

**The University of New South Wales
School of Aviation**

AVIA5037 – Airline Operations and Delay Management

2017 Course Outline

Course Staff

The lecturer in charge is Dr. Cheng-Lung (Richard) Wu in the School of Aviation. Dr. Wu can be contacted via e-mail at C.L.Wu(at)unsw.edu.au. Many of your questions may be related to study contents of this course and may be also questions by other fellow students. Hence, you are encouraged to ask your questions on Moodle, so everyone in the class can get involved in answering your questions.

About the Author

Dr. C. Richard Wu

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IATA Certified Instructor- Airports and Ground Ops

Dr. Wu is currently an Associate Professor in aviation who specialises in solving operations management and scheduling problems for airlines and airports. These problems include airline operations management, scheduling, airport terminal planning, airport retail development and passenger choice behaviour studies. Many of his past projects helped industry partners save millions of dollars in operating costs or enhