%
Textbook recommendation	ACTL30002 Workbook, available on Canvas. It includes lecture slides, tutorial problems, progress check questions, a specimen Exam paper (the solution is unavailable) and statistical tables. ✓ Having a physical workbook is highly recommended as it provides you with better experience tracking the progress of your learning.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Comments

The aim of this subject is to provide foundations in mathematical and statistical modelling techniques that are of particular relevance to actuarial work. This includes methods of estimating mortality rates and assessing their adherence to data and smoothness, as well as techniques for mortality projections. Elementary principles of machine learning are covered, with applications to mortality modelling. As a result. there is some level of overlap in terms of content between this subject and both ACTL30001 Actuarial Modelling 1 and ACTL30008 Actuarial Analytics and Data 1. This subject will be easy to manage if you have a deep understanding of the other two subjects.

If you keep pace with the weekly lectures and tutorials and complete the provided problem sets, you are likely to achieve a high score in the final examination and be on track for the CS2 exemption.

Subject content

1. **Unit One – Exposed to Risk Methods (Week 1–Week 3)**
   The first three weeks of this subject consider the estimation of mortality rates from crude data. Actuaries are able to use population mortality rates to build actuarial models for a variety of insurance products (e.g. life insurance contracts), or other needs such as pricing or reserving.
2. **Unit Two – Hypothesis Testing (Week 4–Week 7)**
   This unit introduces six different types of hypothesis testing methods: Chi-Squared Test, Individual Standardised Deviation Test, Cumulative Deviation Test, Signs Test, Runs Test/ Stevens' Test and Serial Correlations Test.
3. **Unit Three – Methods of Graduation (Week 7–Week 8)**
   Graduation is defined as the process of smoothing mortality rates. Major graduation methods introduced in this unit are the Whittaker-Henderson Graduation Method, Graphical Method of Graduation, the Univariate (delta) Method, Graduation by Mathematical Formula, Graduation by Reference to a Standard Table and Graduation Using Cubic Splines.
4. **Unit Four – Mortality Projection and Machine Learning (Week 9–Week 12)**

Unit Four contains two parts: the first concerning mortality projection and the second concerning machine learning. With the advent of computers and voluminous data, techniques employed in mortality projections have increased in sophistication, making use of stochastic models and machine learning techniques.

Overall, the content of the subject is manageable in terms of difficulty. I found Unit One is the most difficult part of the subject as the exercises on different types of rate intervals always caused a headache. Extra care may be needed when studying this unit.

Lectures

Kevin creates clear and comprehensive lecture content but, admittedly, he sometimes loses track of time. In the first few weeks, quite a large amount of lecture exercises was omitted as he did not have enough time to cover. It is critical as a student to keep up with each week's lecture materials and make sure you understand basic concepts to be able to tackle all lecture exercises. My suggestion is to write your own notes, then you will be able to get a clear overview of each unit and how they relate—it also acts as a good resource for revision.

Some level of Excel and R knowledge is required as sometimes you need to use matrices or Excel Solver to solve numerical questions that cannot be easily calculated by hand. Detailed explanations of how to implement Excel and R were covered in the Lectures.

Tutorials

There are two sets of questions available, tutorial questions and additional questions. Each week's tutorial questions consist of three to six questions in general. They are easy to approach and require a basic understanding of lecturer materials. The tutor will go through all questions on a weekly basis. In terms of the format, the two major types of questions are stating definitions and solving numerical questions. I encourage you to attempt all tutorial questions beforehand as they are not time-consuming, but a great resource for you to consolidate your knowledge. The additional questions are the exact same as the lecture exercises, therefore is not needed to be completed beforehand as they will not be discussed in the tutorial.

Assignments

The first assignment mainly assessed knowledge on Units 1–2 and the second assignment mainly assessed knowledge on Units 2–4. Both assignments were in a similar style compared to tutorial questions and lecture exercises. But personally, I would say they were much more difficult than tutorial questions. In Assignment 2, detailed explanation on how to use matrix method solving the Whittaker-Henderson Graduation Method and Cubic Spline method in Excel were included and applying this knowledge via creating your own Excel sheets (samples of Excel sheets regarding both methods were available on Canvas) to tackle questions were extensively tested. We were required to submit a CSV file online with only your final answer to each question, which means no intermediate steps were needed upon submission.

From my experience, you will start to realise the importance of certain topics as the assignments are completed. Some topics were assessed intensively in both assignments (e.g. hypothesis testing methods), whilst other topics were not tested (e.g. materials in Week 12). However, there is no clear indication from the lecturer about each topic's level of importance.

End-of-semester exam

This year's exam was in a format of quiz and we had 3.5 hours to complete it, with a 6-hour window available. Other aspects regarding types and structures of questions were very similar to assignments.

A practice exam was made available to enable us to familiarise ourselves with the exam format. Unfortunately, this year, all questions were directly extracted from the second assignment and no other questions were available for practice. I think the lecturer intended to give us a signal about the types of question would be in the exam paper and indeed, it was proved in the actual exam. Therefore, I strongly encourage you to attempt assignment questions under exam condition for final revision.

ACTL30003 Contingencies (1)

Exemption status	CM1 *Actuarial Mathematics I*, in conjunction with ACTL20001 *Introductory Financial Mathematics*. Satisfactory performance across both subjects is required.
Lecturer(s)	Dr Rui Zhou
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial
Assessments	Individual Assignment 1, due in Week 5 15% Individual Assignment 2, due in Week 10 15% End-of Semester Exam (Hurdle) 70%
Textbook recommendation	Dickson, D., Hardy, M., & Waters, H., 2020 (or 2013) *Actuarial Mathematics For Life Contingent Risks.* 3rd (or 2nd) edition. New York: Cambridge University Press. Rui provided a list of selected questions from this textbook as further exercises but neither official answers nor detailed explanations were provided on Canvas. Personally, I found that keeping up to date with tutorials was sufficient. Dickson, D., Hardy, M., & Waters, H., 2020 (or 2013). *Solutions Manual for Actuarial Mathematics for Life Contingent Risks*. 3rd (or 2nd) edition. New York: Cambridge University Press. Both textbooks serve as additional reading materials. ✓ I recommend you have a read when you find certain topics either interesting or confusing.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 2

Overall Comments

As Contingencies had been redesigned into a single subject (was double subject in previous years), it required students to absorb more knowledge in a shortened time frame. That being said, concepts in this subject were not hard to grasp, although being able to apply your solid understanding to tackle tedious questions under timed conditions made the subject challenging.

Contingencies is a content-heavy subject. It requires you to invest a considerable amount of time understanding concepts and tackling questions efficiently. To score well, I believe having a solid grasp of intuitions behind formulae is key to tackling the extremely challenging questions that are designed to separate the cohort.

Subject Content

Overall, this subject heavily relies on the knowledge of probability theory and financial mathematics. It mainly provides actuarial techniques for calculating premiums and policy values for life insurances and life annuities.

- **Select and Ultimate survival model, Insurance Benefits and Annuities (W1-W3)**
  Using an underwriting selection process, insured lives with different mortality experiences compared to the general population are selected. Then, the corresponding Select Survival Models are constructed. The topic of how to construct tables was briefly discussed in the first lecture as it mainly serves as an assumption given in questions. We were taught how to look up values in the given H2005 Table.
  Six lectures were given on the topics of insurance benefits and annuity benefits. We learnt to calculate the first

moment, second moment and variance of the present value of benefit paid on death or/ and survival and annuity until death. For this part, a large number of standard actuarial notation was introduced. It is recommended that you only memorise the most fundamental ones and know how to derive other notation using intuition.

- **Premium calculation and Policy valuation (W4-W6)**
  The last topic prepared us to calculate premiums using the principle of equivalence. Some applications on with-profit insurance and extensions with extra risks were included afterwards. After premium calculation, the teaching flowed into policy valuation. We learnt profit analysis on an annual basis and Thiele's Different Equation under the context of policy value.
- **Multiple state models (W7)**
  This part started with a review of the Markov process learnt in *Actuarial Modelling I*. Topics in multiple state models are extensions of materials in Week 4 to Week 6 where the alive-dead model was used. Several other famous multiple state models were discussed.
- **Two lives benefit (W8-W9)**
  This was the most interesting but challenging topic for me in this subject. Further to the standard notations in Week 1 to Week 3, functions on joint life, last survivor and contingent life were introduced. The difficulty came from questions that applied these functions. I found drawing timelines to understand the relationships between two lives before writing down formulae is the best approach to tackle these questions.
- **Multiple decrement models and Tables (W10)**
  The multiple decrement model is a special case of the multi-state model where there is one alive state and n absorbing states (not necessarily a dead state). Knowledge on constructing relationships between the single decrement model and multiple decrement model, and finding probabilities under fractional age assumptions were discussed.
- **Emerging costs and Unit-linked Insurance (W11-W12)**
  So far in the course, we had focused on determining the EPV of cash flow series. This topic mainly talked about how to project the cash flow emerging from a contract in each time period for pricing, reserving and profit testing.

Lectures

Rui is very organised and sent us an email each week beforehand summarising topics. She explained concepts and intuitions clearly. I suggest that you should pay attention to the examples provided in the lectures after the explanations of concepts. All of the examples were explained in detail and provided great insights on what to expect in the tutorial questions, assignments and even the final exam.

Tutorials

There are 11 tutorial problem sets in total. I highly recommend that you attempt all questions beforehand and attend all tutorials. Both tutors in my cohort were very good at explaining intuitions behind formulae and you will gain valuable insights that you might not have realised by watching lecture recordings only.

Assignments

Both assignments were individual and were worth 50 marks each. Each assignment consisted of six questions including Excel spreadsheet questions and handwritten questions. Both assignments were manageable in terms of difficulty. For assignment one, a large part of it was working with an Excel spreadsheet where attention to detail came into play. For assignment two, a few questions required a large amount of deviations and highly relied on your pre-requisite knowledge of calculus.

Rui likes to make assignments available before the knowledge required for the majority of questions has even been taught yet. Both assignments included questions that were learnt within the same week of the due date. Having good time management is essential and you should not leave all questions until a few days before the due date.

End-of-semester Exam

The end of semester exam was out of 70 marks and was consisted of five True/False questions and eight long-answer questions with one required Excel spreadsheet submission. The True/False questions were intended to examine your understanding of relationships between different types of actuarial notations, whilst the eight long-answer questions tested materials of all topics in the subject.

With only one practice exam available, the difficulty level and types of questions unpredictable. The actual exam was indeed harder and more time-consuming compared to the practice exam. In hindsight, redoing tutorial questions and practising extra questions in the textbook under an exam condition can be extremely helpful. Another tip is around the strategy of allocating time to each question relative to the marks it gave. And whilst most of the students are aware of this, managing to do so in the actual exam required practice.

ACTL30003 Contingencies (2)

Exemption status	CM1 *Actuarial Mathematics I*, in conjunction with ACTL20001 *Introductory Financial Mathematics*. Satisfactory performance across both subjects is required.
Lecturer(s)	Dr Rui Zhou
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial
Assessments	2 × individual assignments 30% 3-hour end-of-semester exam 70%
Textbook recommendation	None, I did not use any textbook during my study period.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 2

Overall Comments

Contingencies is a fun yet challenging subject that covers different types of insurances and annuities. It can be seen as the final boss of actuarial subjects, with it being a culmination of actuarial calculations, premium calculations and life insurances — all of which are topics that were touched upon in previous subjects. I found the subject to be interesting and intuitive, although there could be improvements made to the structure and clarity of certain aspects of the subject, which was expected since this year introduced the first iteration of the 12.5 point variant of Contingencies .

Subject Content

1. **Overview and Select Life Table**
   - An overview of the course and a different population called "select life", representing policyholders who were specifically selected by insurance companies. This module was much more conceptual than calculative and, whilst I did not completely understand the select life at first, it became very intuitive shortly after since it is constantly alluded to throughout the semester.
2. **Types of Insurances and Life Annuities**
   - Expected present values of different types of insurances and annuities, including *term insurance, endowment insurance, increasing continuous annuities* and many more.
3. **Loss Random Variables and Policy Value**
   - Defining how much a policy is valued at based on the randomness of future deaths and policy exits. This is then used to calculate and price premiums for insurances.
4. **Multiple State Markov Mortality Models**
   - *Disability income models, permanent disability models*, this topic relates Accelerated Maths 1 to *policy values*. Introduces *Thiele's Differential Equation*.
5. **Joint Life Theory and Multiple Decrement Model**
   - Teaches *survival probabilities* for *joint lives*. That is to say, the probability a male and female aged x and y will survive to time t, and other types of *joint life probabilities*. Also includes a model that considers multiple ways a policyholder can exit a policy.
6. **Emerging Costs and Unit-Linked Insurance**
   - Profit testing based on a table of cash flows to be constructed on Excel. Includes *IRR* and *Net Present Value tests*.

Lectures

Lectures for this subject were all recorded online in advance. Rui spoke clearly and concisely about all the topics in this course and demonstrated herself as a proficient lecturer for Contingencies. Since all the lectures were pre-recorded, there was more flexibility with the duration of each lecture — some lectures were longer than an hour. Watching lectures proved to be very useful, since some topics — especially the ones in the last module — were difficult to understand by purely reading slides.

Tutorials

I did not directly attend tutorials, but I watched the uploaded recordings. My tutor summarised the formulae and concepts presented in the weekly lectures, which served me well for my final exam revising period. I was also able to watch another tutor's tutorials, and when there were difficult tutorial problems or concepts, I would watch both to get a more widely encompassing perspective on the topic.

Assignments

The first assignment has questions based on insurances and annuity calculations performed on Excel. It was a pedagogical approach that enables students to learn how to apply the concepts in a workplace environment. This complemented the tutorial questions perfectly since it allowed us to learn both the recursive and formulaic methods for calculating *expected present values* and *variances* of insurances products and annuities.

The second assignment encompassed the remainder of the course, with questions on *joint life theory* and *multiple decrements*, and was delivered using Excel too. I overall enjoyed this assignment since helped me consolidate my knowledge for the final exam.

End-of-semester Exam

The final exam was a three-hour online exam held on Canvas Quiz. I answered the questions on Microsoft Paint and uploaded them question by question. Question 8 on the exam required the submission of an Excel file with annuity calculations, which increased the difficulty of this exam as opposed to paper exams in previous years. I also felt that the exam was harder than the past exam since Rui had likely made the exam more difficult to compensate for the exam being open-book. Fortunately, the exam was manageable as I had done all the tutorial questions.

In preparation for the exam, I watched all the lectures and completed all the tutorial questions, which served as an all-encompassing study method. I regret that I did not clarify some confusions with the last module, (specifically *Emerging Surplus* calculations), since the exam question on that topic was quite different from the corresponding tutorial questions.

ACTL30004 Actuarial Statistics

Exemption status	CS1 *Actuarial Statistics I*, in conjunction with MAST20004 *Probability* and MAST20005 *Statistics*. Satisfactory performance across all three subjects is required.
Lecturer(s)	Dr Enrique Calderín
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial
Assessments	Individual Assignment 1 15% Individual Assignment 2 15% End-of-semester exam (hurdle) 70%
Textbook recommendation	**Prescribed Reading** *Actuarial Statistics* Reading The prescribed reading is pretty much the same as the lecture materials with additional background information and an appendix. I read it on a weekly basis before lectures to give myself an overview of each week's material. **Supplementary Reading** • Frees, E. W., Derrig, R. A. and Meyers, G. (eds) (2014) *Predictive Modeling Applications in Actuarial Science.* Cambridge: Cambridge University Press (International Series on Actuarial Science). • Boland, P., 2007. *Statistical And Probabilistic Methods In Actuarial Science.* 1st ed. CRC Press. • De Jong, P. and Heller, G., 2013. *Generalized Linear Models For Insurance Data*. Cambrigde: Cambridge University Press.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 2

Overall Comments

Actuarial Statistics is the second subject after *Actuarial Analytics and Data I* that focuses on data and statistical analysis. You will find that these two subjects overlap in materials in Units 1–3 (see subject content for details), which implies that the subject starts with revisions initially and then goes into applications and implementations in R, some of which were not covered in AAD1. Materials in Units 4–5 are brand-new and super important as emphasised by the lecturer. To conclude, you should be fairly confident about this subject if you have a decent grasp of the knowledge taught in AAD1.

The beauty of this subject comes from the fact that it sets you apart from tedious mathematical questions and dives you into modern statistical analysis. Unlike other subjects excepting AAD1 in the third year, this subject does not set the scene in either life insurance or general insurance. It provides you with fundamental statistical techniques in the process of how to suggest the causes of observed phenomena, to assess assumptions of statistical inferences, to support the selection of statistical techniques and to provide a basis for further data collection.

Subject Content

- **Unit One — Exploratory Data Analysis with R (W1–W2)**
  Exploratory Data Analysis is a technique for analysing datasets to summarise their main features, often with visual methods. The main goal of exploratory data analysis is for observing what the data can tell us beyond the formal

modelling or hypothesis testing. The use of statistical software is crucial to perform the analysis. The first part of this chapter gives an introduction to exploratory Data Analysis and the second part discusses different methods of multivariate exploratory data analysis and their implementation in R.

- **Unit Two — Properties Estimation and Estimates (W3–W4)**
  Most of the knowledge covered in this unit regarding MLE, simulation and introduction of bootstrap method will be a revision of ideas that you have already met in *Statistics*, *Actuarial Modelling I* and *Actuarial Analytics and Data I*, respectively. There will, however, be some new material related to the use of the bootstrap method to estimate the properties of an estimator.
- **Unit Three — Multiple Linear Regression (W4–W6)**
  This unit introduces linear regression in the case of several explanatory variables. Many of the results derived for the simple linear regression extend directly including goodness-of-fit measures and inference. Further materials on residual analysis, multicollinearity, variable selection procedures and some special explanatory variables are discussed afterwards.
- **Unit Four — Generalised Linear Models (W6–W9)**
  GLM is the most important topic in this subject and serves as an extension of the multiple regression models where the assumption of a normally distributed response variable is no longer needed. This is particularly important in actuarial work where the data very often do not have a normal distribution and this method is often used in general insurance for determining premiums. This unit aims to provide an in-depth understanding and applications of the exponential family of probability distributions and the parameter estimation procedure.
- **Unit Five — Credibility Theory (W9-W12)**
  Credibility theory can be considered to calculate premiums or to estimate claim frequencies in general insurance. The mechanism to design a way of combining the experience of the group with the experience of the individual risk to calculate a better premium can be formulated in an either frequentist or Bayesian statistical settings. The Bayesian statistical method is often preferred and is a focus of this chapter due to its flexibility to recognise more than one source of randomness via sampling and prior information.

Lectures

Enrique is a great lecturer who explains answers clearly for the questions you have in the consultations and he often provides you with the background knowledge required first and then guides you through the questions patiently. For most of the time, Enrique liked to read off slides firstly and then provided further explanations on concepts and deviations. Admittedly, you may find that it will take you a few weeks to adapt to his accent and his way of teaching.

Tutorials

Tutorial questions consisted of R questions and mathematical deviations. Tutors in my semester explained all questions in detail. I suggest that you should complete the questions before attending tutorials as tutors may skip some steps due to the time limit and you may find it hard to follow afterwards.

Assignments

Both assignments were designed in a way that students could further develop their knowledge and interest in writing in R and performing analysis. I suggest that you should make yourself comfortable conducting research and practising critical-thinking ability to manage both assignments. Notably, the lecturer does not assume that you have some pre-requisite knowledge learnt from AAD1. Therefore, you might find the assignments easy. Personally, I noticed that it was likely to overthink questions and to go beyond what the question asked for.

In my year, the two assignments share a similar structure and format of questions. However, the first assignment was fully R-based while the second one was a combination of both R questions and mathematical deviations. As both assignments have page limits, you should be concise in your analysis and code.

End-of-semester Exam

This year, the final exam was manageable in terms of difficulty compared to the other two core subjects offered in the same semester. There were a specimen paper and a practice exam available on Canvas. Due to the curriculum change, the specimen paper became less valuable as only three questions in the paper examined knowledge learnt in this subject. The practice exam, however, reflected the styles and difficulties of the questions in the actual exam very well and I suggest you use it as guidance.

ACTL30006 Intermediate Financial Mathematics

Exemption status	CM2 *Financial Engineering and Loss Reserving*, in conjunction with ACTL20004 *Topics in Actuarial Studies* and ACTL40004 *Advanced Financial Mathematics*. Satisfactory performance across all three subjects' end-of-semester exam is required.
Lecturer(s)	Dr Ping Chen
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial
Assessments	2 × Individual assignments 2 × 30% 3-hour end-of-semester exam 70%
Textbook recommendation	Prescribed References: Joshi, M.S. and Paterson, J.M., 2013. *Introduction to mathematical portfolio theory*. Cambridge University Press. Supplementary Readings: Goetzmann, W.N., Brown, S.J., Gruber, M.J. and Elton, E.J., 2014. *Modern portfolio theory and investment analysis*. John Wiley & Sons, 237.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 2

Overall Comments

This subject takes the ACTL20001 *Introductory Financial Mathematics* one step further. Intermediate Financial Mathematics aims to explain the mathematics underlying Modern Portfolio Theory. It examines the fundamental question of how to divide an investment amongst many possible investment opportunities under the assumption that those investments are correctly priced. One thing you should consistently keep in mind throughout the semester is no single model is flawless. A large part of the content discussed was how to conduct experiments and analyse the downsides of the models.

Personally, the concepts were easy to understand as they were well-structured and based on different assumptions of investments and investors. Most of the material in this subject served as the background for further studies. The most rewarding part for me was the process of developing the intuition of financial models using mathematical knowledge learnt in previous subjects.

Subject Content

- **Lecture 1**: Introduction to Modern Portfolio Theory
  The objective of the modern portfolio theory is to maximise the risk-return trade-off when investing in the markets through the use of mathematical tools. Notably, in financial mathematics, we generally focused on the future rather than the past. Therefore, the expected return is the centre of focus.
- **Lectures 2–5**: Mean-variance Theory
  The mean-variance theory provides a way of choosing a combination of assets based on the idea that investors only care about mean-variance efficiency. This topic guides you through the steps of constructing an opportunity set and finding efficient frontier and typical portfolios.
- **Lectures 6–9**: Single-factor model and Multi-factor model
  These two models simplify the mean-variance theory via relating assets to the market portfolio, which largely reduces the data required in the analysis. I found that it helped to understand the topic by treating the model as a financial application of the linear regression model learnt in *Actuarial Analytics and Data I* and *Actuarial Statistics*.
- **Lectures 10–13**: Expected Utility Theory
  Expected Utility Theory helps to choose portfolios by giving assumptions on risk preferences. This is in compar-

ison to the mean-variance analysis, which does not show which portfolio to hold, which instead reduces the set of investments worth considering.

- **Lecture 14**: Geometric Means
  Given the previous two criteria in portfolio selection (mean-variance criteria and expected utility theory), geometric means is another method used for long-time (lifetime) growth of a portfolio.
- **Lecture 15**: Stochastic Dominance
  The three criteria derived so far require very strong assumptions on the investor. Here, Stochastic Dominance requires strong assumptions on the investments, but only very weak assumptions on the investor.
- **Lectures 16–17**: Capital Pricing Asset Model (CAPM)
  Depending on the investor's analysing ability, the investment pool varies from investor to investor. The CAPM develops a simple relationship between the expected return of an asset and its covariance with the market portfolio by making an unrealistic assumption that investors have identical analysing abilities.
- **Lectures 18–19**: Arbitrage Pricing Theory (APT)
  APT provides analysis based on the multiple factor model but with no diversifiable risk involved.
- **Lecture 20**: Efficiency and Rationality
  This lecture examines three different forms of market efficiency. It is one of the most theoretical topics in the subject.
- **Lectures 21–22**: Risk Measures — Value at Risk (VaR)
  to this point, the variance has been used as the principal measure of risk. Value at Risk is another measure of risk that compensates for some disadvantages of the variance. For example, the variance penalises upside variance as well as down-size variance.

Lectures

The lecture slides were very clear and connected. Ping explained abstract concepts extremely well, so I found that not much time was needed to digest concepts after attending lectures. Therefore, I highly recommend that you should keep up to date with the lectures to make your learning enjoyable. In terms of content, lectures were theory based with one to two examples after each topic.

Tutorials

Tutorial questions were straight-forward, with no complicated calculations or proofs required. If a consistent effort is applied throughout the semester (by watching lectures), the level of difficulty should not be a concern. However, I found attending tutorials helpful in terms of consolidating my understanding, as my tutor provided concise recaps of the previous week's content. I do suggest that you attempt questions prior to attending tutorials as then you will find tutorials to be much easier to follow.

Assignments

Both assignments were Excel-based and intended to mimic a real-life scenario you may encounter at work. The first assignment examined the knowledge of the mean-variance theory with five assets and required a spreadsheet model built using Excel. In the second assignment, the task was to estimate the CAPM betas of four self-selected stocks and also write an 800 words commentary essay.

End-of-semester Exam

There were five multiple-choice questions and seven file-uploading questions, examining all topics in the course. Personally, the difficulty level of the exam was unexpected, given the straightforward nature of the tutorial questions. A few questions examined the understanding of definitions and intuition behind models. For the most part, the final exam had a similar difficulty to the practice exam, and a similar format to the tutorial questions — with just extra layer of complexity.

ACTL30007 Actuarial Modelling III (1)

Exemption status	CS2 *Risk Modelling and Survival Analysis*, in conjunction with ACTL30001 *Actuarial Modelling I* and ACTL30002 *Actuarial Modelling II*. Satisfactory performance across all three subjects is required.
Lecturer(s)	Prof Benjamin Avanzi
Weekly contact hours	2 × 1-hour lecture 1 × 1-hour tutorial
Assessments	Individual assignment due in Week 6 15% Individual assignment due in Week 12 15% 3-hour end-of-semester exam 70%
Textbook recommendation	Multiple textbooks were recommended for different parts of the course (refer to **Subject Content**): • **[MW]**: Wuthrich, Mario V., *Non-Life Insurance: Mathematics & Statistics* (January 7, 2020) ✓ Highly recommended as there are some proofs worth reading that are not discussed in the lectures. • **[FV]**: Frees, E.W. and Valdez, E.A. (1998), *Understanding Relationships Using Copulas*, North American Actuarial Journal 2:1, pp. 1-25 ✗ Not necessary, but it is still a good resource • **[RS]**: Shumway, Robert H., Stoffer, David S. (2017) *Time Series Analysis and Its Applications With R Examples*, Springer The lecture materials are comprehensive; ✗ do not recommend.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Subject content

Essentially, the course is constituted of two main parts with 9 modules in total:

Part 1: Random Variables and Distributions for Risk Modelling

This part studies the aggregate sum S of losses of a portfolio of contracts or a contract over a certain period. Three of the different ways that S is modelled is taught in the first half of the subject:

- **Weeks 1–2**: Collective Risk Modelling **[MW]**
- **Weeks 3–4**: Individual Claim Size Modelling **[MW]**
- **Week 6**: Approximations for Compound Distributions **[MW]**

The next two selected topics focus on demonstrating how the copulas function represents the dependent structure of its joint function with impacts of the marginal distribution removed and how to analyse extreme values of a dataset using Generalised Extreme Value distribution and Generalised Pareto distribution, respectively.

- **Week 7**: Copulas **[FV]**
- **Week 8**: Extreme Value Theory **[FV]**

Part 2: Time Series

Time series refers to the systematic approach by which one goes about answering the mathematical and statistical questions posed by these time correlations. The primary objective is to develop mathematical models that provide plausible descriptions for sample data that are connected at adjacent time periods.

- **Week 9**: Characteristics of Time Series **[RS]**
- **Week 10**: Time Series Regression and Exploratory Data Analysis **[RS]**
- **Weeks 11–12**: ARIMA Models **[RS]**

As remarkably emphasised by the lecturer, this subject requires a deep understanding of concepts. Rote learning and memorising concepts will not suffice. Therefore, I would recommend taking time after classes to digest concepts and make sure you can apply knowledge to not only tutorial exercises but also real-life problems that demonstrate your understanding. Consultation is always a good place to go if you find topics confusing,

Time series is the most interesting part for me in this subject. Being able to correctly analyse relationships between two time series and demonstrate potential stationarity of time series always make me satisfied.

Lectures

This is a brand-new third-year actuarial subject this semester. Ben had spent a considerable amount of time and made a great effort into writing the lecture notes. The content is well-structured with an introduction and/or industry background at the start of each module and it often ends with detailed case studies.

Ben is a student-orientated lecturer. He loves feedback from students and makes adjustments accordingly throughout the semester. I will not deny that this subject is the most difficult one among three exemption subjects in Semester 1 as it contains a lot more in-depth concepts than the other two. But I believe by tacking actions such as spending 10 minutes reading lecture slides before attending lectures and watching lecture recordings for unclear parts, you are likely to conquer this subject.

Tutorials

Tutorials begin in the first week of the semester. There was a brief lecture review conducted at the start of the tutorial. I would say the best way to prepare for the tutorial is trying your best to attempt all questions beforehand as tutors often go through answers quickly and not all questions will have time to be discussed in class.

Assignments

There is one individual assignment involving R coding for each half as mentioned in the subject content. It is worth mentioning that students are assumed to have good practical knowledge of R, which is required for the assignments. Doing some revision on R during the holidays is highly recommended.

End-of-semester exam

The final exam consists of nine questions corresponding to each module and one additional question on Time Series. Questions styles included interpreting and explaining R output, short answer questions, algebraic and numerical calculations and sketching graphs. As this subject requires a deep understanding of the materials, you should expect questions aiming at being aligned with situations and/or problems you could encounter in real life.

Concluding Remarks

The beauty of this subject is that it provides you with basic knowledge in general insurance modelling as well as some in-depth discussion and exploration of some topics like time series. The well organised combination of the two makes the content easy to follow and not dry at all. This subject acts as a great introduction into modelling general insurance and a concrete foundation of time series.

ACTL30007 Actuarial Modelling III (2)

Exemption status	CS2 *Risk Modelling and Survival Analysis*, in conjunction with ACTL30001 *Actuarial Modelling I* and ACTL30002 *Actuarial Modelling II*. Satisfactory performance across all three subjects is required.
Lecturer(s)	Prof Benjamin Avanzi
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial
Assessments	Individual assignment on Data Modelling 15% Individual assignment on Time Series 15% 2-hour end-of-semester exam 70%
Textbook recommendation	The textbooks are chosen and provided by the lecturer. I ✓ highly recommended reading them for the theory and your understanding. • Wuthrich, Mario V., *Non-Life Insurance: Mathematics & Statistics* (January 7, 2020) • Shumway, Robert H., Stoffer, David S. (2017) *Time Series Analysis and Its Applications With R Examples*, Springer
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Comments

Overall, Actuarial Modelling III (AM3) taught me a lot about data modelling and theory and imparted upon me a look into the work of an actuarial analyst. I particularly enjoyed learning about how to actually apply the skills that I have learnt in more than just a classroom setting.

This subject offers an in-depth look into statistical analysis and data modelling. AM3 invites students to sit in the shoes of insurance companies and learn how to forecast potential future losses and reduce probability of bankruptcy. There is as much a requirement of understanding statistical theory as there is a need for strong quantitative mathematics skills. This subject bolsters students' knowledge of actuarial modelling and provides insight into how actuaries use these toolkits in the workforce.

Subject content

The first half of the course explores the understanding and finding of underlying distributions of large datasets through modelling collective risks and individual claim sizes. Consider yourself in the insurer's position—if you know how many policies will have claims, can you ascertain the expected cost you will have to pay? Well, that's individual claim size modelling. What if the number of claims is random? We do collective risk modelling!

- **Module 1**: Introduction
- **Module 2**: Collective Risk Modelling
- **Module 3**: Individual Claim Size Modelling
- **Module 4**: Approximations for Compound Distributions
- **Module 5**: Copulas
- **Module 6**: Extreme Value Theory

The second half of the course delves into time series analysis, wherein students are asked to explore a set of data and tell

a story using the data. This section of the course touches base on previously covered topics, including auto-correlation functions and ARIMA models. These sections give you a breather on the otherwise statistics-heavy topics covered earlier in the course, whilst maintaining the general theme of data modelling.

- **Module 7**: Characteristics of Time Series
- **Module 8**: Time Series Regression and Exploratory Data Analysis
- **Module 9**: ARIMA Models

Lectures

Unsurprisingly, due to the COVID-19 pandemic, lectures were mostly online-only. Ben's lectures were organised neatly according to their module, and even according to their subsections. Due to the lectures being online and pre-recorded, it gave Ben more flexibility with timing, enabling some more in-depth explanations on certain more difficult topics. Lectures delivered the content clearly, exploring all the data theory with graphs. However, as with many other actuarial subjects, watching lectures alone will not suffice!

Tutorials

As we were doing distant learning, tutorials were all online, and therefore all recorded as well. I watched them all in retrospect. There were extra tutorial questions on module 2 and 3—to an almost excessive degree—but those who complete them all are greatly rewarded with a comprehensive understanding of the content. Tutorials either focused on the difficult questions or the questions that needed more explanation, which was very helpful as I was working through the tutorial questions during exam period. Often, the tutorial questions would teach you about certain aspects of theory, or to allow you to derive proofs for formulae discussed in lectures. My tutor was excellent at explaining difficult concepts to me, and since the tutorials were pre-recorded, I was able to choose which tutor to listen to while I was reviewing the content during exam period.

Assignments

There were two assignments for AM3, one due immediately after mid-semester break, and the other due in the last week of the semester. Both assignments were done using R, and both were individual assignments. For assignment one, we were each given similar insurance claims data sets simulated based on some distribution, and our job was to find what that underlying distribution is. The second assignment was much more flexibl—we were asked to find our own data sets and tell a story using the data. I used a spreadsheet on AFL player statistics to correlate player performance with various factors. Overall, the assignments were a mixture of challenging and interesting, and gave insight into what being in the workforce as an actuarial analyst would be like.

End-of-semester exam

We had an online format for the final exam, where we downloaded a Word document for each question and reuploaded the documents with written in answers. The exam was 3.5 hrs, including half an hour for students to scan and upload their written responses. Ben structured the questions based on learning outcomes, where essentially each module from 1–9 had a question on the final exam. The actual exam had a similar feel to the practice exam, but it was filled with completely different content, therefore requiring students to have a complete understanding of all the concepts and the theory. Ben stressed that it was important to focus on demonstrating understanding, which reflects the whole subject's general theme. To study for the final exam, I would recommend re-attempting all the tutorial questions until you truly understand them. It was helpful to try and explain the concepts out aloud to myself.

ACTL30008 Actuarial Analytics and Data I

Exemption status	Not an exemption subject, but it is a prerequisite for ACTL40012 *Actuarial Analytics and Data II* (DAP *Data Analytics Principles*)
Lecturer(s)	A/Prof Xueyuan (Shane) Wu
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour Computer Lab
Assessments	Group assignment due in Week 6 15% Group assignment due in Week 12 15% Take-home end-of-semester exam 70%
Textbook recommendation	James, G., Witten, D., Hastie, T. and Tibshirani, R., 2017. *An Introduction To Statistical Learning*. Springer. This textbook is essential as the subject is heavily based on the textbook and the resources provided on the textbook website. It is ✓ highly recommended to have a preview of this book before taking the course as you will get a clear and comprehensive overview of the subject.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Comments

This is a new third-year subject and aims to provide us with basic training on modern data analytical methods, which include linear regression, classification, resampling methods, spline-based methods, generalised additive models and tree-based methods.

This subject closely follows the textbook (as mentioned above) *An Introduction to Statistical Learning with Applications in R* (Gareth James, et al. 8th printing 2017), and uses R throughout the whole subject. Lab materials are provided at the end of each chapter. You are required to have basic knowledge in R before taking it. As many of you are already familiar with R and/or MATLAB from previous level-2 math subjects, and perhaps even took computing subjects before, you will be able to get a hand on the computer labs easily. Additionally, you should not worry too much about the difficulty level of these computer labs if you follow lectures and readings on a weekly basis.

I enjoyed how Shane organised this course and you may find it is a relatively easier subject compared to the other three Actuarial Modelling subjects in third year Actuarial. As this is the prerequisite subject of ACTL40012 Actuarial Analytics and Data II, I found the majority of statistical learning methods and R knowledge taught in this course are not that in-depth, but rather require a basic understanding. Nonetheless, this subject will provide you with a concrete foundation for the exemption subject.

Subject content

This subject introduces various types of statistical learning methods consisting of two main aspects, supervised learning (first ten weeks) and unsupervised learning (final two weeks). Methods of accessing the prediction accuracy of a supervised learning method are covered in week 5 (i.e. Resampling methods) and Week 10 (i.e. Bagging, random forests, boosting).

1. **Linear regression & Linear model selection**:
   - This topic is about discovering linear regression, a very simple approach for supervised learning. In particular, linear regression is a useful tool for predicting a quantitative response .
2. **Dimension Reduction methods**:

- This explores a class of approaches that transform the predictors and then fit a least squares model using the transformed variables.

3. **Resampling methods**:
   - Resampling methods involve repeatedly drawing samples from a training set and refitting a model of interest on each sample to obtain additional information about the fitted model.
4. **Non-linear Regression methods**:
   - In this topic, we relax the linearity assumption, while still attempting to maintain as much interpretability as possible. It can be done by examining very simple extensions of linear models like polynomial regression and step functions, as well as more sophisticated approaches such as splines, local regression, and generalized additive models.
5. **Classification**:
   - Predicting a qualitative response for an observation can be referred to as classifying that observation since it involves assigning the observation to a category, or class.
6. **Bagging, Boosting and Random Forests**:
   - Bagging, boosting and random forests use the tree data structure as building blocks to construct more powerful classification models.
7. **Principal Components Analysis (PCA)**:
   - PCA refers to the process by which principal components are computed, and the subsequent use of these components in understanding and visualising the data.
8. **Clustering**:
   - When we cluster the observations of a data set, we seek to partition them into distinct groups so that the observations within each group are quite similar to each other, while observations in different groups are quite different from each other.

I personally really enjoyed learning about resampling methods (e.g. K-fold cross validation) and how to utilise a single dataset to evaluate the prediction ability and accuracy of statistical learning methods. The topic of supervised learning is also widely applicable and powerful. Overall, you will find lecture materials are quite connected from week to week and easy to understand with the help of the textbook.

Lectures

Shane is a very organised lecturer who prepares a weekly to-do list for you on Canvas. Attending lectures and/or listening to lecture captures are necessary as Shane helps you deepen your understanding of certain concepts and you will be able to get an idea of which parts of the knowledge are more important than others for both learning and examining purposes. For that being said, you should have a general idea about each week's material via reading the corresponding textbook chapter(s) beforehand to helping you make fair judgements on the levels of importance of different concepts and methods.

All lecture materials are directly extracted from the textbook with some level of restructuring and extra explanation from the lecturer's point of view.

Tutorials

Tutorials directly follow lab materials at the end of each chapter. Therefore, I would encourage you to read through the R code provided in the book before attending tutorials. It is critical to understand what the existing R code performs and how it is applied to each data analytics method.

Assignments

Both assignments are done with the same group—with a maximum of four people—but you can choose to do them individually. You are required to know how to use R markdown to output your work and be able to reach conclusions from numerical values and graphs from R. In terms of the format and assessed topics, both assignments consist of four to six main questions with two to three subsections assessing knowledge on linear regression and classification (with basic

tree-based methods involved), respectively.

There might not be a single correct answer for each question; and the questions resemble those that examine your understanding about lecture materials, and how to explore and apply your knowledge on statistical learning methods with corresponding code to solve problems.

End-of-semester exam

For this semester, the final exam is an take-home assessment—to be completed and submitted online within a 24-hour time period. The questions follow a similar format and style of questions used in the assignments, but with clearer instructions about what to expect for each subset of the questions.

Definitions are not directly examined, but a deeper understanding of underlying techniques about these statistical learning methods is required. Being able to apply diverse knowledge of R to tackle tasks and to analyse output from code are essential. The final exam is completely R-based and has some extra programming knowledge (such as writing a `for` loop) that is tested but is not directly taught in the weekly computer labs.

In preparation for the exam, one specimen exam was provided, but it was shorter and easier than the actual exam. You may expect questions with definitions of concepts and explaining the certain process of a statistical learning method. Proofs of formulae are not examinable.

Graduate Subjects

Contents

Equivalent Graduate Subjects

Subjects offered as part of the 150 credit MC-COMACTS *Master of Commerce (Actuarial Science)* program and the 200 credit MC-ACTSCI *Master of Actuarial Science* program (as well as it's variants) also allow graduate students to gain professional actuarial exemptions from the Actuaries Institute. Due to the overlap in content between these subjects and actuarial subjects offered as part of the B-COM *Bachelor of Commerce* and BH-COM *Honours* programs, we have listed graduate actuarial subjects with their undergraduate counterparts below.

Some of these graduate actuarial subjects will share the same lectures as their undergraduate counterparts, as in Table 1. Others will just contribute to the same exemption subject as their undergraduate counterparts (and hence have common content), as in Table 2. Whilst we continue to accumulate reviews from graduate-level actuarial subjects, the reviews for Masters subjects included in the *Actuarial Students' Society Subject Review* will also serve as an accurate reference of the content in the corresponding Honours subjects.

Please note the year and study period that each subject was reviewed in, as some subjects reviewed before 2019 will still refer to the old actuarial curriculum.

Table 1: Graduate and undergraduate actuarial subjects with common lectures

Graduate subject	Undergraduate subject
ACTL90003 Mathematics of Finance III	ACTL40004 Advanced Financial Mathematics I
ACTL90004 Insurance Risk Models	ACTL40002 Risk Theory I
ACTL90014 Insurance Risk Models II	ACTL40003 Risk Theory II
ACTL90010 Actuarial Practice And Control I	ACTL40006 Actuarial Practice and Control I
ACTL90011 Actuarial Practice and Control II	ACTL40007 Actuarial Practice and Control II
ACTL90016 Actuarial Science Research Report	ACTL40001 Actuarial Studies Research Essay
ACTL90013 Actuarial Studies Projects	ACTL40010 Actuarial Studies Projects Part 1
ACTL90013 Actuarial Studies Projects	ACTL40011 Actuarial Studies Projects Part 2

Table 2: Graduate and undergraduate actuarial subjects with common CP exemption subjects

	Graduate subject	Undergraduate subject
CM1	ACTL90001 Mathematics of Finance I	ACTL20001 Introductory Financial Mathematics
	ACTL90005 Life Contingencies	ACTL30003 Contingencies
CM2	ACTL90021 Topics in Insurance and Finance	ACTL20004 Topiocs in Actuarial Studies
	ACTL90002 Mathematics of Finance II	ACTL30006 Intermediate Financial Mathematics
	ACTL90003 Mathematics of Finance III	ACTL40004 Advanced Financial Mathematics
CS1	MAST20004 Probability	MAST20004 Probability
	MAST20005 Statistics	MAST20005 Statistics
	ACTL90008 Statistical Techniques in Insurance	ACTL30004 Actuarial Statistics
CS2	ACTL90006 Life Insurance Models I	ACTL30001 Actuarial Modelling I
	ACTL90007 Life Insurance Models II	ACTL30002 Actuarial Modelling II
	ACTL90020 General Insurance Modelling	ACTL30007 Actuarial Modelling III
CB1	ACCT90042 Accounting and Finance for Actuaries	ACCT10002 Introductory Financial Accounting
		FNCE10002 Principles of Finance
CB2	ACTL90022 Economics for Actuaries	ECON10004 Introductory Microeconomics
		ECON20001 Intermediate Macroeconomics
ACC	ACTL90010 Actuarial Practice And Control I	ACTL40006 Actuarial Practice and Control I
	ACTL90011 Actuarial Practice and Control II	ACTL40007 Actuarial Practice and Control II
DAP	ACTL90019 Data Analytics in Insurance II	ACTL40012 Actuarial Analytics and Data II

ACTL90001 Mathematics of Finance I

Exemption status	CM1 *Actuarial Mathematics I*, in conjunction with ACTL90005 *ACTL90005*. Satisfactory performance across both subjects is required.
Lecturer(s)	Dr Zhuo Jin
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial
Assessments	Group Excel assignment, due in Week 11 — 10% 1-hour mid-semester test (topics 1-3) in Week 10 — 20% 2-hour end-of-semester exam — 70%
Textbook recommendation	Fitzherbert, R., & Pitt, D. (2012). *Compound Interest and its applications*. Melbourne, AU: University of Melbourne Custom Book Centre. ✓ I highly recommend buying this textbook.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2017 Semester 1

Comments

I loved this subject. This was my first subject from the actuarial studies department and it was the perfect introduction. Although there were many formulas to memorise, the applications later in the semester was interesting. In addition, many of the mathematical proofs were elegant and satisfying to see.

Subject Content

The content from this subject is equivalent to the undergraduate subjects ACTL20001 *Financial Mathematics I* and ACTL20002 *Financial Mathematics II*.

The first topic was an introduction to interest. We covered all the various types of interest such as simple interest, compound interest, nominal and effective rates of interest, the force of interest and varying interest rates.

The second chapter was on valuing cash flows. We looked at discrete and continuous annuities, increasing and decreasing payments and briefly covered solving equations of value.

The third chapter was on different loan types and their repayment schedules. We also covered financial evaluation of projects and focused on the five evaluation criteria; the net present value, the internal rate of return, the payback period, the discounted payback period and the accumulated profit of the project. This chapter also touched on allowing for inflation.

The fourth chapter was an overview on different investment classes such as shares, discount securities, fixed coupon securities, indexed bonds and derivatives. This section was very theory heavy compared to the other chapters that were more problem solving. We spent most of our time on futures, options and understanding long and short positions.

The fifth chapter was applying the formulae learnt in the first two chapters in asset markets. We looked at measuring investment performance by calculating the money weighted rate of return, time weighted rate of return, linked internal rate of return and Hardy's approximation. In this section, we also forayed into some more actuary specific content such as the idea of immunisation.

The final chapter was taking the content from previous chapters and applying probability theory. We looked at how to

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calculate expected present values and how to solve problems where the interest rate was a random variable. This chapter also introduced independent and dependent lognormal models.

Lectures

The lectures were all recorded with full audio and video. Zhuo provided notes on the LMS and during our lectures he used the document projector, often writing notes on the slides. He drew a number of diagrams to explain the different of annuity formulas. I found his lecture style extremely engaging and enjoyed his way of teaching. Zhou was also very receptive to students asking questions after class and always had time to go over concepts with individual students when needed.

Group Excel Assignment

For our spreadsheet assignment, we were required to evaluate four projects according to the five criteria introduced in chapter three. Not only did we have to provide our spreadsheet, but we also needed to write a summary explaining how our spreadsheet was set up and answer some short questions on which projects we would recommend.

This was a good introduction to Excel and to learning some graphing and linear interpolation techniques.

Mid-Semester Exam

The mid semester exam was an in class exam that covered chapters one to three. The questions were of a similar style to the ones from the textbook and the tutorials. There was nothing surprising or overly difficult on the MST.

For most of the cohort, the main problem was time management as the exam was long and everyone was writing until the last minute. There was basically no time to check over work or even to stop and think about the problem. The best way to do well in the exam was to do the questions from the tutorials and the textbook over and over again until the formulae were imprinted in your memory and the steps to follow for different types of questions was second nature. Before the mid semester exam, I had done all the questions from the book three times and so while I found the exam challenging, it was definitely doable and there were no surprises.

In our exam, there were no proof questions or deriving formulas from first principles. We were also provided with a small formula sheet with a limited number of formulae but I recommend memorising them rather than relying on the sheet.

End-of-Semester Exam

The end of year exam was a two hour exam in the last week of the exam period. The exam was incredibly long and covered everything from chapters one to six. There were a small number of theory questions but no proof or derivation questions. The questions in the exam were of a similar style to questions from the book as well as the few sample exams Zhuo provided.

Similar to the mid semester exam, there were no surprising questions, just a high volume of questions. While studying for the exam, it was tempting to look over the complex annuity questions that had increasing or decreasing payments and different interest rates and just say you know how to do it, but it was super important to actually sit down and do those long questions over and over again until the steps are engrained.

For the final exam, no cheat sheet was provided and it was important to keep all the formulas from the start of the semester in chapters one and two fresh in your mind.

Textbook

I highly recommend buying the textbook. It is relatively cheap and you can probably buy the textbook from a third year student. It covers the content in more depth than the lecture notes and has some background reading options as well.

Additional Study

For more practise questions, you can look at the past exams for CT1 from the Institute. A few students did that this semester for additional practise.

End-of-Semester Exam

This subject was the perfect introduction to actuarial studies. The mathematics was elegant and there were plenty of problems to practise. Neither exams had any surprises but they were both extremely long. The content was interesting and well taught.

ACTL90002 Mathematics of Finance II

Exemption status	CM2 *Financial Engineering and Loss Reserving*, in conjunction with ACTL90003 *Mathematics of Finance III* and ACTL90021 *Topics in Insurance and Finance*. Satisfactory performance across all three subjects' end-of-semester exam is required.
Lecturer(s)	Dr Jane Joshi
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial
Assessments	Individual assignment, due in Week 11 — 10% 1-hour mid-semester test (topics 1-6) in Week 10 — 20% 2-hour end-of-semester exam — 70%
Textbook recommendation	Joshi, M. S., & Paterson, J. M. (2013). *Introduction to Mathematical Portfolio Theory*. Cambridge, UK: Cambridge University Press. This is a required textbook, however there are a number of copies in the library available for short term loans.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2017 Semester 2

Comments

Overall Mathematics of Finance II was well taught and the content was interesting. The spreadsheet assignment was fun. The mid semester exam had nothing unexpected. The end of year exam was hell.

Subject Content

- Definition of risk and return
- Efficient Portfolios
- Portfolios with a risk-free asset
- Finding the efficient frontier
- Single-factor models
- Multi-factor models
- Introducing Utility
- Utility and risk aversion
- Foundations of utility theory
- Maximising long term growth
- Stochastic dominance
- Risk measures
- The Capital Asset Pricing Model
- The arbitrage pricing model
- Market efficiency and rationality
- Brownian motion and stock price models across time

Lectures

The lectures were all recorded with full audio and video. In the notes printed off the LMS, some sections were left blank for us to fill out during the lectures. Personally, I found the lecture pace slow but the content was well taught and explained

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clearly.

The first half of the semester concentrated on mean variance investors and we covered a lot of theory and content in depth. It's extremely important to be able to solve matrices quickly using row reduction techniques learnt in MAST10006 *Linear Algebra* (or MAST10008 *Accelerated Mathematics 1*).

Tutorials

Tutorial attendance is, of course, highly recommended. It is a great chance to ask Jane questions and clarify subject material. There are not many worked solutions in the lectures so the tutorials are a great way to do more problem solving. Jane assigned select questions from each chapter to do before the tutorial and they took an hour or so to do each week, so not very long at all. During the tutorials, we usually did not go over the solutions to the set problems from the book unless there were particularly difficult ones. Instead, we worked through the additional exam style questions she provided at the beginning of the week.

Assessments

I really enjoyed the spreadsheet assignment. I have no experience at all with spreadsheets and it was a great introduction to excel. We were required to create an active workbook that found the weights of five assets to form an efficient portfolio. The question was based on a multi-factor model with two indices and Jane varied the parameters and the lending & borrowing rates to check our outputs. Using the same model, we also had to find the weights for a given mean and another for a given standard deviation. Jane marked the assignments in a way that if we scored less than 8, she allowed us to resubmit the assignment to get a new mark out of 8 if we wished.

The mid semester exam covered topics 1 to 6. We had 3 questions for our exam and the longest one worth the most marks was using Gaussian elimination to find the minimum variance portfolio, and the composition of two efficient portfolios; one for a given mean and another for a given standard deviation. The questions were reasonable and not unexpected. We were given enough time to complete the paper provided we worked consistently. All questions were problem solving rather than theory based although Jane hinted throughout our lectures that we should know our definitions well. Doing the questions at the end of each chapter as well as learning all the formulae in the lectures was enough to do well in the exam.

The end of semester exam was challenging. Jane had provided a number of past exams and sample exams that were a reasonable indication of the length but not of the difficulty. The exam consisted of a mix of theory questions, such as defining Brownian motion, as well as practical questions and proof questions. In the exam, there were a few practical questions in a style that we had not encountered at all during the semester. It was important to understand the differences between APT and CAPM and when to apply each. To do well in the exam, it was crucial to understand all the theories and concepts rather than just rote learning how to solve the questions in the book and the sample exams. To study for the exam, a few of us also memorised some of the proofs of the various theorems covered during the semester. Time management was another issue in the exam and I found that the time spent on solving matrices to find an efficient portfolio did not correspond to the number of points the question was worth. You may consider starting with the shorter questions first before going onto the easy but longer questions

Textbook

Although I bought the textbook, I feel it was not necessary. The lecture slides that you can print from LMS were practically identical to the textbook. The only material you need from the textbook are the questions at the end of each chapter and there were a number of copies in the library you can borrow before a tutorial to see the questions.

Closing Remarks

In summary, MoF2 was a challenging but rewarding subject. The content is manageable and interesting. The most important thing is to understand the content thoroughly and not rely too heavily on the questions in the book or the sample exam questions when studying for the final exam.

ACTL90003 Mathematics of Finance III

Exemption status	CM2 *Financial Engineering and Loss Reserving*, in conjunction with ACTL90002 *Mathematics of Finance II* and ACTL90021 *Topics in Insurance and Finance*. Satisfactory performance across all three subjects' end-of-semester exam is required.
Lecturer(s)	Dr Zhou Jin
Weekly contact hours	3 × 1-hour lectures
Assessments	Individual assignment, due in Week 12 30% 3-hour open book end-of-semester exam 70%
Textbook recommendation	Joshi, M. S. (2008). *The Concepts and Practice of Mathematical Finance* (2nd ed.). Cambridge, UK: Cambridge University Press. ✗ Not necessary
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Subject content

This subject focuses on the pricing of derivative securities and is very theoretical.

- **Topics 1–2**: Using the Binomial Model to Price Options
- **Topics 3–5**: Martingales, Brownian Motion and Stochastic Calculus
- **Topics 6–8**: The Deviation of Black-Scholes Model and the Greeks
- **Topics 9–12**: Interest Rate and Credit Models used to Price Derivatives

While the first few weeks of content may not seem to be too difficult, it gets progressively harder as stochastic calculus and the derivation of the Black-Scholes model is introduced. Retaining prior knowledge from ACTL30005 Models for Insurance and Finance or ACTL20003 Stochastics Techniques in Insurance will certainly be helpful since many of the content is covered in MoF3 in a lot less detail.

Lectures & Tutorials

Each week there are three lectures. Lectures were recorded and accessed online for the majority of the semester. The lecture slides in Mathematics of Finance III tend to be long and dense, and Zhuo tries his best to explain quite difficult concepts in the best way possible. However, it may not be obvious as to how content from different lectures are connected to each other at first, and many of the abstract concepts required more thinking after class. There were no tutorial sessions for this subject, instead, at the end of each lecture, theory and general questions provided. Zhuo uploaded summary notes and solutions to the general questions at the end of each week. However, the summary notes are quite broad and did not capture all the things that would be tested in the exam, and the solutions provided for the general questions are at times very simple, often describing answers in one or two short sentences. These solutions were not always useful as they require a lot more thought, and it may be worthwhile emailing Zhuo for clarification if necessary.

Assignments

There was one assignment for this subject, and similar to previous financial math subjects, it was completed using Excel. We were required to price various types of options using both *tree methods* and the *Black-Scholes equation*. Overall, the assignment was pretty straightforward and did not require a lot of advance Excel techniques.

End-of-semester exam

In preparation for the exam, one specimen exam was provided. The specimen exam itself contained some difficult questions, and it was useful for gaining some last-minute understanding of the subject content.

The exam was open-book and held online in 2020, meaning you could refer to slides and past questions, as well as search online. As such, the difficulty of the exam was higher compare to the specimen. As a matter of fact, there were only one or two questions where you could find a similar example in lecture slides or practice questions; one of the questions also required searching for online references. This made it extremely time-consuming and almost impossible to complete. Students were given questions from a question bank, and it seemed like the difficulty of some of the questions were inconsistent; a tutorial question could be straightforward and completed using usual techniques, while the exam variation of the same question was much more difficult and require a more thorough understanding on the concepts.

Overall, the exam was challenging; it was simply not enough to rely on just understanding what is provided in summary notes or solutions provided for practice questions, and after the exam, you would feel that there were not enough practice questions to begin with, as they only covered much simpler variations of a question than it is to be expected in the exam.

Concluding Remarks

I found Mathematics of Finance III to be very challenging. When you break down the subject content, it may seem like there were not a lot of topics, the abstract nature of many concepts meant that you need to invest a lot more time in going through the content and completing practice questions. I also recommend that you try to find additional practice questions using the textbook and online resources, as there may not be enough relevant practice content for the final exam given in the subject alone.

ACTL90004 Insurance Risk Models

Exemption status	None
Lecturer(s)	A/Prof Xueyuan (Shane) Wu
Weekly contact hours	3 × 1-hour lectures
Assessments	1-hour mid-semester exam in Week 7 20% Individual assignment, due in Week 12 10% 3-hour open-book end-of-semester exam 70%
Textbook recommendation	Dickson, D. C. M. (2005). *Insurance Risk and Ruin*. Cambridge, UK: Cambridge University Press. Online version is available through the University of Melbourne's library website. A few questions in problem sheets will be from this text, and additional questions are useful in exam preparation. ✓ Recommended.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Comments

This subject begins by introducing various probability distributions and their properties. It then provides various actuarial models for the purpose of estimating premiums and claim costs for insurers and reinsurers of non-life insurance products.

Throughout this subject, an adequate understanding of concepts such as the various distributions, conditioning and moments, MGFs and PGFs taught in MAST20004 Probability, as well as MLE, Bayesian Estimation from MAST20005 Statistics will be very useful.

Although not conceptually difficult, this subject is quite heavy in proofs and formula derivations. Rather than remembering every step of a proof, it is much more important to understand the techniques involved, as proofs are usually tested with slight variations. The calculations involved in this subject are not hard, however, it can be easy to make careless mistakes since it can be quite long and tedious.

To do well in the exam, it is important to be able to fully understand the question and apply the steps and techniques taught in lectures. Some questions may require a lot of personal judgement by asking you to select the most suitable method to apply rather than referring to a particular theory or formula; explanation of the rationale behind model set-ups may also be required in exam questions. Moreover, it is important to be familiar with the formula sheet and know some of the tricks that can be used to solve some otherwise very lengthy expectation calculations (mainly for Pareto and Gamma distributions).

Subject content

The subject is well structured and split into 5 sections.

1. **Distributions in Non-life Insurance:**
   - This section begins with a revision of some basic results of some important distributions within the subject. Later on, we will see how we can find expected payoffs for the insurer and reinsurer under excess of loss and proportional reinsurance agreements. A very crucial lemma for the multiplication of summations is introduced. This result will be used repeatedly in the subject for almost every recursion proof. Finally, the concepts of parameter estimation techniques and the goodness of fit test will be reviewed.
2. **Collective Risk Model:**
   - This is the crux of the subject and the most crucial section. The collective risk model is introduced as a way to

model aggregate claim amounts. Calculation techniques for expected values under reinsurance will be taught and remembering the results for the Compound Poisson will be useful. Not only that, different classes of distributions, and corresponding recursion formulae to find the distribution for each, will play a crucial part in this as well. I cannot emphasise enough how important it is to understand the techniques being used in the proofs, in particular, for Panjer's Recursion. Finally, the chapter ends with some approximation techniques by matching the moments of the collective risk model to the normal and gamma distributions.

3. **Individual Risk Model:**
    - The IRM is similar to the CRM in the previous chapter but with some different assumptions. This chapter has numerous proofs and results. Although De Pril's Recursion was incredibly lengthy, the techniques used within it are definitely examinable. Finally, some estimation techniques using Compound Poisson caps out this section.
4. **Introduction to Ruin Theory:**
    - In our context, Ruin theory says that if an insurer's capital follows a certain process, how long it would take them to go bankrupt. In this subject, only a brief introduction is made for this concept and more details will be involved in RT2. The main concept taught is to find upper bounds for this ruin probability.
5. **Credibility Theory:**
    - Credibility theory is about being able to estimate a future using data for a group, as well as individual claim experience. Using Bayesian techniques, we are able to do this under some distribution assumptions. However, it will soon be apparent that they do not always work, so we introduce a non-parametric technique known as the Empirical Bayes Credibility Theory (EBCT) Models 1 and 2. The proofs within this section can seem quite lengthy and there is a lot of notation to go with it. At first, the results may seem all over the place, but once you get a grasp of the bigger picture and the meaning of each formula, they can possibly be more intuitive than you first thought. Since the exam was open-book, we were asked to use Excel to build the EBCT models and compute the results.

While many techniques will have been familiar from prior studies, there are some new and simple results that are important to know, such as the CDF of a gamma distribution, variations of the Pareto distribution, relationships between different distributions, and so on. Many proofs in this subject are examinable, hence having a good understanding on the techniques used is essential. Utilising first principles to find probabilities and other results is also quite useful when initially attempting a question.

Lectures

This subject involves 3 lectures per week. In addition, there were 6 'tutorials' throughout the semester which take place of a lecture, where Shane will go through questions on the tutorial sheet.

Overall, I really enjoyed Shane's teaching style. He was excellent in explaining every concept in a clear and logical way to ensure that everything makes sense to us. Shane also supplied us with handwritten notes for some of the long proofs and I found these to be very useful. These notes would then be uploaded onto a OneNote file, accessible to the class, which he shared at the start of the semester. I found the tutorial problems to be more difficult than the problem sheets and textbook questions, so they are probably the best practice materials for the exams.

Assignment

The assignment was provided in Week 10 and due in Week 12. It contained only 2 questions, but they were expanded and explored in depth. A significant part of the assignment was on Ruin Theory and being able to calculate the adjustment coefficient in different reinsurance contracts. Most of the calculations were done in Excel, as required by Shane, forming a part of the required submission. The other part of the submission can be handwritten or typed into a Word document.

Mid-semester test

The MST was held online in Week 7. Unlike the undergraduate subjects, the MST counts towards exemption. We were given one and a half hour to complete and upload the test. The MST had 2 multiple choice questions and 3 short-answer

questions. The questions were quite standard and focused on utilising techniques previously used in the tutorial and problem sheets.

End-of-semester exam

The exam was held online in 2020. Different to prior years, we were given three and a half hours to complete and upload our answers. Since this year's exam was open-book, proofs and questions where you could find from lecture slides or textbook were not directly tested, there was a stronger emphasis on understanding the underlying techniques. One practice paper was given; some questions were quite difficult and introduced new ways of applying textbook concepts, which was helpful for the actual exam. Overall, the exam was well written, especially since it was the first time this subject offered an open book exam. It had a good range/length of questions and, with sufficient revision, should all be doable. One point to note was that many questions required numerical solutions that may not seem 'pretty', i.e. having complicated equations, hence it is important to be both fast and accurate.

Concluding Remarks

I found this subject very interesting and well taught. It built on the probability and statistics concepts from earlier years in an insurance context. Shane taught the subject with clarity and dedication; he made sure to go through all the content even though the semester was cut short by a week. There were many practice questions with detailed solutions which greatly aided learning, and Shane provided even more clarification when needed. Overall, this was a subject I thoroughly enjoyed.

ACTL90005 Life Contingencies

Exemption status	CM1 *Actuarial Mathematics I*, in conjunction with ACTL90001 *Mathematics of Finance I*. Satisfactory performance across both subjects is required.
Lecturer(s)	A/Professor Shuanming Li
Weekly contact hours	2 × 1-hour lectures Additional lecture slots were blocked out in case content was not covered 1 × 1-hour tutorial during the two one-hour lectures, however, Shuanming did not use these with us.
Assessments	1-hour mid-semester test in Week 8 20% Individual assignment due in Week 12 10% 2-hour end-of-semester exam 70%
Textbook recommendation	None.
Lecture capture	Full (both audio and video).
Year and semester reviewed	2018 Semester 2

Comments

I really enjoyed ACTL90005 Life Contingencies. The subject really builds on ideas first introduced in ACTL90001 *Mathematics of Finance I* but rather than finding the present value of payments, we found the expected present values instead.

The subject was very content-heavy. The 2019 undergraduate version of this subject (ACTL30003 *Contingencies*) is 25 points, so they had double the lectures and double the tutorials for the same content.

Subject content

- Unit 1: Select life table and ultimate life table
  This unit is very short and gives a definition of a select life.
- Unit 2: Valuations of Insurance Benefits
  This unit introduces different insurance products that will be dealt with in future units, including whole life insurance, term insurance and endowment insurance amongst others.
- Unit 3: Valuations of Life Annuities
  This unit introduces different annuity products such as whole life annuity due, term annuity due, and continuously payable annuities. It also presents different approximations between continuous and discrete annuities.
- Unit 4: Future Loss and premium calculations
  This unit covers the equivalence principle and how to calculate the premiums of different insurance and annuity products.
- Unit 5: Policy Values
  This unit extends on Unit 4 and teaches calculations of the future value of a product under both discrete and continuous models.
- Unit 6: Multiple state Markov mortality models
  This unit builds on the previous two units and looks at premium calculations and policy values when there are multiple states rather than the simple Alive-Dead model.
- Unit 7: Joint Life Theory
  This unit looks at how insurance and annuity benefits are affected when there are two lives involved rather than one.

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- Unit 8: Multiple Decrements and Applications
  This unit teaches us how to build multiple decrement tables, so for example, a table that shows how many lives will die, retire or be injured each year. It also covers calculating future salary and benefits related to salary.
- Unit 9: Emerging costs
  This unit is very spreadsheet-heavy and looks at measuring the profit of different policies from an insurer's point of view.

Lectures

Our lectures moved very fast, so it was essential to attend them. Shuanming also provided additional handouts almost every week so it was doubly important to attend the lectures. The lectures elaborated on the content of the slides and really helped me to understand and give context to each unit. I tried to read through ahead of each lecture to stay on top of this massive subject, but I found the content too difficult to understand by myself without the explanations and timelines that Shuanming drew to explain things.

Tutorials

The tutorials were a great help towards my learning in this subject and I feel that attendance was essential to doing well. The tutorial solutions presented in class were sometimes different from the ones provided online afterwards and it was helpful to see different ways to solve the same problem.

Assignments

Our assignment was individual and mostly done in Excel. The questions were extensions of the examples covered in class. I found the assignment helpful in my revision for the exam as it was due in Week 12 and covered all units.

Mid-semester test

Our mid-semester test was one hour. It was difficult and I believe most people ran out of time. It covered units 1 to 5 and the questions were extensions of the content we had covered. All questions required a deeper understanding of the content and it was not enough to just memorise formulae and rote-learn the units. In particular, I'd hoped the questions covering the first two chapters on insurance and annuities would be straightforward application of formulae to find expected present values, however in reality, we were given questions that required going back to first principles to find slightly adjusted formulae.

Shuanming also wrote a few True/False questions that required us to find different forms of a formula. There was also a surprise question at the end that required knowledge from ACTL90006 *Life Insurance Models I*.

Personally, I found that the lecture examples, tutorial questions and problem sets provided more than enough material to use for revision for this test.

End-of-semester exam

Our exam was 2 hours and covered the whole semester. I found it was important to go to lectures and tutorials. In our last tutorial, Shuanming gave us a breakdown of the exam and expectations we could have for the structure of the final exam. During the lectures, he would also comment on formulae we were required to memorise and ones we did not, as there was no formula sheet provided.

Overall, I found the exam fair. There were many questions that were similar to ones we'd seen in either tutorials or as examples in lectures as well as some more difficult questions that required a deeper understanding of the content. The exam was long and had nine questions, but I found I had some extra time at the end to check over work and properly attempt questions I had skipped. We were provided with one specimen exam that I found more difficult and in a different style to the one we sat.

Concluding remarks

Overall, I really enjoyed this subject, especially the maths involved and the challenge of deriving variations on established formulae.

ACTL90006 Life Insurance Models I

Exemption status	CS2 *Risk Modelling and Survival Analysis*, in conjunction with ACTL90007 *Life Insurance Models II* and ACTL90020 *General Insurance Modelling*. Satisfactory performance across all three subjects is required.
Lecturer(s)	Prof David Dickson
Weekly contact hours	1 × Set of online lectures (adding up to roughly 1 hour) 1 × 1-hour workshop 1 × 1-hour tutorial
Assessments	Group Assignment 1, due in Week 5 10% Mid-semester test, in Week 8 20% Group Assignment 2, due in Week 11 10% End-of-semester exam 60%
Textbook recommendation	Dickson, D. C. M., Hardy, M. R., & Waters, H. R. (2013). *Actuarial Mathematics for Life Contingent Risks (2nd ed.)*. Cambridge, UK: Cambridge University Press. ✗ It is not necessary to buy this textbook. There are several copies in the high use section of the Giblin Eunson library. I would recommend consulting this textbook for additional problems should the problem sheets, tutorial problems and workshop questions not be enough.
Lecture capture	Full (both audio and video) for online lectures. None for workshops.
Year and semester reviewed	2019 Semester 1

Comments

Overall this subject was well taught and the content can be very interesting and intuitive. Assessments were challenging but fair with a wealth of questions to consolidate your understanding.

Subject content

- Modelling mortality — This section introduces lifetimes and how to model these lifetimes. New concepts such as lifetime distribution, survival function and force of mortality, which underpin the remainder of this subject, are introduced. It is important to know the intuitive interpretation and the derivation of the equations.
- Non-parametric methods — This section looked at applying data to model the lifetime distribution introduced in section 1. We start with an introduction to different types of censoring (when data is incomplete) and how to work with censored data then look at two different techniques to model a lifetime distribution.
- Estimating Mortality Rates — This section looks at modelling the mortality rate rather than the lifetime distribution. We examine three techniques; the Two-State Markov model, the Binomial model and the Poisson model. A good way to consolidate your understanding is to derive the Method of Moments Estimate and the Maximum Likelihood Estimate under different assumptions (Constant Force of Mortality, Baldduci, Uniform Distribution).
- Multiple state models — This section requires you to be comfortable with the previous sections as it is in a sense a generalisation of the dead or alive model taught in section 1. The differential equations may at first seem difficult but once you repeat the derivation across multiple questions you will see that the techniques are very routine. It is important to focus on the general techniques for solving and deriving these equations.
- The Poisson Process — This section is very proof heavy and focuses on different theorems associated with the

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Poisson Process. By the end of this section, you should be very familiar with the probability functions of the Exponential, Gamma and Poisson distributions as well as their Moment Generating functions. The numerical part of this section requires concepts learnt in Probability such as conditional probability, independence and equivalent events.

- Simulation — This is the shortest section in the course and was covered in the last week of lectures. This topic covers simulating random variables from a discrete or continuous distribution using random drawings from a uniform distribution.

Lectures

The lectures for this subject were delivered purely online. They are clearer than live lectures as David has the luxury of multiple takes. The lectures lasted about an hour in total per week, but I found myself spending two to three hours with pauses to attempt to reconstruct the proofs.

Assignment

The assignment was an individual assignment in Excel. The numerical computations were straight forward but a significant proportion of marks were given for presentation of the excel workbook and the written submission. It takes more time to obtain full marks for presentation than to obtain full marks for the correct answer. Attempting to copy the format and language used in David's textbooks is a good idea.

Workshops

Instead of lectures, David runs weekly workshops. It was an online multiple-choice quiz containing three to four questions. You can log into the website on your phone or laptop and submit the answers anonymously.

Tutorials

We all got a tutorial sheet, worked on a question in smaller groups, and then took turns presenting our solutions to the class. It was a great way to learn new techniques to solve problems as on more than one occasion, the solutions presented in class were different to the solutions uploaded to the LMS. In both workshops and tutorials David would give us key points in the question to look out for to highlight the important parts explained in lectures.

Midsemester test

The mid-semester exam was composed of standard questions across sections 1 and 2 with one challenge question. Doing textbook questions can give you an advantage as some of the question pool stems from the textbook but all questions were doable with the provided material.

Exam

The final exam was slightly more difficult than the mid-term exam purely due to the fact that sections 3 to 6 were more difficult than sections 1 to 2. The paper covered the whole semester's content and not just the second half. This exam was slightly more lenient with computation speed and accuracy as the other actuarial exams. David meant it when he said to not gamble by being an expert in certain areas/types of questions and neglect others. The exam extracted material quite evenly between lectures, workshops, tutorials and problem sets.

ACTL90007 Life Insurance Models II

Exemption status	CS2 *Risk Modelling and Survival Analysis*, in conjunction with ACTL90006 *Life Insurance Models I* and ACTL90020 *General Insurance Modelling*. Satisfactory performance across all three subjects is required.
Lecturer(s)	Dr Kevin Fergusson
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial
Assessments	50-minute mid-semester test in Week 8 20% Individual assignment due in Week 12 10% 2-hour end-of-semester exam 70%
Textbook recommendation	ACTL90007 Life Insurance Models II. Available from the bookstore. ✓ Yes, I recommend getting this textbook although all problems, tutorials and lecture material is also provided online as a PDF.
Lecture capture	Full (audio and visual).
Year and semester reviewed	2018 Semester 2

Comments

I thought ACTL90007 Life Insurance Models II was going to be an extension of ACTL90006 *Life Insurance Models I*, but it was completely different. In my opinion, Life Insurance Models 2 uses more statistics and has more theory and less mathematics. The content covered was more in line with what I imagine actuarial modelling is like.

Subject content

Unit 1: Rate Intervals

This unit introduces rate intervals and age labels. It covers life year, calendar year and policy year rate intervals. In my opinion, this unit was the most difficult as some of the calculations of exposed to risk under each type of rate interval was difficult to conceptualise. Wrapping my head around the start of the interval and how that related to a life was, at times, frustrating.

Unit 2: Hypothesis Testing

This unit introduces six hypothesis tests to test the validity of the data: the Chi-Squared Test, the Individual Standardised Deviations Test, the Cumulative Deviations Test, the Runs Test, the Signs Test and the Serial Correlations Test. Advantages and limitations of each test are also covered.

Unit 3: Graduation

This unit covers 4 different graduation methods including the Whittaker-Henderson method, the graphical method, graduation by mathematical formula, graduation with respect to a standard table and graduation using cubic splines. It also covers the advantages and disadvantages of each method.

Unit 4: Stochastic processes This unit is not related to mortality rate modelling and felt disjoint from the rest of the subject. Markov chains are studied in depth and there is a brief introduction into new stochastic processes such as the Compound Poisson Model and White Noise.

This review was previously published in the 2018 end-year edition of the *Actuarial Students' Society Subject Review*.

Lectures

I found the lecture content sparse. We were able to comfortably fit all content in the 50-minute lectures with time to spare. As a result, Kevin got to know us very well during lectures and vice versa. He knew all of our names which was also a nice personal touch. The lecture content followed the textbook content closely.

Tutorials

In our tutorials, Kevin went through all the solutions on the board and we had the opportunity to input our own opinions on alternative solutions. The tutorial questions were a great opportunity in seeing different applications of the content taught.

Assignment

For our assignment this year, we were required to graduate mortality rates under different models including the Whittaker-Henderson model. Most people used Excel, but we were allowed to use any program we preferred, and some tried their hand at the assignment with R. After graduating our rates, we were then required to perform different hypothesis tests to see if they fit the model well. The assignment was well-designed and gave us a chance for additional practice on hypothesis testing.

Mid-semester test

The mid-semester exam was 50 minutes and covered units 1 and 2. Overall, the exam was doable in the time given. We were required to perform all hypothesis tests from unit 2, including the serial correlations test, which does not have an example in the textbook.

Exam

This 2-hour exam covered all content in units 1 to 4. We had one past exam provided which I found extremely difficult and different from our actual final exam. Our exam had a mixture of theory questions and application questions. I think the professional exams were a good resource for additional questions as we were only provided with tutorial questions and textbook examples. I also found that the theory questions in the exam were similar to the ones from the professional exam. It helped me see which theories were more important and emphasised for this subject. Unit 4 in particular covered loosely-connected ideas and I found the professional exams helped connect and consolidate the required knowledge.

ACTL90008 Statistical Techniques in Insurance

Exemption status	CS1 *Actuarial Statistics I*, in conjunction with MAST20004 *Probability* and MAST20005 *Statistics*. Satisfactory performance across all three subjects is required.
Lecturer(s)	Dr Enrique Calderín
Weekly contact hours	1 × 2-hour lectures 1 × 1-hour tutorial
Assessments	50-minute mid-semester exam in week 7 — 10% Individual assignment due on last day of week 12 — 10% 2-hour end-of-semester exam — 80%
Textbook recommendation	ACTL30004 *Actuarial Statistics* workbook can be purchased from Co-op. ✓ The workbook is essential, as all tutorials are in this book and not provided elsewhere.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2018 Semester 2

Comments

Statistical Techniques in Insurance is a content heavy subject. Although the first chapters fit together nicely, I found some disjointedness in the content overall. The subject covered a lot of ground and I really enjoyed the topics.

Subject content

Unit 1: Introduction to R

This unit covers all the basics in R – from downloading the software to addition in R, to simulating values from probability distributions. Properly understanding this unit is essential to this subject because the assignment requires R coding.

Unit 2: Likelihood Theory

Much of this unit was taught in MAST20005 *Statistics*. It covers maximum likelihood estimation, the likelihood ratio test and the Fisher-Scoring algorithm.

Unit 3: Generalised Linear Models

This unit is an extension of Unit 2 and is especially applicable to actuaries. It covers parameter estimation for generalised linear models and techniques used to assess the statistical significance of the estimated parameter values.

Unit 4: Simulation

This unit covers different techniques in simulating random numbers from a variety of distributions. Some methods covered have been taught in previous actuarial subjects, such as the inverse transformation method, and other new methods are taught, such as the acceptance-rejection method.

Unit 5: Outstanding Claims Provision

This unit covers four different methods used by general insurers to calculate the liabilities.

Unit 6: Experience Rating Systems

This review was previously published in the 2018 end-of-year edition of the *Actuarial Students' Society Subject Review*.

This unit is the shortest section in the whole subject. It introduces the no claims discount system and explains applicable areas of insurance for the model.

Unit 7: Time Series Analysis

This unit introduces times series, which are variables that change over time. I found this unit the most difficult and the most maths heavy. We are introduced to new processes such as moving average processes and ARMA processes.

Lectures

Our lectures this year were during a two-hour time slot on a Monday evening. Fortunately, we were usually given a short 10-minute break in the middle. I attended all the lectures and I feel it was essential and helpful to do so, however, many of my class did not attend or only attended the first half. Although lecture capture records everything on screen, I felt that by attending classes, I was able to pick up hints for exams and assessable material more easily.

Tutorials

Tutorials were essential to attend as the solutions were handed out during class and were not provided online. Furthermore, Enrique often wrote additional notes or fleshed out solutions during tutorials.

Assignment

The assignment was an individual assignment which was done in R. Some of the stuff, such as glm calculations, was covered during lectures but the majority was not and required extra research. A coding background was extremely advantageous in this assignment as we were required to do "if" statements and "for" loops for some questions.

We were given the assignment after our midsemester break and although there was enough time, I found if I had not started on the assignment straight away, I probably would not have been able to finish it. The same assignment was given to the third-year undergraduate cohort but they worked on it in groups.

Overall, I found the assignment enjoyable, albeit at times frustrating, and found it helpful in my learning.

Midsemester test

We were provided with one past mid-semester paper as a guide. The test covered Chapters 1, 2, and half of chapter 3 and included practical questions as well as theory/proof questions. During lectures, Enrique told us which proofs were examinable and highlighted a select few, one of which was in our mid-semester test. There were also a few marks allocated to R code which he also informed us about during lectures. The exam was a reasonable length but as is usual with actuarial papers; I personally did not have time to check over answers at the end.

Exam

Enrique provided the 2017 exam as a specimen paper. I thought it was a good indication of the difficulty of the exam we sat. As usual with all actuarial exams, we were pressed for time. It covered all topics and had a good variety of questions. I believe the material we were given, tutorials and the 2 practise exams, was sufficient revision. During lectures, Enrique also covered tips on what we should memorise for the exam which turned out to be helpful, so definitely attend lectures and make a note when he says something needs to be memorised.

A couple topics I wish I had looked over again before the exam were the lognormal distribution and other common distributions. Although Enrique was fair and provided the probability density functions for more obscure distributions, seeing the lognormal distribution in a No Claims Discount system initially threw me in the exam. Another tip that came up during discussions after the exam was to make sure your calculator is in radians and not degrees.

During our 2018 exam, we were not required to reproduce any proofs of theorems taught throughout the course. Some things examined were not explicitly covered during semester and were assumed knowledge such as finding the quantile function from a cumulative distribution function.

Concluding Remarks

Overall, the exam was fair and felt like a reasonable test of our understanding of the course. The questions were a challenging extension of what we were taught.

ACTL90010 Actuarial Practice and Control I

Exemption status	ACC *Actuarial Control Cycle*, in conjunction with ACTL90011 *Actuarial Practice and Control II*. Satisfactory performance across both subjects' end-of-semester exam is required.
Lecturer(s)	Mr David Heath: General Insurance Mr Andrew Brown: Life Insurance Mr Donald Campbell: Superannuation
Weekly contact hours	2 × 2-hour lectures
Assessments	Group assignment 30% 3-hour open-book end-of-semester exam 70%
Textbook recommendation	Bellis, C., Lyon, R., Klugman, S., & Shepherd, J. (Eds.). (2010). *Understanding Actuarial Management: the actuarial control cycle (2nd ed.)*. Sydney, AU: The Institute of Actuaries of Australia The textbook is ✗ not essential. However, there are also background documents provided on the LMS at the start of the semester. These provide students with some basic knowledge of the three industries mentioned above.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Comments

Actuarial Practice and Control is quite different from many of the other actuarial subjects you would have taken previously due to its qualitative nature. Rather than dealing with mathematical proofs and calculations, this subject places more emphasis on the "consulting" part of actuarial work. As such, it requires students to have a more comprehensive skillset. For example, the ability to identify what is material in a situation and to effectively communicate findings to stakeholders.

Overall, the subject content is most definitely interesting, and it gives you a break from all the "mathy" subjects you've been doing and adds some context towards all the maths you've been learning. You gain much more of an idea of the types of situations and problems that actuaries actually encounter and solve in the workplace.

Subject content

This subject is based on learning objectives, which are discussed in a life insurance, general insurance and superannuation context. Broadly speaking, the learning objectives are:

1. Discuss and apply an actuarial control cycle in a variety of situations
2. Relate the main features within the general environment to medium and long term commercial decisions
3. Analyse the main features and risks of financial products and contracts, from the point of view of consumers and providers
4. Demonstrate an understanding of Enterprise Risk Management
5. Apply a risk assessment framework to identify the risks in a range of situations
6. Discuss and apply the process of product design
7. Understand how models are used to solve client problems

Lectures

All three lecturers are working actuaries with many years of professional knowledge in their respective fields. Since this subject evolves around approaching solving actuarial problems in the real world, it is very useful to listen to lecturers'

personal experiences and anecdotes, which is quite helpful for gaining a better understanding of some of the concepts in the subject. Lecturers also frequently mention current and past events (e.g. COVID-19) and their impact on each of the three different actuarial industries. While these are not always examinable, they are often used to differentiate the better answers in the exam.

Some of the lectures contain case studies, which can be used to test yourself on the ability to apply knowledge to real-life problems. Apart from understanding the solutions provided by lecturers, I recommend working through these examples again with other classmates. That way, you can compare your approach and way of thinking with theirs and identify any areas that you are missing or need improvement on.

One important thing about the lectures for this subject is that the order in which the topics are taught is quite confusing. For example, you would have a lecture on General Insurance product design followed by another one on Superannuation environment. Therefore, I suggest keeping your notes separate for each industry, which will make revision for the exam much easier as you would then have a systemic understanding of each industry and the interdependencies between the topics.

Assignments

For the group assignment, we acted as consultants to a financial organisation to provide actuarial advice on the design of a "capital guaranteed" product. Required submissions included a draft report, a newsletter to customers and a final report. The assignment was designed to imitate the stages of an actual work project. The reports were written in an executive summary format and advice provided was required to touch on the relevant regulation, sales and marketing strategies, potential risks and mitigation strategies of the product. The feedback given after the draft report is very useful and should definitely be incorporated into the final report. Overall, the assignment could be easily completed within the given time frames, as long as your group was efficient at dividing up tasks and staying on track.

End-of-semester exam

The final exam is open-book, so you don't need to memorise definitions, legislations, etc., which was quite useful. However, it is important to not give a generic answer that would fit into any circumstances, but a rather specific answer that is tailored to the question. Although three hours sounds like a long time, it was definitely packed with writing (or in the case of an online exam, typing) from start to end. The exam format was provided in Week 12, which clearly indicates the relevant topics for each question. The exam consisted of 9 questions and all questions required short answers, which can be done either in paragraphs or dot point form. Marks were allocated based on whether key points have been covered in the answer and sometimes bonus marks are given out for answers that showed a reasonable level of "thinking outside the box". A specimen exam was provided, which is very similar in both format and difficulty level (but not length) of the actuarial exam. Moreover, the final exam had one question that was related to an area not covered in-depth in lectures, therefore, having industry background knowledge is particularly important for this subject.

ACTL90011 Actuarial Practice and Control II

Exemption status	ACC *Actuarial Control Cycle*, in conjunction with ACTL90011 *Actuarial Practice and Control II*. Satisfactory performance across both subjects' end-of-semester exam is required.
Lecturer(s)	Mr David Heath: General Insurance — Subject coordinator; Mr Andrew Brown: Life Insurance Mr Donald Campbell: Superannuation Mr Andrew Gale: Health Insurance
Weekly contact hours	2 × 2-hour lectures
Assessments	Group assignment, due in Week 5 15% Group assignment, due in Week 10 15% 3-hour end-of-semester exam 70%
Textbook recommendation	Bellis, C., Lyon, R., Klugman, S., & Shepherd, J. (Eds.). (2010). *Understanding Actuarial Management: the actuarial control cycle* (2nd ed.). Sydney, AU: The Institute of Actuaries of Australia. The textbook is ✗ not essential.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 2

Overall Comments

Actuarial Practice and Control II is the continuation of the previous course, APC I. Both APC subjects form a bridge between the technical skills previously taught in *Part I* subjects and their applications in a business and commercial context. Therefore, they require, to a large extent, personal judgement and experience. Consequently, you should be thinking comprehensively and considering all potential implications when provided with specific cases.

APC II is slightly more technical and challenging compared to APC I, as it covers the techniques relevant in pricing products and calculating financial statement item and requires more industry knowledge together with a deeper understanding of the inter-relationships between the topics. In terms of succeeding in this subject, I found that studying in groups allowed me to best strengthen my understanding for each topic.

Subject Content

1. **Model**:
   - Selecting an appropriate model to solve actuarial problems. The majority of this topic has been studied in APC I, hence it is not explored in detail here.
2. **Capital**:
   - Recognizing the importance of capital, which is defined as the "excess of assets over liabilities", and the difference between regulatory and economic capital. We mainly discuss the purpose of capital, how capital is acquired, the quality of capital, and the calculations of regulatory capital requirements.
3. **Liabilities**:
   - This includes liability valuation, different types of liabilities of an insurer, and relevant economic and financial assumptions used in the valuation process.
4. **Pricing**:
   - This topic covers pricing of products and contracts. In particular, how premiums are calculated and what risks should be considered in the process of pricing.
5. **Solvency**:

- Measuring, reporting, and managing solvency of an insurance company, which is defined as the issue arising if insurers cannot meet the obligations as they fall due. We explored different types of solvencies in each actuarial industry and the corresponding solvency measures.

6. **Profit**:
   - Measuring and reporting profits as they emerge. The Accounting Principle indicates that revenue is only recognised when services are conducted. In terms of insurance companies, the emergence of profit is largely affected by liability valuation. We studied how profit emerges in each actuarial industry and ways to distribute or retain profit.
7. **Monitoring & Managing the business**:
   - These two topics complete the control cycle, highlighting its nature as a feedback loop. It is crucial for actuaries to monitor assumptions, evaluate performance, and make appropriate adjustments according to either favourable or unfavourable outcomes.

Lectures

The lecturers cover the previously mentioned topics by industry. For example, we would often have a lecture on Superannuation Solvency, followed by Life Insurance Solvency and General Insurance Solvency. The lectures are very similar to those in APC I, except that there is an additional lecturer for Health Insurance — Andrew Gale. There are only two lectures on Health Insurance and they are pretty much introductory compared to most of the lectures in the other industries.

Some of the lectures contain case studies, which can be used to test yourself on the ability to apply knowledge to real-life problems. However, solutions were not provided for all of the examples, and students were encouraged to post their answers in the discussion forum to share answers with other students and have meaningful discussions. I personally found it useful to compare my approaches and ways of thinking with other students to enrich my understanding of the subject content and identify any areas where I might need to improve on.

Assignments

For the group assignment, we acted as consultants to a superannuation fund to provide actuarial advice and develop a detailed methodology for the valuation of the fund's long service leave liability. Final submissions required a draft report and a final report.

The assignment was designed to imitate the stages of an actual work project. The reports were written in an executive summary format and advice provided was required to touch on the relevant accounting and actuarial regulations. Since the methodology for valuing long service leave liability was not covered in lectures, my group spent days researching the correct valuation method used by insurers in Victoria. What also proved to be difficult in completing the assignment was explaining actuarial concepts and formulae in plain language to the intended client - an accountant with no actuarial background. Luckily, David provided us with detailed feedback after reading through our draft report and we were able to produce a much better final report.

Overall, the assignment was harder compared to the assignment in APC I, since the knowledge required to complete this assignment was not covered in detail in lectures. However, with a reasonable amount of research, this assignment could be managed and completed within time frames. It should also be noted that, in this semester, the assignment was not considered for *Part II* exemptions, but it will affect your subject score at the end of the semester.

End-of-semester Exam

The final exam is open-book, so we were allowed to bring annotated lecture slides, the textbook, and other notes. When preparing for the exam, it is important to consider the interconnection between the topics, since, in reality, they do not exist in isolation. All questions required short and long answers, which can be done either in paragraphs or dot point form, depending on the question. Some questions can require an email or letter type of answer format. One exam question typically covers content from more than one topic. Marks were allocated based on whether key points have been covered

in the answer and sometimes bonus marks are given out for answers that showed a reasonable level of "thinking outside the box". Overall understanding of all the issues learned throughout the semester is required to be expressed effectively in the exam.

The exam was quite lengthy, although three hours sounds like a long time, it was definitely packed with writing (or in the case of an online exam, typing) from start to end. The specimen exam provided prior to the exam was both shorter and easier than the actual exam.

ACTL90013 Actuarial Studies Projects

Exemption status	None	
Lecturer(s)	Dr Kevin Fergusson Dr Rui Zhou Dr Zhuo Jin	
Weekly contact hours	3 × 1-hour workshop per project	
Assessments	3,000 word individual report, due at the end of Week 8, Semester 1 3,500 word individual report, due at the end of Week 4, Semester 2 4,000 word individual report, due at the end of Week 12, Semester 2	25% 35% 40%
Textbook recommendation	None	
Lecture capture	Full (both audio and video)	
Year and semester reviewed	2020 All Year	

Overall Comments

Actuarial Studies Projects is one of the two research subjects offered by the faculty, the other being the year-long research thesis. For those that are interested in completing a PhD, it is recommended to do the research essay. However, the majority of the cohort had chosen to undertake this subject, as it appears to be less demanding. This subject consists of three eight-week long projects, and there is no exam at the end of the year.

Subject Content

1. **Project 1** — The first project was led by Dr Kevin Fergusson and focused on analysing investment strategies for the purposes of mitigating interest rate risks. Key concepts used were from second-year financial mathematics subjects, as well as the *Black-Scholes option pricing model* which was taught in *Advanced Financial Mathematics* in the first semester of my postgraduate studies. For this project, Excel was sufficient to complete all the tasks, though it may have been possible to utilise R packages as well. Kevin had provided a detailed template on how to tackle each part of the problem, as such the overall difficulty of the project was not too high.
2. **Project 2** — The second project was led by Dr Rui Zhou and focused on analysing *longevity risk* hedge products. Some parts of the projects were quite similar to Assignment 1 have done in Contingencies back in 2019. For this project, R was required, and it was a bit of a struggle at first since I have not used R in quite a while. Nevertheless, once I remembered how to write functions, the majority of the technical portion of the project was fairly straightforward. More research was required by this project compared to Project 1, as concepts such as *basis risk* were not taught in previous subjects. There were quite a few research papers online, which you could find by either googling or going through the sources of the required reading provided.
3. **Project 3** — The third project was led by Dr Zhuo Jin and focused on analysing a ten-stock portfolio, as well as related options contracts and the *volatility index* (*VIX*). This project requires knowledge taught in Zhuo's third-year and fourth-year financial mathematics subjects, including *single and multi-factor models*, *mean-variance analysis*, and *options* knowledge. Excel was more than capable of completing the technical analysis, as long as you know how to use the Regression tool and Solver. However, no readings were provided for this project, as such it was hard to tell to what extent was required by Zhuo's standards. Overall, it did not feel like a particularly hard project, I was able to complete most of the project by watching several Youtube tutorials or explanatory videos, as well as going through just a few chapters of an ebook I have found from the university library website.

Summary

Being successful in this subject, largely depends on how well you can manage time. The advice is obviously to complete as much as possible, as early as possible, because as the semester goes on, you usually get assignments from other subjects (they all come at once!), or it is getting closer to the exam period and you do not want to be stressed out. The project leaders were quite helpful and would respond to questions through emails, so do not wait for consultations which only occur every three weeks.

Another key factor for success was being innovative. Whilst not as important for the first project, the second and third projects had specific requirements of 'innovation' in the marking criteria, as such it is important to look beyond the readings provided by project leaders, and find ways to incorporate something different into your report.

Looking back, this was one of my favourite subjects in my postgraduate degree as it provided good practical experience and allowed me to apply knowledge learnt to a more 'real-life' situation. It is also something worthwhile to bring up in an interview, especially if you did not get the opportunity to work on large projects during your undergrad degree. For those who are not sure what subjects to take, I would strongly recommend giving this subject some consideration!

ACTL90014 Insurance Risk Models II

Exemption status	None
Lecturer(s)	Dr Enrique Calderín
Weekly contact hours	3 × 1-hour lectures
Assessments	Mid-semester exam in Week 7 20% Individual assignment, due in Week 10 10% 3-hour end-of-semester exam 70%
Textbook recommendation	Dickson, D. C. M. (2005). *Insurance Risk and Ruin*. Cambridge, UK: Cambridge University Press. The textbook is ✗ not essential. However, it is extremely good at explaining some of the more complex concepts learnt. The exercises in the textbook are also useful for exam practices.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 2

Overall Comments

Insurance Risk Models II (IRM2) is an extension of ACTL90004 *Insurance Risk Models* (IRM) and has a similar level of difficulty. In comparison to IRM this subject concentrates more on the application of theories in practical insurance problems, instead of the models that insurance companies use. The concepts in this subject are a lot easier to understand than the abstract *martingale theory* of financial mathematics, however, the challenging part of this subject is to derive and solve complicated differential equations, which often requires solid computational skills. Nonetheless, if you have done well in IRM, this subject should not be too difficult.

Overall, IRM2 will not be as conceptually challenging as many of the subjects you will have taken in the past. Resultantly, many of your mistakes in calculations will be silly mistakes, so it is always useful to double-check your working before moving onto the next step. In the assessments, the questions that differentiate good and excellent students are likely to be those that require you to prove something or derive/solve complicated differential equations. To conquer those questions, you will need to find your best way to understand the proof of each theorem and be able to use them flexibly.

Honestly, if you have made it this far into your degree, it should not be too hard to do decently well in this subject. Best of luck!

Subject Content

While this subject's precursor deals with models for a general insurance company, Insurance Risk Models II is concerned with the decisions made by the Insurer in a variety of contexts. The subject content is split into 4 distinct units:

1. **Utility Theory** makes its return from ACTL30006 Intermediate Financial Mathematics. Calculations on the minimum and maximum premium amounts that should be charged for a given risk and utility function are the focus of this unit.
2. **Premium Principles** explores a wide range of methods to calculate premiums by taking into account the moments of the corresponding distribution of risk.
3. **Optimal Reinsurance Arrangements** is where the subject starts to get a bit hairy. *Suppose an insurer is thinking about reinsuring its business; what type of reinsurance arrangement should it take (e.g. Excess of Loss, Proportional)?* Depending on the goals of the insurer, the optimal reinsurance arrangement is different. Here you will cover an onslaught of theorems to rigorously prove the optimality of these arrangements — arguably the hardest part of the course.

4. **Ruin Theory**: Insurers are always at risk of becoming ruined (i.e. having no more money). Assuming that claims paid follow a compound-counting process, we are interested in the probability that this actually occurs over both finite and infinite time intervals. Interestingly, the answer is not always 1 in the infinite time case. This topic derives *Lundberg's inequality for the probability of ruin* (which you may remember from IRM), covers finding the analytic solutions for the *ruin probabilities* (assuming certain distributions) using various calculus techniques and derives approximations to the ruin probability.

Lectures

Much like in IRM, slides were released in units (with the exception of Unit 4 which was released on a rolling basis). Enrique went through each slide, filling in any blank space with proofs and examples as they appeared. However, the pace of teaching was quite fast and sometimes it could be difficult to follow up on the lectures. Other than that, Enrique explained the theorems comprehensively using additional diagrams not found in the lecture notes; I found those diagrams very helpful to understand the theorems.

Occasionally, a tutorial was held in place of a lecture, in which Enrique worked through around 5 questions. In addition to tutorials, problem sheets were provided on LMS on a weekly basis for students to practice. Some of the questions in the problem sheets were closely related to knowledge taught in IRM (especially for *(a, b, 0) and (a, b, 1) classes of distributions*), hence you need to be very familiar with those concepts and formulas. Additionally, some of the questions referred to the textbook.

Mid-semester Exam

The mid-semester exam was held in Week 7, with a specimen mid-semester exam provided as practice beforehand. In 2020, the only units that were examinable were Units 1 and 2.

Due to the pandemic, all exams were taken remotely and therefore the exam structure was quite different from previous years. Questions in the exam ranged from theoretical questions to computational questions, and these were asked in forms of multiple-choice, short-answer and long-answer formats. The mid-semester exam was relatively easy, considering the strong set of mathematical tools that the undergraduate course should have equipped you with.

Assignment

Questions in the assignment were primarily related to Unit 3, with one question on Unit 4. It was a very long assignment, with seven lengthy questions. Overall, none of the questions in the assignment were too difficult to answer. However, there was one question whose tasks were to conduct additional reading outside the scope of the subject to reproduce the proof from a specific paper; another question that required the use of RStudio to produce different diagrams.

End-of-semester Exam

There was a specimen final exam provided as a practice, although only a few of the practice questions were closely related to those in the real final exam. Due to the nature of an online exam, questions focused more on your understanding instead of your computational skills. For example, instead of asking students to derive a specific mathematical expression — like what would be normally asked, students were given the derivation and were asked to explain the derivation in detail.

There were three multiple-choice questions and eight long-answer questions in total, with more of a focus on Units 3 and 4. Many of the questions were quite approachable. Questions ranged from some calculation questions like: *"Should an individual purchase an insurance at a specific premium using utility theory"* and *"Prove that a reinsurance arrangement is optimal"*, to explanatory questions like: *"Explain intuitively what this mathematical expression means"*.

ACTL90018 General Insurance Practice

Exemption status	None; this subject does not constitute any exemption requirement but is intended to prepare students for their *Fellowship Program* exams.
Lecturer(s)	Mr David Heath Ms Lynda Young Mr Cameron Lucas
Weekly contact hours	2 × 1.5-hour lectures
Assessments	Group assignment, draft due in Week 9, final due in Week 12 30% 3-hour end-of-semester exam 70%
Textbook recommendation	Hart, D., Buchanan, B., Howe, B. (2007). Actuarial Practice of General Insurance (7th Ed). Sydney, AU: The Institute of Actuaries of Australia. The textbook is mentioned a few times during the semester, but the slides are more than sufficient for the subject.
Lecture capture	Full (both audio and video).
Year and semester reviewed	2018 Semester 1

Comments

One of the main draws for doing the Masters of Commerce instead of Honours is the opportunity to study General Insurance Practice (GIP) to prepare for your Part III exams if you choose to specialise in general insurance. Taken by working actuaries, this is one of the most practical subjects you will study, and will give you a great taste for what is to come.

Subject Content

The subject aims to be a watered down version of the 3A and 3B General Insurance modules with the Actuaries Institute. Obviously, it would be impossible to fit everything in these modules in this subject, but nonetheless, this subject is still an excellent introduction into the main aspects of general insurance (GI). The topics are categorised as follows:

General Insurance Products (4 lectures) – Before studying what actuaries actually do in GI, we require a strong understanding behind the general insurance products out there, and how they work. Different insurance products will have very different characteristics. For instance, workers' compensation insurance claims might take years to resolve, but something like a comprehensive motor insurance claim may only take a couple of weeks. The impact that these differences have in an actuary's work will become clear as the semester progresses.

Liability Valuation (3 lectures) – Now that we know about GI products, we get to some numbers. Some claims might take years to resolve. Of the claims that have come through the door, how might we estimate the amount of money that we expect to pay out for these claims? Actuaries use development triangles (which was briefly touched upon in ACTL30004 *Actuarial Statistics* under the name Run-Off Triangles) to do just that. Different models such as the PPCI, PPCF, PPAC models and more are touched on here, each of which relies on a different aspect of the claim handling process, and an explanation as to when one may be more appropriate to use than another.

Reserving (4 lectures) – Balance sheets for an insurer are quite interesting. Recall that an asset/liability is an expected cash inflow/outflow from an entity arising from events that have occurred in the past. For an insurer, reserves are created for claims that have been made in the past, but these amounts are unknown: we don't know if an injured person will need $1,000 to pay for medical fees in the future or $100,000! Touching upon the accounting principles of revenue recognition,

This review was previously published in the 2018 mid-year edition of the *Actuarial Students' Society Subject Review*.

matching expenses to revenue and conservatism, the ideas of unearned premium reserve, outstanding claims reserve, premium liability reserve, and unexpired risk provision are explored. Among other topics, accounting for the uncertainty in these reserves is covered as well, before finishing off with reconciliation, which helps actuaries understand the movements in the outstanding claims provision from period to period.

Pricing (5 lectures) – How exactly do we determine an appropriate premium to charge customers for coverage? A premium should cover what we expect to pay out and any expenses we may incur, as well as a profit margin. However, there may be some instances where premiums charged are much higher or lower. Why would that be? Things to consider while pricing are covered here, as well as modern techniques for pricing premiums, which touches on some machine learning ideas (such as overfitting and cross-validation), machine learning models (such as gradient boosted machines, and random forests) as well as the Generalised Linear Model (which you should be very familiar with from *Actuarial Statistics*).

Capital (2 lectures) – i.e. the excess of assets over liabilities. Recall that insurance is about bearing the risk of policyholders. If the money we have set aside for claims is not enough, then the insurer goes bust. To account for this, APRA (the regulator for insurance) requires insurers to hold a minimum amount of capital. How exactly is this minimum amount determined? Two insurers with the same number of policies may have vastly different capital requirements, simply due to the nature of the types of insurance products they provide.

Following these broad topics, a series of single topic lectures are delivered. The first dedicated to Government Injury and Disability schemes, giving some background behind insurance schemes that have government involvement such as Worksafe and the TAC. Accounting statements and profits are covered as well, showing how our reserving assumptions may affect how profit emerges for an insurer. Lastly, the role of the appointed actuary is covered, outlining what the requirements of the appointed actuary are, as well as the reports they are responsible for. The last few lectures are dedicated to revision.

The subject is still in its infancy (only being the second time the subject was delivered) and there are no strict curriculum requirements set by the Actuaries Institute, so the content is quite malleable. Lecturers are always open to feedback to see how the subject could be improved as well. Because of this, don't be surprised if the way the subject is delivered is vastly different to what is in this review. Overall, like the APC subjects you would have studied beforehand, the subject is quite qualitative.

Lectures

Just like in APC, the subject is delivered by a number of working actuaries. David Heath makes a return from APC as the subject coordinator, alongside Lynda Young (who delivered the reserving module) and Cameron Lucas (for the pricing module). Each of the lecturers were extremely clear in explaining specific ideas and encouraged students to ask questions that they had during the lecture. As such, lectures were very engaging, despite starting at 5:15pm.

The cohort of 2017 left an extremely good impression for the lecturers, as there was active discussion from not only the lecturers, but also the very small cohort. I think David was hoping to reproduce that experience in 2018, where unfortunately, the cohort was very quiet. I strongly encourage you to answer questions that are asked by the lecturers, as they not only force you to think a bit more, but they might also help to correct some of the misunderstandings you may have about certain concepts. You don't have to be correct all the time!

Discussion Forum

Just like in APC, the discussion forum is available for students to ask questions they had about the subject content. Apparently this was used heaps in 2017, but it was not used at all in 2018 (and I imagine David will point this out when he teaches the subject in 2019). Unlike the Online Tutor, the discussion forum is not anonymous.

Students can provide answers for questions others have posted, as well as lecturers. With the right cohort, this would be an extremely powerful tool to help consolidate understanding, as you would be able to (attempt to) answer another student's question with what you think the answer is, and the lecturer would be able to not only answer the original question, but

also comment on the response that you provided (either confirming that you were right or providing amendments to your answer). Try your best to use it if you don't understand something in the subject. There is nothing wrong with being incorrect!

Group Assignment

The group assignment involved looking at the annual reports of two very different insurers, looking at a number of figures from the balance sheet and income statement, and commenting on them. Students were then asked to compare the difference of the figures between the two insurers by considering the characteristics of the two insurers. Like in APC1 and APC2, a report was meant to be submitted in two parts: a draft, and a final after feedback was provided on the draft report.

Overall, students performed fairly poorly. I personally felt like it was a bit unclear as to what David was exactly looking for, and David spent a bit of time in lectures clarifying what exactly he was looking for before the deadline for the final report. Despite that, the assignment was designed to help students understand some of the reasons behind the figures in the annual reports, and in that regard, it was extremely helpful.

End-of-Semester Exam

Much like the APCs, the end-of-semester exam is a three hour exam. However, unlike the APCs, it is a closed-book exam, meaning we could not bring in our 300-page binder of notes. A specimen exam is provided, which is a good indication of the types of questions you will encounter in the exam. However, I thought the actual exam was ever-so-slightly harder than the specimen.

Everything on the course was examined, from liability valuation, to reserving and pricing. I found the exam to be quite a bit more computational than the APC subjects before it, so some comfort can be derived from that. Depending on the question, you may also be able to use the numbers provided in the question as a check for your calculations. If you have studied machine learning in the past, then that will also help you heaps for the pricing section. I found the trickiest part of the exam to be the reconciliation section.

Overall, I felt the exam was very fair.

Concluding Remarks

Thinking back on it, I should have taken advantage of the fact that it was delivered by working actuaries to ask more questions, as ultimately, this is what I am likely to end up doing for a huge chunk of my career. GIP was an incredibly interesting subject, and I strongly recommend taking it.

ACTL90019 Data Analytics in Insurance II

Exemption status	DAP *Data Analytics Principles*, Satisfactory performance in this subjects' end-of-semester exam is required.
Lecturer(s)	Dr Rui Zhou
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial
Assessments	2 × Group presentations, due in Week 8 and Week 12 30% 4-hour open-book end-of-semester exam 70%
Textbook recommendation	James, G., Witten, D. Hastie, T., & Tibshirani, R. (2013). *An Introduction to Statistical Learning with Applications in R.* The textbook is ✓ essential, as it provides in-depth explanations of the intuition behind many concepts taught in the lectures.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 2

Overall Comments

This is a new fourth-year subject and is one of the *Actuary Program* exemption subjects. It builds on the concepts taught in ACTL30008 Actuarial Analytics and Data I, going through almost identical topics, and focuses on many practical examples throughout lectures and tutorials. While technical skills in R is essential, the subject also requires strong analytical skills. Being able to interpret results is key to learning the content well.

The subject was quite enjoyable, as I really enjoy Rui's style of lectures, and the content taught throughout this subject does seem more practical than many others in the past. To future students, I would encourage everyone to not just aim to master the R programming language, but also work on interpreting results, as you definitely need the combination of both to do well in this subject.

Subject Content

The subject covers the following topics:

1. **Regression & Classification**: linear regression is a useful tool for predicting a quantitative response, whereas predicting a qualitative response for an observation can be referred to as classifying that observation since it involves assigning the observation to a category, or class.
2. **Resampling**: resampling methods involve repeatedly drawing samples from a training set and refitting a model of interest on each sample to obtain additional information about the fitted model.
3. **GLM**: generalized linear models can be used to model both frequency and severity from claim data
4. **Tree-Based Methods**: tree-based methods involve stratifying or segmenting the predictor space into a number of regions, methods include bagging, random forest and gradient boosting.
5. **Neural Network**: the central idea of neural network is to extract linear combinations of the inputs as derived features, and then model the target as a nonlinear function of these features

Lectures

Rui releases lecture slides and recordings at the beginning of each week. The lectures are quite often split between theoretical content and practical demonstrations on R. Most of the theoretical content is directly extracted from the textbook, with some level of restructuring. Generally, the theory covers the concepts used in the practical example that follows, where Rui

applies these concepts to a dataset of her liking. Personally, I really enjoyed the lecture structure, as Rui's demonstration on R certainly reinforced the theory that precedes it, giving students a better grasp on how textbook knowledge works in real life. The lecture slides are not necessarily considered comprehensive, as only brief descriptions are provided. Therefore, reading the textbook is recommended in order to get a deeper understanding of the intuition behind the concepts.

Tutorials

The tutorials focused on R applications of the concepts taught in lectures. I personally found the tutorials useful, as the relevant techniques demonstrated by Rui were very helpful when it came to completing assignments or the exam. Detailed solutions are uploaded as well, though it goes without saying that listening to how Rui interprets the outputs is extremely beneficial in improving your own understanding.

Assignment

The only in-semester assessment was the group assignment. Students formed themselves into groups of three, chose any dataset of interest and utilised data analytics techniques taught throughout the semester to analyse the dataset. Groups were judged on two presentations. The first covered mainly introductory content, outlining the objective of the analysis, and conducting exploratory data analysis. The second focused more on the methodologies used for the analysis and how groups responded to any issues they faced. Overall, this assignment was a great way to summarise the majority of the course content, as you need to have a thorough understanding of the advantages and disadvantages of different models and methods.

End-of-semester Exam

The end of semester exam was conducted using R, lasting for four hours. While this may seem like a long time, do not be fooled. The exam was still packed with many questions, and most people ran out of time. The exam was split into two sections (six questions each). The first section was spent answering general theory questions, whilst the second was spent analysing a specific dataset. The marks were not allocated proportionally, however, as the second section of the exam was worth about double the marks of the first half, so do spend time wisely. I would say that most of the content did come from lectures and tutorials, but you definitely need to be very familiar with both coding and interpretation to complete all questions in a sufficient time manner.

Breadth and Elective Subjects

Contents

Breadth Subjects and Master's Electives

BLAW10001 Principles of Business Law [SM1]

Lecturer(s)	Dr Tanya Josev
Weekly contact hours	1 × 2-hour lectures 1 × 1-hour workshop in Weeks 3, 8 and 12 (optional)
Assessments	2 × multiple-choice quizzes in Weeks 4 and 9 2 × 10% = 20% 1.5-hour end-of-semester exam 80%
Textbook recommendation	Lambiris and Griffin. (2017). *First Principles of Business Law.*
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Comments

Principles of Business Law should have a considerably less workload compared to your other actuarial subjects, giving you more time to focus on them. Through this subject, I got an understanding of what it is to actually study law and learnt about important real-life scenarios which could potentially affect me when it comes to contract law. I highly recommend this subject if you are keen on getting a taste of what learning law is like.

Subject content

1. **The nature and function of law**:
   - This section introduced different types of law and gave a summary of who makes law.
2. **Legislation as a source of law**:
   - This was the first content-heavy week in terms of material. It talked about the legislative process in significant detail and introduced the legislatures in each state of Australia.
3. **Role of the courts in law-making**:
   - We were presented with the basic procedure of a civil case and made familiar with important law jargon such as *Stare Decisis* and *Ratio Decidendi*. I'd suggest understanding these two concepts thoroughly, as they were tested in both the first quiz and in the final exam. It was also in this chapter where different cases were first introduced.
4. **Contract Formation**:
   - This subject heavily focuses on contract law and devoted 5 weeks of learning to it. Here, we were presented with what a contract is and what it means for a contract to be created and enforced in law.
5. **Terms of a Contract**:
   - Here, we were presented with some terms that later become essential when deciding if a contract has been breached or not. Classifications such as *Conditions* and *Warranties* is paramount to your understanding this section, particularly the hypothetical tests to classify each term. The latter half of this topic touches upon the key sections of the Goods Act and how they protect consumers.
6. **Discharge of Contractual Obligation**:
   - We were introduced to different levels of performance and the different kinds of breaches. Understanding the terms learnt in the previous topic is key to fully comprehending this topic's content.
7. **Remedies for Breach of Contract**:
   - We were presented with different remedies that are available for different degrees of contract breaches.

8. **Circumstances that may invalidate legal transactions**:
   - This was the last week of contract law and discussed in depth the situations in which contracts can be defaulted. This was possible via proving that vitiating factors existed, such as: duress, undue influence, mistake, unconscionable dealing, misinterpretation and illegality. Proving these existences required us to implement hypothetical tests and compare these to the outcomes to past cases that had been decided upon.
9. **Consumer Protection**:
   - This week discussed important sections of the Australian Consumer Law and how it protects consumers. A key section is classifying who a consumer is and how they are defined. This is important because different sections of the Australian Consumer Law state whether it applies to only consumers or anyone.
10. **Tort Law**:
    - A brief summary of the different types of tort law was introduced before learning in detail the *tort of negligence*. We were presented with the necessary elements to establish negligence, and later discussed remedies if negligence had been deemed existent.

Lectures

Tany broke down 2-hour lectures into 4–5 smaller videos that were much easier to digest and also gave me the freedom to take breaks in between the lectures. These videos were again broken down into topics, making the content much easier to comprehend. Moreover, what I really enjoyed about Tanya's lectures was the last video in each of her lecture, where she discusses a hypothetical situation. Here, we used apply theory and concepts learnt in the former sections of the lecture to new hypothetical situations.

Workshops

Before each of the online quizzes and the final semester exam, a sample paper was released. Workshops would involve discussions on the questions from this paper. Similar to the lectures, workshop videos were broken down and seperated the questions by topics. This made it easier for students to keep track of the content and identify sections they struggle with. I'd suggest attempting the sample papers before watching the workshop videos, because the questions are much trickier than you think and the explanation then helps to clarify any doubts.

Multiple-Choice Quizzes

There were two online multiple-choice tests consisting of 40 questions each, and were to be completed in an hour in one sittings. Each test makes up 10% of your final grade and were open-book, so I suggest writing your notes and keeping up with the lectures accordingly.

The first assessment tested our knowledge of the first three weeks. Since this was open-book, I went into this quiz with minimal preparation and assumed that the lecture sides were sufficient. However, there was a lot of details that were explained in the lectures instead of being written in the slides. In retrospect, as the lecturer mainly tested us on her explanations, noting down everything important would have proved as a more effective studying technique. Having noticed this, I found the second assessment much easier than the first, as I prepared more for the it with more concrete notes.

End-of-semester exam

There wasn't as much practice available for this subject compared to your normal math subjects, so I'd recommend becoming familiar with its contents. I found the end-of-semester exam much harder than the sample paper and the assessments, so don't take this subject lightly just because it's open-book and multiple choice. Tanya and the teaching coordinators emphasised how this subject isn't just about memorising; In my opinion if you are someone who can easily memorise content, you will have an added advantage over other students. That said, the majority of the questions tested us on the understanding of the content itself, instead of our knowledge of the textbook.

COMP10001 Foundations of Computing [SM1]

Lecturer(s)	Prof Tim Baldwin Dr Nic Geard Ms Marion Zalk
Weekly contact hours	3 × 1-hour lectures 1 × 1-hour tutorial 1 × 1-hour workshop
Assessments	Weekly Grok Worksheets 10% 40-minute Grok-based mid-semester test in Week 8 10% Individual project 1, due in Week 9 15% Individual project 2, due in Week 12 15% 2-hour and 15-minutes end-of-semester exam 50%
Additional Information	There is a hurdle requirement of 30/60 marks across the mid-semester test and end-of-semester exam.
Textbook recommendation	None
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Comments

COMP10001 Foundations of Computing (FoC) is an introductory subject on programming and the basics of algorithmic thinking, taught with Python 3. As the subject does not expect students to have prior knowledge in computing, everything is taught from scratch with the help of a highly interactive online programming platform, **Grok**. Therefore, for those of you who are completely unfamiliar with computing but are interested in gaining some basic knowledge in it, do not hesitate to take up this subject as you will be guided through the fundamentals step by step.

A considerable amount of effort and time is required to score well in the subject. However, I believe it is engaging and enjoyable enough for most of you to put in the effort voluntarily and is definitely a breadth subject worth taking! The coolest part of the subject is that, if you manage to complete all the required worksheets or the projects, bonus marks are rewarded to those who also successfully completes the bonus worksheets and questions. This gives us a chance to compensate for any lost marks during our assessments.

Subject content

- **Week 1**: Introduction to Computing and **Grok**; Programming Basics
  - Introducing the building blocks of programming
- **Weeks 2-9**: Python Fundamentals
  - Covers the Python basics such as functions, methods and loops and different data types like lists, tuples and dictionaries. Later, we were introduced to the different bug types and the general approach to debugging. Then, we were taught how to write, read and open normal and CSV files using input/output operations. Recursion was the last topic being covered under the Python Fundamentals.
- **Week 10**: HTML; Algorithm Fundamentals and Families
  - Introduces the simple mark-up language of HTML, allowing us to form lists and tables. Also covers the basics and the different approaches of algorithms.
- **Week 11**: Computational Counting; Digital Representation; Fairness and Ethics

– Covers the conversion between decimal, binary, octal and hexadecimal numbers. Also discusses about different types of text document encodings. The last topic, Fairness and Ethics, talks about the professional conduct and dual use of computing.

Lectures

Initially, the on-campus lectures were split into two streams, before transitioning to recorded online lectures in week 4. Lecture slides were posted the night before their corresponding online lectures were uploaded on Canvas.

Lectures in the first eight weeks of the semester were delivered by Tim, mainly covering topics related to the fundamental concepts and building blocks in Python to construct simple programs. Tim would split the lecture into 2 recordings, the first one being announcements and the second being the lecture content itself. Personally, lectures in these weeks were easy to follow coupled with the weekly worksheets on **Grok**.

For weeks 9 and 10, lectures were delivered by Nic, covering contents such as CSV files, recursion and the basics of HTML. Similar to Tim, Nic would also split the lecture into several recordings, each corresponding to a specific topic covered in that lecture. I found recursion to be the most challenging topic in the subject as the concept of breaking the problem into the same problem with smaller input was quite difficult to grasp. Fortunately, during the exam, instead of asking you to write a code using recursion, they would only test on our understanding of the concept behind it.

During the lecture, both Tim and Nic would typically start off by briefly introducing and explaining the concepts before discussing the in-class exercises. It is recommended that you pause the lecture recording and attempt the exercises on **Grok** yourself before proceeding to watch the solution suggested by the lecturers.

Tutorials and Workshops

All tutorials went fully online on Zoom starting from week 3, with a tutorial recording being made available on Canvas each week. In the tutorial recordings, the tutor would go through each of the tutorial questions and provide explanations for the solutions. Even though students would not be able to answer the questions or interact with the tutor during such recordings, you could still participate in any of the live Zoom tutorials. I did not attend the live tutorials and simply relied on the recordings and the solution sheets as I found it more convenient to go through them at my own pace.

Originally, we were also supposed to attend a separate weekly workshop, where its main purpose was to allow students to ask **Grok** or project-related questions. Students would attend the workshop together with around 30 other students in a computer lab. However, it was completely cancelled during the studying-at-home period. Though if you have any questions regarding the **Grok** worksheets, I would highly recommend you make use of the tutoring help on the **Grok** platform or post your questions onto the forum! The forum is a space where students are allowed to post general questions and interact with other students by answering their questions, if you are able to and would like to help out. The tutors were very helpful and responsive, usually answering the questions on the same or following day. Besides that, I found that most of the time the questions I had in mind would already be asked and answered by other students on the forum.

Grok Worksheets and Projects

There was a total of 18 **Grok** worksheets this semester, usually with 2 or 3 due each week. Each worksheet consisted of notes and exercises (in the form of diamonds). The notes would first introduce you to contents related to the topic covered in the specific worksheet. You would then be asked to complete exercises revolving around the concepts introduced and achieve the green diamonds after passing all the tests in the exercise. To me, **Grok** worksheets were the most enjoyable part of the subject as achieving the green diamonds kept me engaged in the subject and the notes were also easy to follow and understand. Therefore, by putting consistent effort into completing the worksheets, you would already have scored an easy 10% of the subject!

Apart from the weekly **Grok** worksheets, there were two individual projects to be completed during the semester, each contributing 15% to the subject's final marks. Each project was broken down into four to five parts and there would be one

bonus question at the end. Since we were given around five to seven weeks for each project, many students only started attempting the projects a few days before the deadline. A lot of them actually posted on the forum around the deadline of project 2 saying that they found the last diamond too challenging and almost impossible for them to complete within such a short period of time. Therefore, I would advise students to start attempting the projects earlier, even if it just meant getting yourself familiar with the questions and not leave it to the last minute.

Mid-semester test

Unlike previous years, this year's mid-semester test was run on **Grok**. The test was 40 minutes long and there were 4 questions in the paper, for a total of 40 marks. Before the day of the mid-semester test, a practice test was made available for us to familiarise ourselves with the format and structure of the test.

The questions given in the mid-semester test were related to code interpretation and code generation, such as writing a single expression that satisfies certain conditions to generate a specified output and rearranging lines of a function. As long as you consistently put in the effort and keep up with the lectures, tutorials and worksheets, you should be able to perform well in the test.

End-of-semester exam

Similar to the mid-semester test, the end-of-semester exam was also being run on **Grok** with the same format. Except that there were 9 questions in total, adding up to 120 marks. Rather than just having two sections, an additional section on conceptual questions was tested. A dry-run final exam was again made available for a few days before the actual exam took place.

Overall, the final exam was not too difficult as we would have been familiar with the concepts and style of questions. However, I did find two questions under code generation to be slightly more challenging than the rest. One of the questions required us to fill in the missing lines of code in a function and I took the majority of the time trying to figure out the purpose of the function. To tackle such questions, it was useful to look for the links between the missing lines and the rest of the code as there would often be hints. Besides, I found it helpful to attempt the past year papers, which were uploaded onto Canvas, even if the format was slightly different as the style of questions were very similar. So definitely attempt those past year papers and do not hesitate to post your questions on the forum if you are stuck!

COMP10002 Foundations of Algorithms [SM2]

Lecturer(s)	Prof. Alistair Moffat Dr Artem Polyvyanyy
Weekly contact hours	3 × 1-hour lectures 1 × 2-hour workshop
Assessments	3× Online quizzes 3×10% Individual Assignment 1, due in Week 8 20% Individual Assignment 2, due in week 12 20% 1-hour 15-minute end-of-semester exam 30%
Additional Information	This subject is only available for students who are completing the *Diploma of Computing* or able to achieve the programming competency prerequisite.
Textbook recommendation	Moffat, A. (2012). *Programming, Problem Solving, and Abstraction with C, Revised Edition*. Pearson. ISBN 9781486010974 ✓ Recommended, especially as a useful revision material closer to the exam period. It is an extension of the lecture slides as most of the content in the lecture slides come from the textbook, which covers the concepts taught in more details.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 2

Overall Comments

COMP10002 Foundations of Algorithms (FoA) is a continuation from COMP10001 *Foundations of Computing* (FoC). It is a prerequisite for most of the second and third-year computing subjects and uses the programming language C. Students are encouraged to download a compiler and code editor early in the semester to familiarise themselves with the programming environment on their laptops.

An important thing to note is that due to the structure of the Bachelor of Commerce, students can only take a maximum of 125 points of Level 1 subjects. Therefore, unless you plan to enrol in the *Diploma in Computing*, you would need to replace ACTL10001 with COMP10001 in order to achieve the prerequisites for this subject (unless you can enrol with the programming competency pathway).

Overall, I found COMP10002 challenging yet fun. It has enabled me to learn and think about the different approaches and algorithms when solving a problem. Although it took me some time to get used to not coding on **Grok**, I soon appreciated the accessibility of programming using a code editor and compiler.

Subject Content

1. **Introduction to Algorithms; Introduction to C Programming**
2. **Selection, Iteration and Abstraction in C**: Introduces the precedence of operators in C programming, the different types of loops and functions.
3. **Functions and Pointers**: Discusses how we can call and pass variables into a function.
4. **Arrays and Algorithms**: Introduces arrays and pointer variables.
5. **Analysis of Algorithms**: Discusses the efficiency of algorithms using the Big O notation. Introduces the algorithms and efficiency behind binary search and quicksort.
6. **Strings and Pattern Search Algorithms**: Introduces the different string and pattern search algorithms such as sequential pattern search, KMP search and BMH search.

7. **String Search Algorithms (cont.) and Indexing Data Structures**: Continuation from Week 6's lectures. Introduces indexing and suffix array construction.
8. **Structs, Dynamic Memory and Linked Data Structures**: Delves deeper into the usage of pointers and introduces the concept of dynamically allocating memory that is sized according to run-time values. This is personally the most challenging topic in the subject as I find the extensive use of pointers very complex.
9. **Linked Data Structures (cont.), Binary Search Trees, Function Arguments, Modules**
10. **Files, Number Representations**: Introduces different file operations, such as writing, reading and appending.
11. **Number Representations (cont.), Problem Solving Techniques**: Discusses the different types of number representations, such as binary numbers with their integer and floating-point representations.
12. **Dictionary and Priority Queue Structures; Hashing; Mergesort and Heapsort**: Introduces more sorting algorithms that have time complexity of O(nlogn).

Lectures

Alistair and Artem took turns delivering the lectures. Both of the lecturers were very passionate and I often found the lectures interesting since they discuss many sample programs introduced in the textbook. Besides just showing the code and how it runs, sometimes the lecturers would prepare an excel spreadsheet to go through how the program or algorithm works step by step, which helped me visualise the concept better.

One key thing to note is that the lecture slides only covered the basics and do not include much details. Therefore, Alistair always stressed the importance of reading the textbook to get a better understanding. I personally annotate my lecture slides as I go through the lecture captures and only read a few chapters on the topics that I found challenging closer towards the exams.

Tutorials/ Workshops

In the weekly 2-hour online workshops, tutors usually went through the allocated exercises that week and recap contents that were covered in the previous week during the first hour. My tutor broke us out into breakout rooms to come up with solutions for some of the questions before discussing together in the main room. Although there were no tutorial recordings, pre-workshop videos that covered the overview of some concepts and some **Grok** exercises are posted up at the beginning of each week. Videos going through the solution to the **Grok** exercises were also made available at the end of the week.

In the second half of the workshop, students were given time to work on their own codes. If you encounter a problem, you could always use the "tutoring help" function on **Grok** or "raise hand" on Zoom to ask for help. I personally found it very helpful to attend workshops since we were given a chance to discuss the concepts with other students, which helps to solidify our understanding.

Online Quizzes

There were three online quizzes this semester, each of them contributed 10% to the final marks and was 30 minutes long within a 45 minute time window, taken via the LMS. The quizzes are closed book assessments, and without any use of gcc/**Grok** permitted. Each quiz included five multiple-choice content question and one function writing question. As long as students keep themselves up-to-date with the lectures, the quizzes will not be too challenging.

Assignments

There were two individual assignments, each contributing 20% to the final marks. Each assignment was broken down into three stages, which guided us to progressively develop a full program. The stages were usually dependent on each other, so it was encouraged to tackle them step by step. We had two and a half weeks to complete each assignment. The first assignment tested our knowledge on functions, sorting and displaying data. Whereas the second assignment tested us on utilising dynamic memory allocation, pointers and linked lists.

Both assignments required us to combine the concepts and techniques learned during the lectures and were challenging yet very stimulating. Marks were allocated based on the program presentation, execution and structure, and approach of

the code. By putting in enough effort and starting early, it is very doable to achieve high marks for both the assignments.

End-of-semester Exam

In the final exam, students were given an hour writing time with 15 minutes of reading time. Although no past exam papers were provided due to the different exam format this year, a practice exam which highly resembles the final exam was provided in the first week of exams. The exam was separated into three sections: short answer, programming and algorithms. Each of the section contributed 10 marks to the final exam. The exam was heavily focused on the latter parts of the subject content, covering trees, pointers and algorithms. These topics were barely included in the quiz and hence students might tend to overlook. Therefore, I would advise students to go through these topics in more detail to familiarise themselves with the concepts.

COMP90038 Algorithms and Complexity [SM2]

Lecturer(s)	Dr Toby Murray Dr Andres Munoz Acosta
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour workshop
Assessments	Weekly online tests 0% (hurdle req., see Assessments section) Individual assignment due start of Week 7 15% Individual assignment due start of Week 12 15% 3-hour end-of-semester exam 70%
Textbook recommendation	Levitin, L., (2012). *Introduction to the Design and Analysis of Algorithms*. (3rd Ed). Upper Saddle River, US: Pearson Education. The textbook is referenced, but I don't think you need it for the subject.
Lecture capture	Full (both audio and video).
Year and semester reviewed	2018 Semester 2

Comments

Obviously, the main subject matter covered here are algorithms and complexity. So what exactly do we mean by these two terms?

Essentially, an **algorithm** is a sequence of *unambiguous* steps that you can follow to solve any instance of a specific problem, typically carried out by a computer. For instance, how would we sort a list of objects? A naïve approach would be to scan through the entire list, looking for the smallest object and listing it as the first element in your new sorted list, then the second smallest and listing it as your second, and so on until you have a new sorted list.

It shouldn't be too hard to realise that this algorithm is one that works (i.e. you end up achieving your goal of sorting the list). However, there are a lot of other different algorithms that can also be used to sort lists.

Let's think back to our naïve approach. This approach might work okay for small lists (e.g. 5 to 10 elements). However, once your list becomes larger and larger, the amount of time it takes to perform all the steps and complete the algorithm grows at a high rate. The length of time it takes for a less naïve algorithm to complete will also grow as the size of a list increases, but it may not grow as quickly as the naïve approach. This is what we refer to as **complexity**.

Why would an actuary care about any of this? This subject introduces a number of different approaches you can use when trying to solve a problem, which can be applicable when you are (for example) required to code up a macro to do a specific task for you.

Subject Content

The content in the subject can roughly be grouped into these overarching topics:

Problem-solving Techniques – different problem-solving strategies are covered here, with a plethora of examples to illustrate how they work. The example earlier in the review for sorting a list is an example of the *brute force* method. However, some more clever methods make use of the *decrease-and-conquer*, *divide-and-conquer*, and *transform-and-conquer* methods. Some of these methods you would have (unknowingly) employed in your studies – for instance, bisection is an example of a *divide-and-conquer* strategy.

This review was previously published in the 2018 end-of-year edition of the *Actuarial Students' Society Subject Review*.

Later on, more sophisticated ideas such as *dynamic programming* and *greedy algorithms* are also explored.

Complexity – for each of the algorithms introduced, its complexity is also discussed (i.e. how the length of time it takes to complete an algorithm scales with the size of the problem fed into the algorithm). To quantify an algorithm's complexity, the subject uses the computer science version of Landau notation (gasp). While Big-O notation will be familiar to you from *Accelerated Mathematics 2*, things such as Theta notation and Omega notation will be somewhat unfamiliar. However, it shouldn't be too hard to learn them. Somewhere in the midst of the study of each algorithm, the **master theorem** is discussed, a powerful result that helps to determine the complexity of a recursive algorithm.

In between each of the techniques studied, an overview of data structures is also provided.

Data Structures – there are a number of different ways of storing data in a computer; you may already be familiar with arrays and lists. However, there are a number of other data structures (referred to as *abstract data structures*) that are introduced in this subject as well. Different algorithms may require the use of a specific type of data structure, so a solid understanding of each of the different data structures used is essential to study these algorithms. Some examples of data structures studied are *stacks* (the latest element placed into a stack is the first one that is taken off), a queue (the oldest element placed into a queue is the first one that is taken off), graphs (a series of "nodes and edges" where two nodes are connected by an edge), binary trees (a more complicated list), and more. Don't feel overwhelmed, each of these structures are covered in-depth in tutorials and lectures.

Towards the end of the subject, Huffman encoding (a method of storing information using less memory) and NP-completeness (look it up, it's complicated) are covered as well. However, these were not examinable.

Algorithms in the subject are presented using *pseudocode*. This left a lot of uncertainty among students for assessments. See below for more detail.

Lectures

There was one stream and two lecturers. Toby took the first half of the semester's lectures while Andres took the second half. Both were excellent at explaining and delivering subject content and making use of slide animations for illustrations and the document camera to work through examples. Occasionally the lecturers would ask questions expecting a response from students. Luckily students in this subject are a lot more responsive than in actuarial lectures, so there were rarely any awkward silences.

Slides were released weekly before the lecture began. However, the annoying thing about slides was that for each frame of animation, there was a new slide in the slide pack. This made it infeasible to print slides for lectures. So it is probably better to just write your own notes in a notebook, rather than go through the hassle of printing each unique slide from the slide pack.

I only went to the first lecture of semester and decided it wasn't worth the effort to go to the remaining lectures in person. Instead, I watched them all in one go at the end of each week (at $> 1.5 \times$ speed as usual), and I don't feel like this decision disadvantaged me at all.

Workshops

Workshops ran the same as tutorials do – 1 hour where tutorial problems are discussed with the tutor, and maybe a review of lecture content from the week before. Each week there was a set of tutorial problems, ranging from as low as 3 problems to as many as 15ish.

While lecturers expected students to attempt tutorial problems before coming to the tutorial, I did not get that same impression from tutorials. My tutor would regularly give us time during the tutorial to solve a question before discussing the solution.

Ultimately your workshop experience will depend on your tutor.

Assessments

Throughout the semester there were **compulsory** weekly tests from weeks 2 to 12, covering the previous week's content. These opened the Friday before the content was covered and closed the Tuesday the week after the relevant lectures, giving you plenty of time to attempt the quiz. These questions were not exactly trivial and required some careful thinking as well as a pen and some paper. You needed to get 100% on 8 of the 11 quizzes to pass the subject, so don't neglect them. You get as many tries as you want, so you can even brute-force your way through the quiz through guessing and checking before the content was even delivered. There were also two diagnostic tests (mathematics and programming) in week 1 designed to give you an idea of what was assumed knowledge.

Assignments were released roughly 3 weeks before they were due. They had roughly 4 to 5 questions each and were a leap above question encountered during the semester as well as what was in the end-of-semester exam. The most challenging questions on these assignments were those that required us to come up with our own algorithm to solve a specific problem. While there are multiple ways of solving the same type of problem, the challenge comes with coming up with the one that is the most efficient (in terms of complexity).

The lecturers' insistence that you use pseudo-code to present your algorithms may cause a bit of grief, as the subject presented no standardised set of rules for us to use for our pseudocode. This left a lot of uncertainty with regards to what was acceptable and what wasn't. However, as long as you generally follow the unwritten rules that the pseudocode examples in lectures followed (albeit they were occasionally inconsistent there), you should not lose any marks for any "shoddy" pseudocode.

End-of-Semester Exam

The exam is a standard 3-hour science exam. What you may not be used to is providing your responses on the exam paper instead of in a separate script book. This shouldn't be a huge deterrent though.

In 2018, we were given 2 practice papers, which were very indicative of the type of questions on the end-of-semester exam. However, no solutions were provided. The lecturers encouraged the student cohort to set up a Google Doc to work together to create our own set of solutions. However, the lecturers did not verify them, but 100 people on the same Google Doc can't be wrong… right?

Honestly, if you made it through the 3-year undergraduate degree, this exam should not cause you any headaches. As usual, do tutorial problems and practice exams, making sure to understand the solutions wherever they are provided. In terms of subject content, I would prioritise the following:

- Understanding how to perform each algorithm on a given set of data;
- Complexity (deriving it from a recursive formula or through analysing an algorithm);
- Data structures – how each of them works;
- Qualitative features of different algorithms.

Questions here include (but are not limited to):

- What will the final binary tree look like if you insert these 5 elements in order?
- What sort of sorting algorithm should be used if you want to do [blahblahblah]?
- Design an efficient algorithm to solve this type of problem. Inefficient algorithms get half marks.

The hardest question on the exam will generally be the last type of question listed. I know in my exam many students spent between half-an-hour to an hour on the first 11 questions, double-checked them, and spent the remaining time on the 12th question (which required us to design an efficient algorithm).

Suitability as a Breadth

If you have any programming background whatsoever (whether you did COMP10001 *Foundations of Computing* or COMP20005 *Engineering Computation*), this subject may be a tempting follow-up if you study a post-graduate degree. However, I personally feel like your elective or breadth is better spent on choosing something else. Many of the problem-solving techniques were covered in *Engineering Computation* (if you did that), so I felt like I was studying things that I had already learned in the past.

If you want something you don't need to dedicate too much time in, this is something you may want to do as an Actuarial student. If you don't mind dedicating a non-trivial amount of time each week into a subject, maybe look into a level-3 mathematics subject.

JAPN10001 Japanese 1

Lecturer(s)	Dr Yasuhisa Watanabe
Weekly contact hours	2 × 30-minute seminars 1 × 1-hour consultation 4 × 1-hour Peer Assisted Study Sessions (PASS)
Assessments	5 × Fortnightly Quizzes 25% Oral Assessment in Week 6 and Weeks 11/12 20% Cultural Discovery Project 15% 2-hour end-of-semester exam 40%
Textbook recommendation	Banno, E. (2011). Genki Book 1 & Workbook: An Integrated Course in Elementary Japanese. Tokyo, JP: Japan Times. ✓ Necessary. The textbook was required to follow along with content in seminars, and to also study in preparation for all assessments.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Comments

Japanese 1 was a well-designed subject for students who have zero foundation or who haven't had any systematic study of the language. The pace of the subject was mostly reasonable but could be fast at times. The first few weeks might be a bit time demanding in terms of memorising the hiragana and katakana. However, once you're on top of those basics, the process of building up your vocabulary and grammar will be more natural and easier.

Overall, I found this a fairly enjoyable subject to learn. It provides you a great opportunity to build a foundation of the language and to learn about the social components in Japanese culture.

Subject content

1. **Self-Introduction, Time & Numbers, Hiragana:**
   - Introduced some useful daily expressions for greeting and self-introduction
   - Learned the expressions for small numbers from 0 to 100 (time and age)
   - Hiragana practice
   - Culture note: Japanese names
2. **Shopping, Dining, Katakana:**
   - In the setting of shopping, introduced how to ask and describe things using "this", "that", "here", "there" etc. and a range of nouns of goods and foods
   - Katakana practice
   - Culture note: Japanese currency
3. **Daily Routines, Invitations, Kanji:**
   - Introduced grammar of verb conjugation, verb types, present tense to describe daily routines
   - Learned about word order in a sentence and the particles to be used accordingly
   - Started to add in simple Kanji's
   - Culture note: Japanese houses
4. **Locations, Talking about Past Events and Habits:**
   - Description of where the things are
   - Learned about past tense of verbs

- Accurate and approximate expressions of time lengths
- Culture note: Japanese national holidays

5. **Travel, Interests, Likes & Dislikes:**
   - Learned to use "like" and "dislike" to describe hobbies and interests
   - Introduced a range of adjectives and how to use them in present and past tense
   - Invitation to do something together
   - Culture note: Japanese festivals
6. **Requests, Permissions, Rules, Directions:**
   - Learned a specific form of verbs (te-form) to send requests, ask for permissions, set rule and describe two activities
   - Explanation of reasons for behaviour
   - Culture note: Japan's education system

Seminars

A chapter of the Genki textbook was covered every 2 weeks, meaning that only chapters 1–6 will be covered in this subject while the rest is to be taught in JAPN10002. The 2-hour seminars were designed to be interactive and plenary. However, they were shrunk to 30-minutes per session this semester which I found was not enough to cover everything with sufficient explanation and practice. So, it was crucial to prepare beforehand using the material provided online in order to make the most out of the very limited time.

Thankfully, the Peer Assisted Study Sessions were provided as a supplement for the seminars with 2 streams, which consisted of two 1-hour sessions every week. These performed as less-formal tutorials such that a tutor was leading us through the key points and organising students to chat with each other.

Assessments

Unlike most commerce subjects, where the grades are mostly weighted on the final exam, Japanese requires persistent effort to earn marks progressively throughout the semester.

The fortnightly quizzes were mainly designed to make you keep up with your studying. They were held online consisted of questions that tested the vocabularies and grammar taught in previous chapters (a listening component would also be included in a normal semester). These quizzes were not hard, but do require you to be able to apply your knowledge proficiently in order to complete all questions within the time limit.

There were also two oral assessments worth 10% each. The first one was an individual task where a script was given and all you needed was to master it and record yourself. The second oral task was to be done in pairs. You needed to produce a script with your partner, memorise it and perform it (this would normally be done in class).

A cultural discovery project also had to be completed at the end of the second oral assessment, where you and your partner would analyse the content of your script with reference to Japanese culture and also in comparison to your first language. We were also be asked to set goals in this assessment.

End-of-semester exam

To prepare for your exams, I wouldn't say there is any shortcut, especially with language learning. It is highly recommended to take half an hour everyday, or at least 15 minutes if you are too busy to go through the contents. I personally found it very helpful to achieve a long-lasting memory which leads to a better outcome.

The two-hour final exam which tested both reading and writing was worth 40% of the total grade. The questions were fairly similar to the fortnightly quizzes. There were not many surprises with the content in the sense that everything tested was covered in the textbook. You just need to be careful with the kanji if you have any Chinese background, because only the kanji's covered during the semester are allowed to be used, to be fair for students with all different cultural backgrounds.

MAST20009 Vector Calculus [SM1]

Lecturer(s)	Dr Christine Mangelsdorf
Weekly contact hours	3 × 1-hour lectures 1 × 1-hour practical
Assessments	4 × assignments equally spaced throughout the semester 4 × 5% = 20% 3-hour end-of-semester exam 80%
Additional Information	This subject is only available for students who are completing the *Diploma of Mathematical Sciences* or willing to replace ACTL10001 with this subject.
Textbook recommendation	None
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Comments

Vector Calculus is a good breath option for *Bachelor of Commerce* majors with an interest in mathematics and decide not to pursue Actuarial Studies. In many ways, it combines and extends the content from MAST10006 Calculus 2 and MAST10007 Linear Algebra. The subject itself is not conceptually challenging, but sustained attention to the subject is required to perform strongly overall as it is very calculation heavy.

Overall, the subject was interesting as it opened my eyes up to the applicability of calculus in various settings. To perform strongly in this subject, students should regularly do practice questions since it is very computation and calculation heavy.

Subject content

1. Functions of Several Variables
2. Space Curves and Vector Fields
3. Double and Triple Integrals
4. Integrals over Paths and Surfaces
5. Integral Theorems
6. General Curvilinear Coordinates

The topics covered involved a lot of computation, and at times it felt like formula hunting and number plugging. Regardless, you must be comfortable with most of the integration techniques that were introduced in Calculus 2 to perform well. Linear algebra techniques were not as prevalent, although basic identities about the dot and cross product are required for some of the proofs.

Lectures

With the changes to teaching in 2020 resulting from the COVID-19 outbreak, all lectures bar the first four were held online. Regardless, Christine organised the course in a very logical manner and explained all concepts concisely but thoroughly. Many examples were used throughout the lectures and I encourage students to pay strict attention to these as they cover techniques that are commonly tested on assignments and also on the exam.

Tutorials

Math tutorials ran over Zoom in this semester and was unfamiliar territory for both the students and tutors. Usually, I would attend the tutorials since it was a good way for me to keep up with the content, but I felt that the tutorials were not very useful over Zoom, especially since I did not own an iPad or any sort of writing device. Thus, I chose to do the tutorial

questions in my own time and referred to the answers when I was stuck.

Assignments

There are four assignments equally spaced throughout the semester and each worth 5%. The assignment questions are not particularly tricky and are closely related to the examples Christine goes through in the lectures. Students should be able to score highly on these if one is meticulous with their calculations and shows a good amount of detail in their solutions. Some of the assignments are on the longer side and it is encouraged that students look out for 'tricks' that will simplify working significantly.

End-of-semester exam

The final semester exam was 3 hours long and accounted for 80% of your grade. Christine was very nice to us this semester and allowed to bring any sort of notes into the supervised exam. The difficulty of the exam was very similar to past years as well. Although this seemed like it would make the exam significantly easier, I soon realised that I spent all of my time writing anyway and did not have much of a chance to look through my stack of lecture notes. Regardless, it was a gesture that was welcomed by all of the students. It is imperative that students are familiar with integral theorems and tricks since it would be nearly impossible to finish on time without using these 'tricks' to simplify and shorten working.

MAST90083 Computational Statistics & Data Science

Lecturer(s)	Dr Hamed Soleimani
Weekly contact hours	1 × 2-hour lecture 1 × 1-hour tutorial
Assessments	2 × Individual assignments, due in Week 6 and Week 10 20% 3-hour end-of-semester exam 80%
Additional Information	This subject is available as an elective for MC-COMACT students, and available for MC-ACTSC and BH-COM students with coordinator approvals.
Textbook recommendation	James, G., Witten, D. Hastie, T., & Tibshirani, R. (2013). *An Introduction to Statistical Learning with Applications in R.* The textbook is ✓ essential. It is provided by the lecturer on the LMS
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 2

Overall Comments

This subject is a standard subject taught by the School of Mathematics and Statistics, and links mathematical topics with their applications in R. It is an elective subject recommended by the actuarial postgraduate course coordinator. Whilst the majority of the content covered by this subject overlaps with the content taught in ACTL40012 Actuarial Analytics and Data II & ACTL90019 Data Analytics in Insurance II, this subject focuses more on the general mathematical applications of the topics rather than their actuarial implications.

Overall, the subject content is very useful since it is extracted from the same textbook used for the previously mentioned *Actuary Program* exemption subject. The learning experience was quite enjoyable as this subject is not as content-heavy as an actuarial subject. However, I personally did not enjoy the fact that none of the exercises in this subject had official solutions for us to check our grasp of the subject content. I would not recommend this subject since most of the content taught in this subject is basically a repetition of the exemption subject. However, if you want to boost your WAM or improve your R skills, then this subject is for you.

Subject Content

The subject covers the following topics:

1. **Regression & Classification** — explores different types of linear regression models, K-nearest neighbors, linear discriminant analysis, quadratic discriminant analysis and logistic regression.
2. **Resampling and Model Selection** — covers various cross validation approaches and model selection methods such as forward and backward selection.
3. **Splines and Generalised Additive Models** — introduces cubic spline models, kernel functions and generalised additive models.
4. **Tree-Based Methods and Support Vector Machines** — introduces decision trees, random forests, boosting and support vector classifier.
5. **Unsupervised Learning** — explores unsupervised methods such as principal component analysis, K-means clustering and hierarchical clustering.

Lectures

Slides were released at the beginning of each week. Each weekly lecture typically covered one corresponding textbook chapter, closely following the order of topics and mirroring textbook content including examples and case studies. Every topic was explained thoroughly, and the lecturer went beyond the subject requirement to help us understand the intuition behind each idea. The lectures were easy to follow and usually included a 20-minute section for break-out room discussion in the second half of the lecture. Occasionally the lecturer would ask questions expecting a response from students and fortunately, as students in this subject were a lot more responsive than in actuarial lectures, there were rarely any awkward silences. I found it quite helpful as it provided me with an opportunity to check whether my understanding of certain topics is correct and to have meaningful discussion with other students.

Tutorials

The tutorials focused on R applications of the concepts taught in lectures. There were no tutorial problems provided. Therefore, the tutorials were quite similar to lectures, except for the fact that it focused on how the models in each topic could be fit using R. The code was provided to students after each tutorial.

I personally found the tutorials useful as the relevant R code and techniques demonstrated by the tutors came in handy when completing assignments, which were also heavily based in R applications.

Assignments

Throughout the semester, Hamed uploaded two "Question Banks", which were basically a complete collection of end-of-chapter exercises from the textbook. However, since no official solutions to these questions were provided, the only ways for me to check whether my solutions were correct was to compare them to the unofficial textbook solutions online or posting them in the discussion forum.

Both assignments were purely composed of questions selected from these "Question Banks". It was very unusual as some of the assignment questions had already been discussed in the LMS discussion forum, therefore resulting in a few "easy marks". Most of them required fitting a specific model using built-in functions in RStudio and interpreting the output. Additionally, the assignments were required to be done using RMarkdown. Rather than being released progressively, assignment marks in this subject were incorporated in the final subject result, which was only known to students after the results release date. Therefore, I found it difficult to check or improve my understanding of the subject content as this subject provided minimal feedback throughout the semester nor did it offer any official solutions to any exercises.

End-of-semester Exam

The final exam was a closed-book, Zoom-supervised exam. No practice exams were provided. Instead, the lecturer told us that the Question Banks would be the go-to practice questions for the exam, despite the fact that no answers were provided for them. We were told not to memorise definitions, algorithms, or formulas etc., but to have a deep understanding of them. We were also told that any R applications were not examinable. Therefore, I was very nervous before the exam because I didn't know what to expect at all. I studied very hard for the exam and remembered as many formulae and algorithms as I could. The exam consisted of 6 relatively simple questions selected from the Question Banks, one of them was even in our assignments. I was hugely relieved during the reading time, knowing that I have already seen these questions so many times before that I can remember each of them by heart. I finished the exam one and a half hours before its end time. I looked up and noticed that about 20% of the people in my Zoom supervision room had already left, possibly due to the surprising level of difficulty of the exam.

MUSI20149 Music Psychology

Lecturer(s)	Prof Katrina McFerran and various guest lecturers
Weekly contact hours	1 × 2-hour lecture (non-compulsory)
Assessments	10 × weekly quizzes 10 × 4% 2000 word written assignment 60%
Textbook recommendation	Rickard, N. & McFerran, K. (2011). *Lifelong Engagement with Music: Benefits for Mental Health and Well-Being*. Melbourne: Nova Publishers. ✗ I do not believe the textbook is necessary. See 'Necessary Resources' in the body of the review for more information.
Lecture capture	Full (audio and visual).
Year and semester reviewed	2019 Semester 1

Subject content

- Week 1: Overview and Introduction to the Field of Music Psychology
- Week 2: Music in the Prenatal and Postnatal Phases
- Week 3: Music in Schools
- Week 4: Music and Adolescents
- Week 5: Music and Older People & Introduction to Assignment
- Week 6: Music and the Brain
- Week 7: Performance Science
- Week 8: An Overview of Music and Pain
- Week 9: Music and Emotions
- Week 10: Multi-Sensory Perception
- Week 11: Music Performance Anxiety
- Week 12: From Psychology to Evolutionary Theory: Multiple Perspectives on Music and Wellbeing

Music Psychology is a breadth subject that explores research involving the influence of music on the brain and the body across the lifespan. Weeks 2-5 constitute the "lifespan series", considering each stage of the human life, whilst the later weeks look at the specific impacts of music. I found the subject content very interesting and easy to learn. Since all assessment tasks are open-book, there was no pressure to memorise studies or results, which made the subject relatively relaxed.

Lectures

The class registration offered a 9am 2-hour lecture or an "online lecture" – this actually meant that attendance at the on-campus lecture was not compulsory, providing students with the flexibility to watch the lecture whenever convenient. All of the lectures had full audio and video lecture capture recordings, so watching at home covered all the content. Some of the lectures had audience participation activities, such as Poll Everywhere or even singing, so attending the lecture in person could also be quite fun.

At the start of the semester, it was announced that lecture slides would only be released at the discretion of the lecturer, but they would still be captured on lecture capture if not provided. Luckily, all PowerPoint presentations were made available to us. Since the subject is taken by many lecturers, the slides varied in length, amount of detail and amount of literature discussed.

This review was previously published in the 2019 mid-year edition of the *Actuarial Students' Society Subject Review*.

Professor Katrina McFerran, the subject coordinator, took 3 lectures and the rest were taught by guest lecturers (1 guest lecturer for each of the remaining 9 weeks). Katrina was an extremely passionate and engaging lecturer – I could feel her enthusiasm even through the lecture capture. All of the guest lecturers were leading researchers in their respective fields and had interesting research to share, but I can't say they were all as engaging as Katrina was. I found Dr Tan-Chyuan Chin's lecture on 'Music and Emotions' particularly captivating as it explored different models of how music impacts our emotions.

Weekly Quizzes

There were 10 multiple-choice quizzes that tested content from Week 2 to Week 11. The quizzes had 4 questions each, with each question worth 1% of the final grade. They were open for a week for a single attempt and answers would be released shortly after they closed.

The quizzes mostly tested content from the lectures – initially it was often possible to Ctrl+F in the lecture slides but in the second half of the semester the questions became slightly harder and required watching of the lectures. The questions were generally quite straightforward. However, during this semester, there were 2 questions that were somewhat ambiguous. After the answers were released and students pointed this out, they removed the questions and re-weighted the remaining questions. Overall, the quizzes are an easy way to guarantee 40% (or nearly 40%) of the total marks for the subject.

Written assignment

The final assessment was a 2000-word written assignment worth 60%. It was introduced in Week 5 and due during SWOT-VAC (and later extended to the first day of the exam period as university policy does not allow for due dates during SWOT-VAC). The assignment topic was the impact of personal music use on cognition and emotion, and required both personal reflection and analysis of relevant literature.

Only content from Weeks 3, 4, 6, and 9 were directly relevant for the assignment, so there was no need to wait until after the semester finished to begin working on it, which meant there was sufficient time to complete the assignment. Additionally, the assignment was split into 4 parts, with a recommended word count for each section, so although I hadn't written any long essays since high school, I found it easy to reach 2000 words. It was not required to source academic literature outside of what had been provided through lectures and required readings, but I still found my own sources to ensure that my evidence was relevant and current.

In order to provide students with an idea of what was expected, we were provided with the marking rubric, FAQs, extracts of sample answers and an optional on-campus tutorial. I found the sample answers really useful as they indicated the required balance between personal reflection and research literature.

Necessary Resources

The required textbook was Rickard, N. & McFerran, K. (2011). Lifelong Engagement with Music: Benefits for Mental Health and Well-Being. Melbourne: Nova Publishers, which was available as an e-book from the university library website. It could also be purchased hardcopy for those who prefer physical books. Other essential or additional readings were articles that were available either through the university library or shared as PDFs on the LMS.

For the first few weeks, I completed the readings before watching the lectures and completing the weekly quiz. I found that the reading often overlapped with the lecture content so it was unnecessary. Thus, I don't believe it was necessary to complete the readings to do well in the subject, but the resources were free and easily accessible so they could provide extra support.

Concluding Remarks

Music Psychology was a really interesting subject that allowed me to take a break from the challenges of Actuarial Studies. I believe it will also help to boost my WAM since I have already guaranteed myself a lot of marks through doing well in the weekly quizzes. I highly recommend it as a breadth subject for anyone who enjoys listening to music, playing music or is

just interested in the psychology of music.

MUSI20163 Samba Band [SM1]

Lecturer(s)	Mr Alex Pertout Mr Salvador Persico Mr Ryan Menezes	
Weekly contact hours	1 × 2-hour practical	
Assessments	500 word research on a percussion instrument Final group performance Classroom participation	15% 35% 50%
Textbook recommendation	None.	
Lecture capture	None. A video is filmed after every practical for you to practice at home.	
Year and semester reviewed	2019 Semester 1	

Subject content

- Week 1 Introduction: styles, techniques, pulse, counting, hand to hand
- Week 2 Ensemble: Rhythmic Styles I
- Week 3 Ensemble repertoire rehearsals / basic development of the various parts
- Week 4 Continuation of ensemble development - Discussion on Individual Test in week 6
- Week 5 Ensemble: Rhythmic Styles II - Discussion on Individual Test in week 6
- Week 6 Individual Test - All parts and instruments covered weeks 1-5 (no mark is assigned)
- Week 7 Continuation of ensemble development
- Week 8 Ensemble: Rhythmic Styles III
- Week 9 Ensemble repertoire rehearsals / basic development of the various parts
- Week 10 Continuation of ensemble development
- Week 11 Rehearsal and preparation for formal performance assessment or studio recording
- Week 12 Final rehearsal and preparation for formal performance assessment or studio recording

Samba Band is a breadth subject that provides participants an opportunity for an in-depth practical study of percussion techniques and repertoire. The material is based on African derived drumming which over the centuries has continued to develop and flourish on the American continent. Classes will cover techniques on a variety of percussion instruments, the role of the various instruments in the ensemble, background and selected improvisation styles. The ensemble will prepare and rehearse both conducted and unconducted material that is suitable for public performance or recording. In general, this subject is very relaxing and chilled.

Practicals

I had Salvador Persico as my tutor. He engages the class very well and made the learning experience very enjoyable. You will learn about two ensembles in this subject and there is a brief introduction given during the first week. On that, you will learn how to read music notes that are needed in this subject, which means having a musical background is not a prerequisite. However, a basic background in music and rhythmic awareness will help you to ace this subject.

There will be an individual test in week 6 at your normal practical covering some of the instruments that you learned in the first 5 weeks. No marks are assigned to this test but it does give your tutor an idea on your performing ability, which may affect your marks on weekly participation. The second ensemble is relatively harder. The best advice I can give you is to

This review was previously published in the 2019 mid-year edition of the *Actuarial Students' Society Subject Review*.

print the music sheet out before the practical. It would be much easier to follow when you have a hard copy.

The classroom participation is 50% of the assessment and is marked based on your weekly performance and discussion. 5 students will be selected or volunteer to be recorded at the end of the practical for the class to practice at home. If you are one of those top 5 students in every video, you are certainly doing very well in this subject. There is also a hurdle requirement of at least 80% attendance to these classes.

Final group performance

The final group performance occurs in the last practical in week 12 which forms 35% of your final mark. Your tutor will record the performance and watch the video many times to assess you as an individual. It will be hard to play every note correctly so some practice will be needed for the final performance. However, don't worry too much if you make mistakes as most students will.

Unfortunately, you do not get to take any instruments home, but a good way to practise is by listening to the video recording after class and practise the pattern on your lap, mimicking how you would perform your percussion instrument.

500 word research paper

The research paper should incorporate historical research on a particular percussion instrument, a description of its playing techniques, broad use in traditional and popular settings and include information on particular recordings the participant has analysed that incorporate and/or feature this particular instrument. The paper will be submitted in hard copy at the last class of the semester, week 12. As is the case with all academic essays, it should incorporate a sizeable bibliography and footnotes outlining the research material gathered. I would say this paper was quite easy to complete as it's not marked as strictly as in other subjects.

Concluding Remarks

The total time commitment of Samba Band is 96 hours while it is 170 hours for an ordinary actuarial subject as suggested in the handbook. From my personal experience, I spent 2 hours on the essay and maybe 6 hours in total on practice across the semester. So, if you do the math, I only spent approximately 32 hours (including practicals and time spent practising) on this subject for the whole semester. This gave me more time to focus on my actuarial subjects. In terms of whether it is a WAM booster or not, I would say it is quite a subjective subject as your final mark is highly dependent on what your tutor thinks about your performance. To conclude, considering the amount of work that is required for actuarial subjects, I would highly recommend this subject to all actuarial students as it makes you feel like you are under loading. It was also the most enjoyable subject I've ever taken.

SCIE20001 Thinking Scientifically [SM2]

Lecturer(s)	Prof Andrew Drinnan	
Weekly contact hours	None — Online Subject 1–2 hours of lectures every week depending on the content.	
Assessments	3 online quizzes (due at the end of mid-semester break) 4 module assignment tasks due in Weeks 4, 6, 8, 12 Take-home exam due in the first week of exams	16.7% total 16.7% each 16.7%
Textbook recommendation	None.	
Lecture capture	Full (both audio and video) — Online lectures	
Year and semester reviewed	2019 Semester 2	

Comments

I initially selected this subject with the hopes of *boosting my WAM*; overall, this subject is quite straight forward, and I was able to achieve my objective. As I studied this subject, I found the content to be quite interesting as it allowed me to *think more scientifically* and be able to view issues from a different and broader scope. It is quite interesting as the content and articles prescribed were all surrounding the latest scientific and technological trends.

Subject content

There are a total of 4 modules in the course:

- Science Communication
- Science Observation
- Thinking with Data
- Science in the Media

Science Communicate and Observation were the most straightforward sections within the course while Thinking with Data was the hardest and most challenging (do not under-estimate this topic).

Science Communication

This is the first topic, and it starts simple and straight-forward. Students are required to write two blogs to communicate scientific ideas with simple terms. It is best to understand these ideas fully before then writing it in your own words, rather than direct paraphrasing. This will allow your blogs to flow naturally and prevent it from sounding too *science-y*. The main focus is *simplicity*, which means if you can keep it simple, then it will be good! Students were not restricted to academic journals and were provided with a greater degree of freedom to gather information.

Science Observation

In this topic, we were taught how to observe and make unbiased decisions with scientific topics. The assessment is based on the famous Australian painting *Shearing the Rams*, by Tom Roberts. Students were required to write an observational essay describing the piece, that allows others to replicate the image without seeing it or having any prior knowledge of it. This was quite tricky, especially for students without any background in analysing paintings. It is recommended for students to research how to write a painting analysis before writing. The painting should be analysed for its visual aspects, complemented with interpretations of any meanings behind it.

This review was previously published in the 2019 end-of-year edition of the *Actuarial Students' Society Subject Review*.

Thinking with Data

In comparison with the other areas of studies, this topic was the most challenging. This topic was divided into several subsections, which included statistics, graphics, p-tests, and tables. The assignment questions required an in-depth understanding of the topics as each quiz tested a different aspect within the topic. The final assignment involved the creation of a PowerPoint explaining the Lamarckian theory based on a set of sample raw data provided in Excel format. Students are required to make graphs combined with explanations to explain your findings/conclusions in this module.

Science in the Media

The main focus of Science in Media is to discuss how science is presented in the general media. There are discussions of common issues such as factual factors, over-simplification and incorrect statistics interpretation. The biases within the media are also discussed by the lecturer to allow students to have a better understanding when reading various scientific articles in the press. There are two parts within this module: part A and part B. Within part A, students are required to read 10 different online science articles and identify which biases are present within the reports. Students are also required to write a reference for one of the sources within the articles. For part B, students were required to write a scientific essay based on the original study within one of the ten articles.

Take-home Exam

The take-home exam was a 1000-word response paper, due to be submitted online during the first week of the exam period. The students were provided with four different articles about the recent development of quantum computing to read. Students were required to analyse the articles critically and write an essay in response to the information that they have learned. Students should identify the respective intentions behind each article before writing. Essentially, this is testing the students' reading comprehension and the ability to sort through large blocks of information effectively. It was relatively easy, and it took me approximately 2 days to finish the essay.

Concluding Remarks

This subject was quite enjoyable as it has allowed me to learn many interesting facts about various scientific topics. The time commitment of this subject is much lower than other subjects, so get on it if you have a spare breadth!

Finance Electives

FNCE20005 Corporate Financial Decision Making [SM1]

Lecturer(s)	Dr Chander Shekhar
Weekly contact hours	1 × 2-hour lecture 1 × 1-hour tutorial
Assessments	Tutorial Participation 10% Mid-semester exam in Week 5 20% 3-hour end-of-semester exam 70%
Additional Information	This subject is a required prerequisite for the two core FNCE subjects (Investments and Derivative Securities) to double major in *Finance* with *Actuarial Studies*
Textbook recommendation	Peirson, G., Brown, R., Easton, S., Howard, P., & Pinder, S. (2015). *Business Finance* (12th ed.). North Ryde, AU: McGraw-Hill. ✗ I do not believe the textbook is necessary.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Comments

Overall, I enjoyed this subject very much given its grounding in real-life and focus on decision making (hence the name I suppose). The content was stimulating and easy to absorb if you have an interest in the world of finance. Some of the concepts Chander touched on were initially counter-intuitive or perplexing, however one could often get to the bottom of this by reflecting on lessons taught in PoF or even accounting subjects such as ARA or Introductory Financial Accounting. Finally, Chander always includes additional resources and articles about the covered content. While these are not examinable, they do allow you to make some interesting connections between the content and deals you see in the media.

I would definitely recommend this if you are interested in developing a more holistic understanding into the world of finance!

Subject content

1. **Introduction and Options**
   - This section offers a deeper look into options. It is a useful refresher and also lays the foundation for future topics in *Real Options and Risk Management*. It is important to understand the hedging benefits of options, how certain phenomena influence pricing and the relevant payoffs to different stakeholders.
2. **Raising capital: Equity**
   - This topic offered a comprehensive overview into equity raisings and was quite content driven, describing the motivations for different approaches. While Chander includes a lot of empirical research here, the main study to prioritise concerns of and rationale behind under-pricing.
3. **Debt and Leases**
   - This topic provided an insight into why firms may decide to lease assets instead of purchasing them outright, and how to evaluate this decision via incremental NPV analysis. Ensure you have a clear understanding as to how incremental value is derived by the lessor and lessee.
4. **Payout Policy**
   - This section investigates a more realistic look into how firms decide to utilise excess cash rather than the

Modigliani and Miller (M-M) propositions covered in *PoF*. Whilst M-M is introduced as a base case, you learn about how firms can look to reward shareholders and implications of these strategies for different parties. Ensure you understand the process of a share buyback, notably the impacts that the imputation system has on this and the motivations for choosing between stock buybacks, dividends and reinvestment.

5. **Issues with WACC and Capital Structure Policy**
   - This topic introduces a suite of different theories that offer insight into the debt-equity make up of a firm. In addition to WACC learnt in first year subjects, you must pay extra attention to the influence of taxes and the need to lever beta, allowing the relative risk measure to account for the firm's financial risk. The main point to understand in this topic is the trade-off between using debt (tax benefits, lower cost but higher financial risk) and equity (expensive to issue, higher returns expected, no tax benefits but minimal financial risk).
6. **Advanced Topics in Capital Budgeting: Sensitivity, Break-Even and Decision Trees**
   - Sensitivity analysis is simply NPV analysis but changing one variable at a time based on different sentiments and viewing the consequences of doing so. Break-even analysis, as the name suggests, involves letting NPV equal 0 and noting how much a certain variable would have to change for this to occur. Finally, decision trees allow you to map out potential decisions you will encounter and calculate the benefits of pursuing the best pathway.
7. **Advanced topics in Capital Budgeting: Real options**
   - This is a direct continuation of decision trees, however incorporating a sense of optionality in making decisions: you do not have to fully go through with a project if it is initially unsuccessful. Value is therefore derived from being able to make this decision in the future.
8. **Analysis of Takeovers: Part I**
   - This topic is a comprehensive introduction to the types of mergers & acquisitions and techniques to value targets. The valuation methods are *intrinsic valuation* (discounted cash flow models), *relative valuations* (multiples and comparable methods), *contingent claim valuation* (viewing the takeover as a real option). Make sure you understand the economic rationales of performing a takeover, namely the synergistical benefits.
9. **Analysis of Takeovers: Part II**
   - This topic continues on from the previous lecture and offers a greater insight into how companies fund such ventures. It is imperative to understand the differences between cash and scrip bids and the incentives behind each. There is also an introduction to governance and regulation. This gives an insight into the hurdles encountered through the engagement process and how different engagements can look from a legal standpoint.
10. **Corporate restructuring**
    - This topic ran through the reorganisation of businesses that make them more profitable. The most important thing is to understand the different types of business (divestitures, spin-offs & equity carve outs) and financial restructurings (management buyouts, leveraged buyouts and debt restructuring). A good way to remember these is by drawing diagrams outlining the old and new structures of the business after undergoing restructuring.
11. **Risk Management**
    - Risk management offered a brief look into how firms manage uncertainty. The main thing here is to understand that risk is not a bad thing, it is how firms become profitable. However, risk should be controlled in a manner that limits downside losses without inhibiting upside gain. Techniques covered include hedging through derivatives and Value at Risk measures.

Lectures

Chander creates quite comprehensive slides. However, it is important you have your own set of notes that cover the main ideas he brings up, as these slides are quite dense. You will quickly notice that he places a great emphasis on understanding the motivation and incentives of particular alternatives, so ensure you have these noted. He will often include what he terms "dubious reasons", which are points that may seem valid on surface level but are not supported in theory or in practice. It is important that you flag these and understand the rationale behind them as they are often

embedded into multiple-choice or true/false questions on assessments. Chander also puts a set of general questions at the end of each lecture. Ensure you have an idea of how to answer each of these as they act as a good method of revision.

Tutorials

The tutorial structure is very similar to PoF in that one half of it is to be completed prior to and submitted at the start of class. Each tutorial worksheet you submit that is deemed to be a "reasonable effort" will equate to 2%, which contributes to a maximum of 10% of your final mark. This means you only have to submit 5 in total to secure full tutorial marks.

The tutorials themselves are useful as a foundation, however, do not rely on them to prepare you for the exam as they are generally quite basic. There are often points of discussion or evaluation which can be quite useful for consolidating and justifying your understanding. This is particularly important in the 'true or false' portion of the final exam.

Mid-semester test

Multiple-choice out of 20 marks. Most questions will have a "none of above" or "more than one of above option", hence it is imperative that you understand the content as it will not be enough to simply take educated guesses. The weighting is generally spread equally across all of the covered lectures, so ensure you are comfortable with each of the topic areas.

End-of-semester exam

Part A (40%):

This section included 10 multiple choice questions worth 4 marks each. This section was particularly brutal as you either received 4 marks or 0 marks. For each question, you need to have chosen true or false correctly and accurately justified it. They also provided a rough limit of 200 words in your justifications, so try and be succinct in your responses. The content relates to every topic and sometimes requires calculations, so ensure you understand each topic's relevant formulas

Part B (60%):

This section involved 7 questions with varying marks. While it may be tempting to be extremely pernickety in section A, it is important that you move onto this section quickly as a lot these are time consuming. A lot of fiddly calculations means you must be confident on your calculator and ensure you do not combine too many steps.

We only had one practice exam offered to us, and it was significantly simpler than the final. Other past exams can be found through the library or StuDocu. As mentioned, the tutorials are not really sufficient to prepare for the final exam, as they are quite short and basic. I would encourage you to use online resources in addition to your reflections, such as Investopedia and the Corporate Finance Institute to explore the intuition of topics further.

FNCE20005 Corporate Financial Decision Making [SM2]

Lecturer(s)	A/Prof Sean Pinder
Weekly contact hours	1 × Online module 1 × 1-hour tutorial
Assessments	1-hour mid-semester test in Week 6 20% 3-hour end-of-semester exam 80%
Additional Information	This subject is a required prerequisite for the two core FNCE subjects (Investments and Derivative Securities) to double major in *Finance* with *Actuarial Studies*
Textbook recommendation	Peirson G, Brown R, Easton S, Howard, P and S Pinder.(2015). *Business Finance, 12th edition*. McGraw-Hill. Sean continually reiterates that the lecture slides are sufficient and that students should use the slides to guide any further reading, so I never felt a need to use the textbook. ✗ Would not recommend.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 2

Overall Comments

FNCE20005 Corporate Financial Decision Making is a core subject for Finance majors and seeks to develop further topics covered previously in *FNCE10002 Principles of Finance* such as capital structure and capital budgeting. The subject covers 10 topics across corporate finance, with each topic following on from the previous topic to some degree. Overall, I found that this subject provided me with a very solid overview of the corporate landscape scene and placed many of the things I have read in the Australian Financial Review into perspective. For those with an extra breadth or elective slot, I would recommend taking this subject for this very reason. Sean is also a fantastic lecturer and makes the course as enjoyable as possible.

Subject Content

1. **Options**
2. **WACC and Capital Structure Policy**
3. **Raising Capital — Equity**
4. **Raising Capital — Debt & Leases**
5. **Payout Policy**
6. **Sensitivity, breakeven and decision tree analysis**
7. **Real options**
8. **Takeovers**
9. **Corporate restructuring**
10. **Risk management**

For the most part, the content in this subject is very theoretical and conceptual. Sean often ties in empirical evidence and real-world examples into the lecture slides, which helps to contextualise many of the topics. The only calculation heavy topics are Topics 6 and 7 to a degree. Make sure that you focus on understanding the logic and concepts behind all these topics since this is what will be tested more than anything. It is imperative that you take note of what Sean says during the lectures since it is logic that appears most on exams.

Lectures

All lectures were delivered online this year in line with COVID-19 restrictions. Overall, Sean's lectures were very informative, and he was a very knowledgeable and enthusiastic lecturer. The lecture slides are content-heavy, but this meant that you had almost complete knowledge of everything that would be assessed. I found it effective to annotate Sean's slides with insights that he would provide over the recording. Sean would also include "Key Takeaway" slides after each concept, which I found incredibly useful for revision going into the mid-semester test or exam.

Tutorials

Due to the unique nature of online learning, tutorials were not compulsory this semester. Despite this, I would still recommend attending them virtually since you have paid for them and there is no harm in listening in over Zoom. Personally, my tutor was great at going over the previous week's content and reinforcing the knowledge that I had learnt about in that week. He would also go over the tutorial questions, but I would recommend having a look at them before the class so that you are more easily able to understand the solution.

Mid-semester Test

This year's mid-semester test was administered online on Canvas, which meant that it was open book, unlike previous years. The test consisted of 20 questions covering Topics 1–5 and lasted for an hour. Despite being online, I did not find any noticeable increases in the level of difficulty. As is commonly the case with finance multiple-choice exams, the options are set to be as tricky as possible to really test your understanding of the content. The best way to study for the mid-semester test is to go through the lecture slides and really consolidate your understanding, before reviewing some of the tutorial questions from previous weeks.

End-of-semester Exam

The end of semester exam lasted 3 hours and comprised of 80% of your final grade. Similar to the mid-semester test, it was held online and was open book as a result. However, much like the mid-semester test again, I did not find any increases in difficulty and found that, if anything, it was easier than previous years despite being open book. Usually, Sean's exams are known for being notoriously difficult, and marks were often scaled significantly to reflect this, but this may not be the case this year. There were no surprises with the structure of the exam; Sean made everyone well aware of the exam and provided a sample exam to use as revision. Once again, theory questions dominated the exam, so it is imperative that students devote most of their revision time towards this. Only 10 of the available 80 marks were calculation based questions.

FNCE30001 Investments [SM1]

Lecturer(s)	A/Prof Antonio Gargano
Weekly contact hours	1 × 2-hour lecture 1 × 1-hour tutorial
Assessments	Tutorial participation quizzes 10% Mid-semester test held in Week 8 20% 3-hour end-of-semester exam 70%
Additional Information	This subject is an antirequisite to ACTL30006 *Intermediate Financial Mathematics*. This subject is for students who do not wish to complete CM2 *Financial Engineering and Loss Reserving* with the University, and/or double major into *Finance*. This subject is required for double major in *Finance* with *Actuarial Studies*, alongside Derivative Securities and an additional Level-3 FNCE subject.
Textbook recommendation	None, the lecture slides are sufficient as study material.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Comments

Overall, Investments is an enjoyable subject to learn if you would like to pursue a major in *Finance*. Compared to the other level 3 subjects in *Actuarial*, this will feel somewhat like a breeze, and helps you to build some confidence while you're struggling with all the formula manipulations in Actuarial Modelling. However, I did sometimes find the terminologies used in Investments confusing, as there can be many different terms that correspond to the exact same idea. According to this, I would recommend reading more financial news to make yourself comfortable with these expressions.

Subject content

Topic 1: Security Market

1. **Capital Allocation**
   - Allocating wealth between a risky portfolio and a risk-free asset with mean-variance utility function and capital allocation line.
2. **Asset Allocation**
   - Solution of the best portfolio with two risky assets with concepts like: *Opportunity Set* of risky assets and *Minimum Variance Portfolio*.
3. **Security selection**
   - Markowitz approach to solve the optimal portfolio with many risky assets
4. **The Capital Asset Pricing Model**
   - Estimating the expected return of a portfolio under *CAPM*
5. **Multifactor models, Arbitrage Pricing Theory (APT) and Factor Investing**
   - Estimating the expected return using multifactor models under the *APT*

Topic 2: Fixed Income Market

6. **Intro to Fixed Income and Zero-Coupon Bond**
   - Introducing features of the fixed income market and a review of zero-coupon bond, which was covered in Corporate Financial Decision Making.
7. **Bond Pricing**
   - Price coupon bonds using its yield to maturity and varying interest rates and an in-depth look at the price evolution.
8. **Yield curve**
   - Introducing three theories that explain the shape of the yield curve and the trading strategies in practice.
9. **Managing Bond Portfolios**
   - Overview of the risks in managing bonds and the measuring of the sensitivity to interest rate-risk with duration.

Lectures

Antonio claimed that he's the only one who would teach Investments "in this way" at a bachelor level; he always started each lecture with a real-world problem. For example, we would take a problem, "your boss expects the interest rates to decrease and asks you to implement a strategy that profits from this expectation", and try to solve it using the concepts learned throughout the lecture, so "you wouldn't look stupid on the first day of your internship".

Excluding the theory and pure application of formulas, Antonio spent a great amount of time in his lectures to link the topics to real-world practices, which I found it very helpful to get the intuition behind the theory and also improved my financial knowledge. For example, when illustrating the idea of the *liquidity of bonds*, he spent nearly 20 minutes manipulating a brokerage account to demonstrate how to make a transaction in practice.

Tutorials

Compared to the lectures, tutorials are more exam-focused. Due to the special situation of this semester, they were all recorded and, therefore, pretty well-structured. The key points of each lecture were summarised systematically and were followed by the corresponding exercises. The tutorial questions themselves are also good practice and can involve some concepts and terminologies which were not mentioned in the lectures. So, even though without the recording, tutorial questions were still valuable materials and I recommended you use them wisely for the exam preparation.

Mid-semester test

The mid-semester test was held online and contained 20 multiple-choice questions, to be completed in an hour. It covered the contents from the first four lectures. The questions were not hard, but did have a certain level of complexity which required you to fully understand the concepts taught in both lectures and tutorials. As long as you have sufficient preparation, you will be fine.

End-of-semester exam

The final exam was a 3-hour exam with 15 minutes reading time. There were two sections in the exam: 32 multiple-choice questions and 9 problem solving questions. Most of the problems were pretty straightforward, as Antonio is famous for being generous to give marks (from what I've experienced). So make sure to catch this chance, prepare well, and boost your WAM.

FNCE30007 Derivative Securities [SM2]

Lecturer(s)	Prof Federico Nadari
Weekly contact hours	1 × 2-hour lectures 1 × 1-hour tutorial
Assessments	Mid-semester test in Week 7 25% 3-hour end-of-semester exam 75%
Additional Information	This subject is required for double major in *Finance* with *Actuarial Studies*, alongside Investments and an additional Level-3 FNCE subject.
Textbook recommendation	John C Hull.(2016). *Fundamentals of Futures and Options Markets*. 8th edition, Pearson Education Inc. ✗ I do not believe the textbook is necessary.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 2

Overall Comments

Overall, I enjoyed Derivative Securities very much given its grounding in real life and rigour (compared to a more content-based subject in *CFDM*). Once you start to understand the benefits of the products and think like an investor, you begin to appreciate the role of derivatives in the world of finance (even if Warren Buffet is not a fan).

I would definitely recommend this subject if you are interested in developing a more holistic understanding of the world of finance or would like to get into trading shops.

Subject Content

1. **Futures and forwards**
   In this topic, you are introduced to derivative products in futures and forwards. There is a lot of content covered in this topic. However, the three most important foundational concepts to keep in mind are the different niches between futures and forwards, the different reasons to use such securities (hedging, arbitrage and speculating) and how to construct a portfolio with them. Finally, you are introduced to the pricing of these contracts and given a mountain of formulas, depending on if the asset pays dividends, offers a yield or has storage costs for example. The most important pillar to understand is the intuition behind why these affect the relative price of the derivatives, as you will be given each of these formulas in the final exam.
2. **Options Introduction**
   The first 30 minutes of this lecture is a nice recap of *Principles of Finance* Week 12 and *CFDM* Week 1, however ensuring you understand how different variables influence option prices is integral for proceeding topics (such as volatility, time, interest rates, dividends). You are then introduced to an array of strategies that involve certain positions in options and the underlying asset. Whilst these were easy to access given the assessments were open book, in typical years you will need to know these off the top of your head. A good way to do this is to match the name of the strategy with the pay-off diagram, and then you can understand the strategy if asked (and infer the positions from that too).
3. **Options pricing**
   The final section of the course involves introductions of two ways to price options: The Black-Scholes-Merton and Binomial models. Federico does a good job of building up to these through the course and gradually rolling out different layers of the respective model to make their construction quite intuitive. The questions related to this can

seem very focused on the number-crunching (quite fiddly calculations). However, you will not do well if you don't understand the rationale behind each step or you will likely incur silly mistakes (again this comes back to the earlier idea of grasping the effect of particular events on the prices of options).

Overall all the main theories in this subject are derived from the idea of arbitrage, so ensure you understand how to create payoff tables for a range of scenarios. The main bodies that trade derivative products are quant and high-frequency trading firms, so it is realistic to consider arbitrage in this case.

Lectures

Federico is a great lecturer and spends ample time on all the fundamental ideas. Whilst his slides seem to have been made in the early 2000s, all the information you need is usually on there. Just going through them is not enough, in my opinion, as he offers an incredible amount of value in his explanations. The slides are also filled with examples, and I would definitely recommend pausing the lecture for a while, working through the example in your head before progressing, as these types of questions will undoubtedly arise in tutorials and exams. They also assist in consolidating your overall understanding of the content. Whilst he sometimes goes overtime, it is often a by-product of him spending extra time showing you how the assets work in real life (for example showing you a real exchange or a move that features trading). Whilst you can skip through these quite quickly, keep in mind that these may be tested, so try and at least have the core ideas written down from his explanations.

Tutorials

The tutorial structure is very similar to other finance subjects, with the lecturer going through provided questions. The tutorials themselves are very useful, both to build a foundation and to consolidate understanding, so spend ample time on these. I started off by just attending the tutorials themselves, but there was often too much to go through in the 1-hour block and I didn't feel as though I was learning the content properly. Given pre-recorded videos of the head tutor were uploaded to Canvas, I ended up trying the questions myself prior and then watching his videos with a friend. Whilst this generally took upwards of two hours, I felt it was incredibly beneficial for understanding and I developed a greater level of appreciation for the content, beyond just brute-forcing calculations.

Mid-semester Test

The mid-semester test was a multiple choice quiz out of 16 marks. You are only tested on futures and forwards. Weighting is generally spread equally across all of the covered lectures, so ensure you are comfortable with all the sections. These take place during your usual lecture slot, so many people thought it would be a good idea to change the lecture they were enrolled in from Tuesday to Thursday, to get more time to revise. Unfortunately, the difficulty of the Thursday test was significantly harder than that of Tuesday (Median of 7 for Thursday vs 11 for Tuesday) so that backfired for several students. Fortunately, Federico is a reasonable lecturer and scaled the Thursday session up 3–4 marks, but this is something to keep in mind.

End-of-semester Exam

While the Semester 1 exam had no Futures/Forwards content, about 35% of ours was focused on that. Accordingly, it is essential to listen to what the lecturer announces about the make-up of the exam as can change between semesters. For anyone patrolling Reddit or Unimelb Love Letters, you would have probably seen the stream of complaints after this semester's exam. Derivatives is notorious for having hard exams, but what made this one so controversial was the number of difficult questions and lack of marks allocated to the hardest parts. In some ways, I can see why this was done as students can simulate a lot of the processes via excel and then copy it in given it was open book; but equally, it disadvantaged those students that attempted to do it properly. Regardless, scaling is common for this subject (Semester 1's exam was scaled up 14 marks) so the difficulty will likely be balanced out.

FNCE30011 Essentials of Corporate Valuation [SM2]

Lecturer(s)	Prof John Handley
Weekly contact hours	1 × 3-hour class (lecture and in-class collaborative learning)
Assessments	Take home exam due in Week 6 10% Group assignment due in Week 10 25% 3-hour end-of-semester exam 65%
Additional Information	This subject is available as the Level-3 FNCE subject to attain a double major in *Finance* with *Actuarial Studies*.
Textbook recommendation	None needed, lecture slides are sufficient study material.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 2

Overall Comments

Essentials of Corporate Valuation is a well-designed subject without too much content and a moderate level of difficulty. It provides students an overall understanding of what investment bankers do when they analysing acquisitions.

Subject Content

Three valuation approaches of measuring different types of value of firms and projects were spread over 10 classes (Classes 2–11) throughout the semester.

Class 1: The framework for valuation (Not examinable)

Approach 1: Valuation using Discounted Cash Flow (DCF) — Classes 2–6 and Class 11

- **Class 2: Free Cash Flow for Equity (FCFE) model and Dividend Discount Model (DDM)**
  Introduced the concepts of Free cash flow (FCF), Unlevered free cash flow (FCF^u)and Free Cash flow for Equity (FCFE), measurements of them using financial statements and applications in the FCFE model and DDM model to value the equity value of firms and projects.
- **Class 3: Standard WACC model**
  Illustrated the Standard WACC model in detail to measure the enterprise value and unlevered value of a firm and the important assumptions of the model.
- **Class 4: Vanilla WACC model**
  Illustrated the Vanilla WACC model, the key assumptions and how to distinguish the differences compared to the Standard WACC model.
- **Class 5: Estimating discount rates for DCF valuations**
  Introduced different methods to estimate the discount rate in the DCF models. (i.e. Estimate the cost of equity using CAPM and FAMA-FRENCH, estimate the cost of debt using credit spread and estimate the beta of a stock through comparator firms.)
- **Class 6: Miscellaneous issues in DCF valuations**
  Highlighted important elements to be aware of under DCF approach - treatment of surplus assets, one-off cash flow items, estimation of taxes, risk-free rate, terminal value and forecast of future cash flows.
- **Class 11: Valuation and imputation tax system**
  Explained through the adjustments to be made in the above models for imputation.

Approach 2: Valuation using multiples — Classes 7–9

- **Class 7: Valuation using PE multiples**
  Introduced the measurement of PE multiples and how to choose PE ratios from comparator firms to be used as multiples on the firm being valued.
- **Class 8: Valuation using Other multiples**
  Measurement of multiples EBIT, EBITDA and EBITDA less CAPEX and application of these multiples in practice on corporate valuation.
- **Class 9: Where does value of the proxies in valuation come from**
  Value of the proxies of multiples is determined by the following factors: growth of the firm or project, flexibility to exercise the underlying options, value of ideas at start-ups and dilution of wealth and power when issuing new shares. Each of them was illustrated in detail.

Approach 3: Valuation using replications — Class 10

- **Class 10: Valuation using replications**
  Demonstrated the idea of replication to value complex financial securities, convertible bonds, bonds with Bull Spread Warrants, Floating Priced Options which are too complex to be valued directly.

Classes

Each class consists of a 2-hour lecture and a 1-hour collaborative learning exercise. During the lecture part, John explained the models and concepts in detail, and included demonstrations using Wall Street Journal (WSJ) and Bloomberg to obtain relevant financial information. Additionally, there are a number of extension notes on the slides which are not examinable but were interesting papers to read.

The collaborative learning exercise is usually based on a real-world case. For example, the dilution of power during the three rounds of share issuing of Facebook. John extracted data from a movie for us to do the calculations on. This made that lesson quite impressive and engaging. In order to mirror the real life practices, John paused in between the questions to allow us to attempt the problem before he walked us through. These questions are normally very practical, and it was important to do them individually to prepare for the assignment and exams.

Take Home Exam

The take home exam was equivalent to an assignment which was the simplest assessment compared to the other two. There are two questions in total, the first one being a short response whilst the second was to be done with Excel. Both of them were fairly straightforward and you should be able to find the answers on the demonstrations or the lecture slides.

Group Assignment

The assignment was to be done in groups of up to three people. The topic this year was *"Is Apple Inc. actually worth $2 trillion?"*. A couple of links to Apple's financial reports and screenshots of WSJ data was provided and we were asked to provide a 10-page valuation of the company. I personally really enjoyed this assessment because it felt like a case competition that pushes you to do a lot of research. On top of that, it provided a certain level of flexibility for you to design your own flow for the presentation. Ultimately, practical application of the assignment helped me understand the concepts learnt, whilst the research and teamwork components helped me develop valuable skills for future career development.

End-of-semester Exam

The practice exam and weekly problem sets are useful materials for final exam preparation. Unlike most of the subjects we have, Essentials of Corporate Valuation does not have tutorials and therefore, requires you to keep track on your own. The problem sets questions are not hard, so you should be able to do them on your own and understand the solutions.

The problems in these preparation materials have a similar format to the exam questions except that in the actual exam, rather than clearly stating out the direct actions you need to take, questions prefer a style such as *"What would you*

recommend the firm to do" or *"comment on this firm with the data provided"*. This made the exam harder than the questions with a straightforward format that tells you what they want. Hence, you have to fully understand the concepts and be able to analyse a scenario using right concepts learnt throughout the semester.

Economics Electives

ECON10005 Quantitative Methods 1 [SM1]

Lecturer(s)	Prof David Harris
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial
Assessments	Weekly online quizzes 10% 2 × Online tests due in Week 4 and Week 8 2 × 10% = 20% Assignment due in Week 12 10% 3-hour end-of-semester exam 60%
Textbook recommendation	QME textbook provided by University. The textbook covers all the concepts taught in QM1 in far greater detail than what is required to score well in the subject. Only refer to this textbook if you are very capable in mathematics and want a deeper level of understanding, otherwise it may do more harm than good.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Comments

Quantitative Methods 1 is a subject that can be taken to satisfy the quantitative requirement of the *Bachelor of Commerce* (standard pathway). It teaches the basics and foundations of probability and statistical analysis that is required for future studies in econometrics and finance.

Overall, the subject is fairly reasonable. The lectures are well structured, with each lecture covering a different topic or concept. With regular attendance in tutorials and completion of the online quizzes, most should find it quite manageable. Much of the subject is devoted to the application of the techniques and concepts, rather than conceptual understanding. That said, some of the trickier questions do test your understanding of the content but these only make up a small portion of assessment and tutors are often lenient in marking these types of questions.

Overall, the subject is not the most interesting but definitely manageable if you put in the time to become comfortable with the applications. The exam and online tests are the trickiest parts of the course, so do plenty of practice questions before going into them.

Subject content

- **Week 1**: Introduction to Statistics
- **Week 2**: Basics of probability
- **Week 3**: Bivariate probability distributions
- **Week 4**: Continuous random variables
- **Week 5**: t-distribution and binomial distribution
- **Week 6**: Introduction to statistical inference
- **Week 7**: Hypothesis testing
- **Week 8**: Confidence intervals and testing errors

This review was previously published in the edition of the *Actuarial Students' Society Subject Review*.

- **Week 9**: Comparing means
- **Week 10**: Linear regression
- **Week 11**: Statistical inference with regression

The content in this subject is manageable in terms of difficulty. The first few weeks of content is quite easy, covering concepts that students will have already seen in high school. However, from Week 4 onwards, content becomes unfamiliar as the lecturers introduce statistical inference, which can be conceptually challenging at first. However, once you are able to understand the thinking behind hypothesis testing, the rest of the content essentially becomes applying that one concept in various settings.

Lectures

With the changes to teaching in 2020 resulting from the COVID-19 outbreak, all lectures bar the first 4 were held online. Regardless, they were informative and explained the concepts concisely but thoroughly. It is encouraged that students pause throughout the lectures to fully understand the reasoning and method behind each statistical technique, as well as trying to do the calculations themselves.

Tutorials

Again, with the changes to on-campus learning, all tutorials were held online. Each tutorial ran for an hour. While my tutor did his best to engage the class despite the change, I found that it was still difficult to maintain focus, but that is something that is inevitable with remote learning. The tutorials would consist of the tutor walking through the previous week's tutorial questions, some of which were appeared on the weekly quizzes that makes up 10% of your grade overall. We had the opportunity to attempt the questions ourselves in breakout rooms, but again this was rarely successful as students were quite reluctant to talk or discuss the problems. Nonetheless, I attended all tutorials anyway as it forced me to keep up to date with the content. Note that normally the 10% quiz mark requires of both attendance at the tutorial in addition to passing the online quiz, but with the change in teaching, passing the quiz was enough to secure the marks for that component.

Online Tests & Assignment

There were two online tests, one in Week 4 and Week 8. Since the first few weeks of material are considerably easier than the latter weeks, students will naturally find the first online test to be far easier than the second. The second online test was quite challenging for many, since it covered statistical inference which can be difficult at first. The average mark for the second online test was around 13/21. Both tests contributed 5%, amounting to 10% in total.

The assignment is worth 10% and is a business report. You were required to provide recommendations to a number of potential home buyers, using statistical evidence drawn from a provided dataset to support your recommendations. The assignment is intended to be a group assignment of up to 4 members, but it is definitely manageable to complete it individually. The analysis is not particularly difficult and consists of applying the concepts learned in lectures but with more realistic data sets.

End-of-semester exam

The final end-of-semester exam was administered through Canvas and lasted for 3 hours, comprising 60% of your grade. Despite the fact that the exam was open-book, I found it to be harder than expected. The exam was quite long, and you had to spend almost all of your time typing, leaving little time to even look concepts up and go through your notes. Content-wise, most of it was quite standard and again testing the practical applications of the concepts taught in lectures. There were a few tricky questions around the central limit theorem but for the most part, the exam questions were mainly about constructing and testing hypotheses. Therefore, being comfortable with hypothesis testing is of upmost important going into the exam.

ECON20002 Intermediate Microeconomics [SM1] (1)

Lecturer(s)	Dr James Bugden
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial
Assessments	Online mid-semester test in week 7 — 20% 2 × assignments due in week 5 and week 10 — 20% 3-hour end of semester exam — 60%
Additional Information	This subject is a core subject to double major in *Economics* with *Actuarial Studies*
Textbook recommendation	*A Short Course in Intermediate Microeconomics with Calculus* by Allan Feldman and Roberto Serrano ✗ Not necessary Useful for further reading but not required. Lecture slides are sufficient.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 1

Comments

Intermediate Microeconomics extends the foundations of microeconomics taught in ECON10004. The subject is far more mathematical than its first-year counterpart but should be manageable for most. In the semester and year that I completed the subject, the lecturer was new and consequently the content was perhaps easier than in previous years. As a result, it was common for students to score highly, especially if they have a mathematical background. This subject is quite interesting as it provides rigorous arguments for economic laws that were previously assumed in introductory microeconomics. The difficulty is manageable, and a dedicated student should expect to score into the 90s.

Subject content

Overall the content is not conceptually difficult, especially for those who are competent in maths. Almost all of the content is mathematical in some way or another, and there is very little analysis beyond the pure mathematics of the concepts. There is not a lot of content in this course so students should be focusing on being able to work through the mathematics and developing familiarity with the types of functions that are commonly seen in the tutorial questions.

1. **Preferences and Utility**
   - This topic introduced the basics of consumer theory and how we can quantify our preferences and therefore our decision-making.
2. **Consumer Choice and Income**
   - This topic developed further upon preferences and looked at how our budget constraints impacted decision-making.
3. **Demand Functions**
   - Using theory from Weeks 1 and 2, this topic formulated the demand functions that we are familiar with from Introductory Microeconomics.
4. **Income and Substitution Effect**
   - This topic looked at why we change our consumption level in response to price changes and decomposed this into two separate effects.
5. **Consumer and Producer Surplus**

This review was previously published in the edition of the *Actuarial Students' Society Subject Review*.

- This topic reinforced the concepts of producer and consumer surplus but in the context of non-linear demand curves.

6. **Elasticities**
   - This topic was mainly revision from Introductory Microeconomics, but again with non-linear demand curves.
7. **Introduction to Producer Theory**
   - This topic formalised production theory, looking at how two inputs (capital and labour) generated output.
8. **Cost Curves**
   - This topic developed cost curves to the firm based on rational production choices.
9. **Firm Supply**
   - From Week 7 & 8 content, this topic continued to derive the supply curve, similar to how we developed the demand curve in Week 3.
10. **Market Supply and Equilibrium**
    - After developing consumer and producer theory, this topic provided some revision on how they interact in a market.
11. **Monopolies**
    - Finally, the last topic looked over monopolies and profit maximisation in this unique situation.

Lectures

With the changes to teaching in 2020 resulting from the COVID-19 outbreak, all lectures bar the first 4 were held online. Regardless, they were still informative and went into good depth. Most of the concepts were supported by examples. It is reasonable to watch the lectures at double speed and play/pause where appropriate to refine understanding of the concepts. James is a good lecturer, as he goes into depth with all of the content so that you are able to understand the underlying theory. He is clear and concise in all of his explanations, supporting theory with worked examples.

Tutorials

Again, with the changes to on-campus learning, all tutorials were held online. Each tutorial ran for an hour. While my tutor did her best to engage the class despite the change, I found that it was still difficult to maintain focus, but that is something that is inevitable with remote learning. The tutorials consisted of the tutor going through the tutorial questions, giving students time to try them out themselves before providing the solution. Tutorial questions were a good way of keeping up to date with the content and gave a strong indication of the type of questions that would appear on the final exam and on the online tests.

Assignments and online test

There were two assignments, one due in Week 5 and the other due in Week 10. Both assignments contributed 5% each to your final grade. The assignments were not particularly difficult and were very similar in style to the tutorial questions. Again, the assignments were highly mathematical.

The online test was held in Week 7 on Canvas and consisted of short answer questions. The test is meant to be 90 minutes, but James gave us an extra 90 minutes to submit our answers, which was very generous. It covered all material up to that week. The test was again very similar to the tutorial questions, but with a few trickier questions towards the end. Overall, most students found it very reasonable and scored well.

End-of-semester exam

The final end-of-semester exam was 3 hours long and administered through Canvas. Once again, it was nothing unusual since the questions were similar in style to assignments and mid-semester test. The exam was also open book, but this didn't give too much of an advantage since the whole exam comprised of mathematical calculations anyway. Since the lecturer was new, the past papers available online were not extremely relevant, but were good to use as practice nonetheless.

ECON20002 Intermediate Microeconomics [SM1] (2)

Lecturer(s)	Dr James Bugden
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial
Assessments	Online mid-semester test 20% 2 × assignments 20% 3-hour end-of-semester exam 60%
Additional Information	This subject is a core subject to double major in *Economics* with *Actuarial Studies*
Textbook recommendation	*A Short Course in Intermediate Microeconomics with Calculus* by Allan Feldman and Roberto Serrano ✗ Not needed. The lecture slides were ample study material.
Year and semester reviewed	2020 Semester 1

Comments

Intermediate Microeconomics is a more mathematics-focused version of Intro Micro. You may find the topics quite familiar with a certain level of expansion to a couple of new ideas which are also easily understandable. Therefore, it is a good option to take this subject as a commerce elective for *Actuarial* majors.

Subject content

The subject content was split into three parts. Topics 1–5 focused on *Demand Theory*, topics 6–8 focused on *Production Theory* and topics 9 and 10 focused on *Markets*.

1. **Consumer Choice**
   - An in-depth look at optimal baskets of utility through indifference curves and budget constraint.
2. **Revision of Demand Curves**
   - Approach the shape of demand curve through the theory of consumer choice and a review of shifts in demand.
3. **Income and Substitution effect**
   - Decompose the change in quantity demanded due to the shift in demand into income and substitution effect
4. **Demand elasticities**
   - Zoom into the elasticities on the demand side, including the elasticities to own price, income and other goods' prices.
5. **Consumer Surplus**
   - Derive the consumer surplus through quasi-linear utility and discrete demand curve and use it to measure the benefit to consumers.
6. **Introduction to Production Theory**
   - A deeper look at firms' revenues, costs and economic profit. Derive the production function with one and two inputs with the introducing of isoquants and marginal rate of technical substitution.
7. **Cost Curves**
   - Utilise the cost curves in the long run and short run to solve the firm's problem through cost minimization.
8. **Perfect Competitive Firm Profit Maximization and Supply**
   - Solve competitive firms' profit maximization problem by setting input and output as choice variables to minimize costs in short run and long run respectively.
9. **Market Supply and Market Equilibrium**

- Shifts of market demand and supply and competitive market in the long run.

10. **Imperfectly Competitive Markets**
    - Supply, demand and equilibrium in market with taxes, subsidies, monopolies and externalities.

Lectures

James delivered interesting and clear lectures throughout the semester, despite the fact that all of them had to be online. Therefore, it is highly recommended to watch his lectures either physically or virtually, as they will definitely help with your understanding of the content. The structure of the lecture slides also flowed logically with each other and were easy to follow.

Tutorials

The tutorial questions provided good practice for the theory and formulas learnt in the lectures. My tutor this semester was clear explainer of the economic concepts taught and would give us a quick recap of the contents covered in the previous weeks before going through the problems. Normally, the 10% participation marks would be given based on the record of the attendance of tutorials every week, however, these marks were allocated to the mid-semester exam instead this semester. The tutorial questions serve as a good indicator of your progress in the subject, so I strongly recommended to attend and participate.

Assignments

While most assignment questions were similar to the ones in tutorials, some of them were longer and trickier. Hence, I would advise to think carefully before blindly applying the formulas learnt. Both of the two assignments were done in groups (maximum of four people per group), of people from your tutorial class. So make sure you sign up for the same tutorials with your friends if you want to be in the same group!

Mid-semester test

The mid-semester test contributed 20% to the final grade. It consisted of 10 multiple-choice questions and 3 problem-solving questions and closely resembled the structure of the final exam questions. The 3 hours given was definitely sufficient time to answer all the questions and upload my answers. The multiple-choice questions were pretty straightforward, while the problem- solving ones required you to have a deep understanding of the concepts learnt and be flexible in applying them.

End-of-semester exam

The three-hour end-of semester exam was held online and consisted of 5 questions that covered all the topics taught in the semester. The questions were very similar to the practice exam, meaning it was a good material to use to study alongside the tutorials. Most of the concepts of the *Markets* topic were covered in the last week, as such, there was no tutorial for practice. Luckily, James included these topics in the practice exam and provided detailed solutions which I found quite useful.

ECON30009 Macroeconomics [SM2]

Lecturer(s)	Dr James Hansen
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial
Assessments	Group assignment, due in Week 5 — 8% 90-minute mid-semester exam in Week 6 — 20% Group assignment, due in Week 10 — 7% 2-hour end-of-semester exam — 65%
Additional Information	This subject can be taken as a commerce elective for the *Actuarial* major or count towards a double major in *Economics*.
Textbook recommendation	Auerbach, A.J. and Kotlikoff, L.J., 1998. *Macroeconomics: An integrated approach*. MIT Press.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 2

Overall Comments

Macroeconomics takes a break from classical and Keynesian economics taught in its prerequisites and takes a "micro-founded" approach to answering macro questions. This subject teaches neoclassical economics — mainly in the form of the Overlapping Generations (OLG) model — to take another look at economic growth, business cycles, fiscal and monetary policies and open economies.

The maths used in this subject and outcomes learnt were intuitive; however, the use of the same model throughout the semester (often only changing one or two variables/assumptions in each topic) made learning quite monotonous. You can sometimes grasp links between concepts learnt and real life, but these were few and far between. Ultimately, this subject seemed like a preparatory for research in economics and I would not recommend this subject unless you are very interested in economics/macroeconomics or pursuing further study in economics.

Subject Content

1. **Review of Macroeconomic Research**: Recounted classical and Keynesian economics taught in earlier years and introduced neoclassical economics — the main approach taught in this subject — which uses microeconomic assumptions (household and firm optimisation) to build macroeconomic models.
2. **Introduction to the OLG model**: Builds the OLG or life-cycle model using the assumptions touched on in the previous topic and forms the basis for the rest of the semester. This topic also talks about long-run equilibrium and how the model can be adapted to simulate sustained economic growth.
3. **Real Business Cycle theory with OLG and Unemployment**: Touches on how the OLG model can be used to model short-run fluctuations in output and compares them to the stylised facts seen in empirical data. This topic also briefly introduces unemployment into the OLG model.
4. **Government Consumption and Fiscal Policies**: Introduces the Government entity into the OLG model and how different types of government intervention can affect consumer welfare and economic growth.
5. **Monetary Policy and Inflation**: Introduces money into the OLG model and discusses the neutrality and superneutrality of money.
6. **Two-country OLG model**: Models two countries using the OLG model to discuss the long-run effects of free capital flow for both economies. This topic also covers topic such as the trilemma, exchange rates and balance of payments.

7. **Epidemiology in Macroeconomics**: Although interesting, this topic felt rushed and tacked on. This topic briefly introduced the SIR model and discussed how it can be combined with the OLG model to showcase how economic decisions of individuals and policymakers can influence health and economic outcomes.

Lectures

Due to this semester's online delivery, lectures were split up into smaller subtopics and were pre-recorded and uploaded well in advance. Although some people might appreciate this format, I found that the transitions between lectures were jarring and affected my concentration. If you like to study in short 20-minute sprints, then this style will suit you.

The lecture slides are not sufficient for study. Although James does read off the slides quite a bit, he also spends a good majority of the lecture time elaborating on the concepts and providing examples. Therefore, it is helpful to follow along annotating your slides with his comments.

Tutorials

Tutorials were delivered weekly via Zoom and were generally conducted in two ways. In math-heavy tutorials, the tutor would talk us through the working out and intuition behind the formulae. Otherwise, theory-heavy tutorials involved separating into breakout rooms for discussion.

Similar to past economics subjects, you would have a tutorial sheet with a pre-tutorial section and an in-tutorial section. It is expected that the pre-tutorial section is to be completed before the tutorial, but I advise that you attempt both sections to meaningfully contribute to discussions in the tutorial.

Personally, the tutorials were the highlight of this subject. My tutor created a welcoming atmosphere that allowed students to feel comfortable sharing their cameras and facilitated engaging breakout rooms (contrasting to most other breakout room experiences this semester). Although this subject has tutorial participation marks in on-campus semesters, I definitely recommend attending tutorials regardless of this incentive. The tutorials help provide a more intuitive understanding of the models covered in lectures and will often answer questions that you did not know you needed answers to.

Assignments

The two group assignments were so easy, you would constantly question where you might have misunderstood the question. This sentiment was reflected in the high average marks (88%) and low standard deviations published for the assignments. For both assessments, you could choose your own groups and were given approximately two weeks to complete it. The assignments required you to derive OLG models (see end-of-semester exam section), plot the time trends in Excel, and comment on how your economy changes with different initial values and/or policies. The questions that required derivations and explanations are both textbook, so referring to the slides and tutorials will help you score well.

Mid-semester Exam

The format of the mid-semester exam was also similar to previous economics subjects with a true/false, short answer and long answer sections. You are given 90 minutes to read, write and submit your paper. As I had a relatively strong math background, I found this semester's MSE to be fairly straight forward and straight out of the lectures. However, two key skills that could prove useful for future exams are: your ability to take partial derivatives for variables with time subscripts; and using the method of Lagrange multipliers to optimise functions with multiple constraints.

End-of-semester Exam

The format of the end-of-semester exam was the same as the mid-semester exam's — just longer. For this semester's online exam, we had three and a half hours to read, write and submit your paper. Although the exam itself was "designed" to be completed in two hours, I felt that it was made a bit longer and harder than the practice exams provided.

The exam itself was fairly challenging compared to the in-semester assessments. Whilst the multiple-choice and short answer questions are possible adaptions of tutorial and assignment questions, the long answer questions will very likely ask you to derive the OLG model and analyse the time trends and/or equilibrium. These types of questions often follow

the same structure:

1. Find optimal household consumption
2. Find optimal firm profit conditions
3. Solve for market clearing conditions
4. Derive the capital transition equation using 1–3

To maximise your chances of success, make sure you are familiar with performing these derivations no matter what initial assumptions you might have for the model.

ECOM20001 Econometrics 1 [SM2]

Lecturer(s)	Prof Marc Chan	
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial	
Assessments	12 online quizzes due every Friday	10%
	3 group assignments due in Weeks 5, 9 and 12	15%
	Tutorial attendance and participation	5%
	3-hour and 30 min reading time end-of-semester exam	70%
Textbook recommendation	None needed. The lecture slides and tutorial handouts are ample study material.	
Lecture capture	Full (both audio and video)	
Year and semester reviewed	2020 Semester 2	

Overall Comments

For those who set on the path of *Actuarial Studies*, 80% of the topics in Econometrics 1 are covered in the core subjects spreading over *Probability*, *Statistics* and *Actuarial Statistics*. Therefore, I would not recommend this as a value-adding subject to choose as a breath or elective in regards to the content. However, if you have done all the actuarial subjects but still wanted to maintain your skills in your final year, and are also interested in their econometric applications, you could consider taking this subject. I still found it to be enjoyable and interesting to learn.

Subject Content

- **Topic 1: Overview of Econometrics**
- **Topic 2: Probability review (covered in MAST20004)**
  Random variables, distributions, random sampling
- **Topic 3: Statistics review (covered in MAST20005)**
  Hypothesis tests, confidence intervals, sample variance and standard error, scatterplots
- **Topic 4: Single linear regression estimation (covered in ACTL30004)**
  Population regression line, ordinary least squares estimator, OLS assumptions, model fit measurement
- **Topic 5: Single linear regression hypothesis testing (covered in ACTL30004)**
  Confidence intervals for coefficient estimates, t-statistic, dummy variables, heteroskedasticity and homoskedasticity
- **Topic 6: Multiple linear regression model estimation**
  Omitted variable bias, population multiple linear regression line, control variables, OLS estimators, measures of model fits, perfect multicollinearity, dummy variable trap, imperfect multicollinearity
- **Topic 7: Multiple linear regression model testing**
  Testing joint hypotheses, F-statistic, single restriction with multiple coefficients, model specification, applications
- **Topic 8: Nonlinear regression**
  General framework of estimating and testing nonlinear regression models, partial effects, polynomial regression functions, logarithmic regression functions, interactions between independent variables, differences-in-differences and quasi-experiments
- **Topic 9: Assessing studies based on multiple regression**
  External validity, internal validity and threats to them
- **Topic 10: Time series regression (covered in ACTL30004)**

Basic structure of time series data, autocorrelations, autoregressions, basic principles of forecasting, ADL models, AIC, BIC, seasonality

Lectures

Lectures are well-designed with a fairly logical structure covering all the non-coding content. The lecture notes are ample study material which covers all the knowledge points we need to know. During the lecture, Marc delivers clear and concise explanations of the notes with annotations and highlights of the important parts. He is also very patient when providing online supports and consultations, which make the course enjoyable to learn.

Tutorials

Tutorials are mainly focusing on R programming and the interpretations of the outputs. The handouts are well designed to walk you step-to-step through every line of the code, the economic interpretations of the estimates and the estimation errors. Most of the code should also be covered in *Statistics* and *Actuarial statistics*. It is recommended to attend the tutorials if you take this course for two reasons, earning the 5% participation mark and learning the language used in economic interpretations from the tutor's explanation and interaction with other students.

Assignments

Assignments are to be done in groups up to three people of which you get to choose. All of the assignments are R based and are pretty straightforward. They do not require you to program yourself, but require an understanding of the code taught in the tutorials to identify which code should be used in the model provided in the assignment.

End-of-semester Exam

Even though you may find the maths, code and ideas quite familiar, there is some extension to a couple of the previously taught ideas and many details to be aware of. Past exam papers and a practice exam are given, which are useful material for exam preparation. However, you should only expect the actual exam to have a similar format with as these materials, not necessarily the questions, as these can be quite flexible

The end-of-semester exam was held online this semester in a quiz form. 25 questions (ten multiple choices, three short responses and two comprehensive problem-solving questions with multiple sub-questions under each) were to be done in 3 hours plus 30 reading time. The typing of formulae was a disaster and made the exam an intense experience. It was difficult to finish all the questions in time. Therefore, sufficient preparation is essential to perform well in the final exam.

ECOM30003 Applied Microeconometric Modelling [SM2]

Lecturer(s)	Prof Jenny Williams
Weekly contact hours	1 × 2-hour lectures 1 × 1-hour tutorial
Assessments	Individual assignment, due in Week 5 15% Individual assignment, due in Week 10 25% 3-hour end-of-semester exam 60%
Additional Information	This subject can be taken as a commerce elective for the *Actuarial* major or count towards a double major in *Economics*.
Textbook recommendation	Wooldridge, J.M., 2016. *Introductory econometrics: A modern approach*. Nelson Education.
Lecture capture	Full (both audio and video)
Year and semester reviewed	2020 Semester 2

Overall Comments

In Applied Microeconometric Modelling (AMM), you learn how to handle common econometric problems that are faced in real life. This subject focuses on the *applied* aspect of econometrics and emphasises the key assumptions needed for each model and how to identify the correct model to use. Around 40% of this subject you would already be familiar with from *Econometrics 2* (70% if you have also taken *Actuarial Statistics*).

The subject uses **Stata** to run all the statistical models learned throughout the semester. **Stata** is relatively simple to learn, and you are frequently provided with all the relevant code needed to run the regressions for your assignments and exams. The software itself is available through myUniApps, but I felt that logging into the University servers from home and working around internet and server issues was prone to issues. Instead, I opted for the **Stata** 6-month subscription for $65 (which you can share across three of your **own** devices). Luckily, this saved me from the trouble that other students ran into during the semester when trying access **Stata** through myUniApps.

Ultimately, AMM is a pretty good subject; the nature of the subject was more focused on the interpretability of the statistical outcomes rather than the derivations of the various models. This is especially good for *Actuarial* students and would come in handy when you inevitably work with colleagues without a statistical background. However, if I could go back in time and pick another subject, I would have. Although this subject provided excellent revision for content previously learnt, but I can't picture myself running a 'Tobit' model (see below) in the future.

Subject Content

1. **Introduction and OLS**: Revision of prerequisite knowledge.
2. **Omitted variables bias and Pooled Estimation**: This topic renews your understanding of omitted variables bias from *Econometrics 2* and introduces natural experiments and the Difference in Difference estimator.
3. **Panel Data Analysis**: This section revises the Fixed Effects and First Difference estimators from *Econometrics 2*.
4. **Instrumental Variables**: Covers the assumptions of IV estimators and estimating 2SLS in **Stata**.
5. **Maximum Likelihood Estimation (MLE)**: A familiar topic from Statistics, defining the process of obtaining MLEs that are used to fit the following models.
6. **Binary Outcomes Models**: Introduces the Linear Probability, Logit and Probit models which are used for outcome

variables that are restricted to two values.

7. **The Tobit Model and Censored data**: Brings in the Tobit model to obtain inference even in situations where the outcome variable is censored.
8. **Truncation and Selection Correction**: This section looks at working with truncated data, incidental truncation in particular, and how the endogenous selection of this data is corrected for.

Lectures

This semester, the weekly two-hour lectures were predominantly split up into two, one-hour lecture capture videos. Occasionally, there was the odd week which required a third video to cover all the necessary content. Overall, Jenny was a very sharp and intelligent lecturer. The slides she provided were self-contained and served as excellent study materials. Additionally, Jenny would frequently upload 'tutorial' videos that covered the techniques needed to run the regressions in **Stata** and wrote code that was concise and easily understandable.

However, one particular pet peeve I had with Jenny was her tendency to focus more attention on unimportant facts instead of newly learned material — apparently, students taking an advanced level subject don't know that the '/' symbol can denote division (This particular lesson was taught many times throughout the semester, but spoilers: We do).

Tutorials

Tutorials were held in Zoom calls, where the tutor would slowly go through the tutorial solutions. Even though this was supposed to simulate a classroom setting, this lecture style of tutorials made it difficult for me to retain information. The problem sets themselves were not too difficult, and the solutions provided were clear and comprehensive. Resultantly, I found myself gravitating towards replacing tutorials with private study, completing the tutorial sets with a friend in my own time. Tutorials were also peppered with technical difficulties — in my first few tutorials, my tutor spent a non-trivial amount of time troubleshooting their screen-sharing app or drawing tablet. Consequently, as much as I would normally endorse going to tutorials, this semester I attended less than half of them.

Assignments

The two assignments put the 'Applied' in Applied Microeconometric Modelling. In the first assignment, the task was to read an econometric research paper and discuss the design of the analysis performed, as well as the relevant assumptions and potential consequences of violating these assumptions. The second assignment was a continuation of the first, where the results of the findings had to be replicated and the motivations discussed. This included consideration of the specific variables in the regressions. The level of **Stata** used in this assignment was minimal and was limited to transforming the dataset and running the appropriate regressions. In both assignments, it can be easy to misinterpret the regression results (e.g. reading off 12% instead of 0.12%), so make sure that you take note of the form that the data (log vs level) is in and how it could potentially affect your outcomes.

End-of-semester Exam

This year's exam was a 3.5-hour exam, with time for reading and uploading included. The structure was a multiple-choice section worth 20% and three long answer questions worth 80%. The multiple-choice section were textbook questions, which greatly benefitted this cohort due to the exam being open-book. The long answer questions, however, really tested your knowledge of the different models learned, as you had to decide the most suitable model for each of the three situations. To do well in the exam, make sure you are familiar with all the different assumptions of the models, as well as the appropriate types of data that each model is used for. It is also essential that you keep up to date with the tutorials, as not only lecture content is tested, but also your understanding of **Stata** functions and output.

ECOM30004 Time Series Analysis and Forecasting

Lecturer(s)	Mr Barry Rafferty
Weekly contact hours	2 × 1-hour lectures 1 × 1-hour tutorial
Assessments	4 individual assignments during the semester 4 × 10% 2-hour end-of-semester exam 60%
Textbook recommendation	None.
Lecture capture	Full (both audio and video).
Year and semester reviewed	2018 Semester 2

Comments

In ECOM30004 Time Series Analysis and Forecasting, you learn how to fit time series data to models with various features and evaluate the fit and forecast ability of these models. It is usually taken as an Honours/Master's breadth.

Many of the models explored in the course are familiar, such as AR/MA/ARMA models and ARCH/GARCH volatility models, which are covered in previous actuarial subjects. This subject can be considered a more practical extension, where you use EViews software to apply these models to actual data and interpret the results.

Subject Content

The subject content has 5 main topics:

- Trend stationary processes – modelling trend and seasonality; stationarity and autocorrelation; AR/MA/ARMA models;
- Difference stationary processes – seasonal ARMA/ARIMA models; unit root testing; forecasting and forecast evaluation;
- Volatility modelling – symmetric (ARCH, GARCH, ARCH-in-Mean) and asymmetric (TARCH, EGARCH) volatility models;
- Stationary multivariate models – specification, analysis and forecasting of Vector AR models;
- Nonstationary multivariate models – cointegration; Vector Error Correction Models.

Lectures

The lecture content is pretty easy to understand conceptually, particularly with an actuarial background. The most unfamiliar area will be the use of the EViews program, which makes up a large part of the lecture content; however, through the lecture examples and tutorials, it is not too hard to pick up.

Tutorials

The tutorials generally focus on using the EViews program, with the exercises based on the lecture examples. As an actuarial student, it is likely your first time using the EViews program. Hence, the tutorials are particularly useful, as it is where you can learn step-by-step how to use EViews to perform all the model fitting/analysis/evaluation that is seen in lectures.

However, the tutorials usually cover a lot of content, which is hard to fit into the 1-hour timeframe. Depending on the tutor, you may find that the tutorials are often unfinished, or that the tutor has to speed through the content. This was particularly

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the case in the first week, when most of the class had never used EViews before. In addition, it usually takes a while to load EViews, and many of the computers in the lab periodically do not work, so come to tutorials early if you can.

The tutorial content is quite important for the assignments, so even if you don't attend the tutorial, be familiar with the content and know how to use the various aspects of EViews.

Assignments

Each assignment is split into 2 sections:

- The first section contains 'Conceptual Questions' which are theory-based, and generally involve mathematical derivations. They shouldn't be difficult for an actuarial student. Refer to lecture notes.
- The second section contains 'Empirical Questions' based on a provided data set, which you need to use EViews to complete. These questions generally follow the style of tutorial EViews questions, with some extensions. Hence, it helps if you attend the relevant tutorials, or at least look over the tutorial answers.

Generally, the assignments can be time-consuming (particularly the EViews section) but are not that difficult. In terms of EViews itself, you can access it through the computer labs or via *my*UniApps. *my*UniApps may randomly fail, so plan your assignment completion time wisely. Cracked versions of EViews do exist, but obviously this review does not condone their use!

End-of-Semester Exam

The exam consists of 3 (large) questions relating to different areas of the subject content: Q1 covers stationary processes, Q2 covers volatility modelling, and Q3 covers multivariate models. Generally, Q2 will be worth less marks than the other two. The exam is 2 hours long (in addition to 15 minutes reading time), which is roughly enough time to complete all the questions.

The exam is understandably much more theory-based than the assignments. You should know in detail the features of the various models and tests. The only EViews knowledge required is how to read and interpret the EViews outputs that are in the paper.

Two past exam papers were provided, which gave a relatively fair indication of the difficulty and content of the actual exam. I advise you to do them!

Concluding Remarks

Overall, this is a good subject to take as an actuarial breadth (particularly for Honours/Master's students) as it is relevant to actuarial studies while not being time-consuming and conceptually difficult like many actuarial subjects.

Appendix

Exemptions Guide

The University of Melbourne allows you to fulfil the Actuaries Institute accreditation requirements for all of the **Foundation Program** and half of the **Actuary Program** — the other half of which is obtained through the Institute. Exemptions are obtained by completing groups of university subjects with satisfactory grades, which allow you to be exempt from the exam of the corresponding Institute subjects shown in Table 4 and Table 5.

Exemption Marks

Exemption marks are used to calculate whether an exemption is awarded. These marks are calculated after the corresponding subject is graded, and is chosen by the Centre for Actuarial Studies based off the strength of the cohort and distribution of the final scores with the following formula:

$$exemption\_mark = subject\_score - exemption\_cutoff$$

From 2021, for university subjects involved in the exemption of **Foundation Program** subjects, the final subject score will be used to calculate the exemption mark; for university subjects involved in the exemption of **Actuary Program** subjects, only the score achieved in the final exam counts towards to the exemption mark. Although the exemption cut-off mark varies across cohorts, the marks shown in Table 3 can be used as a reference for the marks needed to obtain exemptions.

To secure the exemption for a particular institute subject, the weighted average of the exemption marks associated with the institute subject must be above zero:

$$exemption = \left(\sum_{i \in A} exemption\_mark_i * weight_i > 0 \right)$$

Where A is the group of university subjects that contribute towards the institute subject. E.g. ACTL20001 and ACTL30003 count towards the CM1 exemption (and are equally weighted). These weights and groupings can be viewed in Table 4 and Table 5.

Example:

Grace would like to determine her eligibility for thet CS2 exemption.

1. She received 71, 82, 74 for ACTL30001 , ACTL30002 and ACTL30007 .
2. She calculates her exemption marks using the 2020 exemption cut-offs as -4, +9 and +4 for the three subjects respectively.
3. The weighted average of her exemption marks are: $-4 * 0.3333 + 9 * 0.3333 + 4 * 0.3334 = 3.0001$, which is greater than zero.

Grace is eligible for the CS2 exemption.

Exemption Cut-Offs for 2020

Table 3: Exemption Cut-offs for 2020

University Subject		Exemption Cut-off
Non-ACTLXXXXX Subjects		73
Undergraduate ACTL Subjects		
ACTL20001	Introductory Financial Mathematics	75
ACTL20004	Topics in Actuarial Studies	72
ACTL30001	Actuarial Modelling I	75
ACTL30002	Actuarial Modelling II	73
ACTL30003	Contingencies	72
ACTL30004	Actuarial Statistics	75
ACTL30006	Intermediate Financial Mathematics	72.5
ACTL30007	Actuarial Modelling III	70
Postgraduate ACTL Subjects		
ACTL90001	Mathematics of Finance I	75
ACTL90002	Mathematics of Finance II	73
ACTL90003	Mathematics of Finance III	73
ACTL90005	Life Contingencies	71
ACTL90006	Life Insurance Models I	73
ACTL90007	Life Insurance Models II	75
ACTL90008	Statistical Techniques in Insurance	Subject not offered in 2020
ACTL90010	Actuarial Practice and Control I	66% (Final Exam)
ACTL90011	Actuarial Practice and Control II	69% (Final Exam)
ACTL90019	Data Analytics in Insurance 2	65% (Final Exam)
ACTL90020	General Insurance Modelling	70
ACTL90021	Topics in Insurance and Finance	72
ACTL90022	Economics for Actuaries	73

Source: *Centre for Actuarial Studies*

List of Core Principle Exemptions

Undergraduate Exemption Subjects

Table 4: Actuaries Institute Core Principle subjects and corresponding undergraduate university subjects

Institute subject	University subject(s)		Weight
Foundation Program			
***CM* Actuarial Mathematics**			
CM1 *Actuarial Mathematics I*	ACTL20001	Introductory Financial Mathematics	50%
	ACTL30003	Contingencies	50%
CM2 *Financial Engineering and Loss Reserving*	ACTL20004	Topics in Actuarial Studies	33.33%
	ACTL30006	Intermediate Financial Mathematics	33.33%
	ACTL40004	Advanced Financial Mathematics	33.34%
***CS* Actuarial Statistics**			
CS1 *Actuarial Statistics I*	MAST20004	Probability	33.33%
	MAST20005	Statistics	33.33%
	ACTL30004	Actuarial Statistics	33.34%
CS2 *Risk Modelling and Survival Analysis*	ACTL30001	Actuarial Modelling I	33.33%
	ACTL30002	Actuarial Modelling II	33.33%
	ACTL30007	Actuarial Modelling III	33.34%
***CB* Business**			
CB1 *Business Finance*	ACCT10002	Introductory Financial Accounting	50%
	FNCE10002	Principles of Finance	50%
CB2 *Business Economics*	ECON10004	Introductory Microeconomics	50%
	ECON20001	Intermediate Macroeconomics	50%
Actuary Program			
***ACC* Actuarial Control Cycle**	ACTL40006	Actuarial Practice and Control I	50%
	ACTL40007	Actuarial Practice and Control II	50%
***DAP* Data Analytics Principles**	ACTL40012	Actuarial Analytics and Data II	100%

Source: *Centre for Actuarial Studies* and the *Actuaries Institute*
Current as of 17th December 2020.

Postgraduate Exemption Subjects

Table 5: Actuaries Institute Core Principle subjects and corresponding postgraduate university subjects

Institute subject	University subject(s)		Weight
Foundation Program			
***CM* Actuarial Mathematics**			
CM1 *Actuarial Mathematics I*	ACTL90001	Mathematics of Finance I	50%
	ACTL90005	Life Contingencies	50%
CM2 *Financial Engineering and Loss Reserving*	ACTL90021	Topics in Insurance and Finance	33.33%
	ACTL90002	Mathematics of Finance II	33.33%
	ACTL90003	Mathematics of Finance III	33.34%
***CS* Actuarial Statistics**			
CS1 *Actuarial Statistics I*	MAST20004	Probability	33.33%
	MAST20005	Statistics	33.33%
	ACTL90008	Statistical Techniques in Insurance	33.34%
CS2 *Risk Modelling and Survival Analysis*	ACTL90006	Life Insurance Models I	33.33%
	ACTL90007	Life Insurance Models II	33.33%
	ACTL90020	General Insurance Modelling	33.34%
***CB* Business**			
CB1 *Business Finance*	ACCT90042	Accounting and Finance for Actuaries	100%
CB2 *Business Economics*	ACTL90022	Economics for Actuaries	100%
Actuary Program			
***ACC* Actuarial Control Cycle**	ACTL90010	Actuarial Practice and Control I	50%
	ACTL90011	Actuarial Practice and Control II	50%
***DAP* Data Analytics Principles**	ACTL90019	Data Analytics in Insurance 2	100%

Source: *Centre for Actuarial Studies* and the *Actuaries Institute*
Current as of 17th December 2020.

Mathematics Prerequisites for the Actuarial major

The second-year subjects that sets the foundation for all subjects in the *Actuarial Studies* major are MAST20004 *Probability* and ACTL20001 *Introductory Financial Mathematics* — the prerequisites for every ACTL subject can be traced back to these two subjects. To be eligible to enrol in MAST20004 and ACTL20001 in your second year, you must have fundamentals in both linear algebra and calculus, shown through your satisfactory performance in the University of Melbourne subjects or equivalent.

Linear Algebra

- MAST10007 *Linear Algebra*
- MAST10022 *Linear Algebra: Advanced*
- MAST10008 *Accelerated Mathematics 1*

Calculus

- MAST10006 *Calculus 2*
- MAST10021 *Calculus 2: Advanced*
- MAST10009 *Accelerated Mathematics 2*

Whilst the requisite conditions for MAST20004 *Probability* is fairly straight forward:

- Obtaining a pass in any subject from the list of *Linear Algebra* subjects, and;
- Obtaining a mark of 60 or greater in any subject from the list of *Calculus* subjects.

Meeting the requisite conditions for ACTL20001 *Introductory Financial Mathematics* can be confusing and the Actuarial Students' Society have tried to summarise these conditions with Table 6. To meet the requirements of *ACTL20001*, you must complete one of the Linear Algebra subjects and one of the Calculus subjects, and receive a **combined mark** greater or equal to the cell that corresponds to the associated row and column.

Table 6: Requisites for ACTL20001 *Introductory Financial Mathematics*

		Linear Algebra		
		MAST10007	MAST10022	MAST10008
Calculus	MAST10006	150	150	135
	MAST10021	150	150	135
	MAST10009	135	135	120

For more information, visit the handbook entry for ACTL20001

Example:

Rose received a 68 and 83 for MAST10008 and MAST10006 respectively. As the combined score is 151 and is greater than 135, Rose can enrol in ACTL20001.

Ineligible for MAST10006/MAST10007

If you have not met the high school prerequisites for MAST10006 and/or MAST10007, you may replace ACTL10001 with MAST10005 in your study plan to meet the prerequisites for MAST10006 and MAST10007.

UMEP Mathematics

If you have completed MAST10018 *Linear Algebra Extension Studies* and MAST10019 *Calculus Extension Studies*:

- with a combined score of 150 or more, you are eligible for *ACTL20001*.
- with a combined score above 135 but lower than 150, you must pass MAST20026 *Real Analysis* to be eligible for *ACTL20001*.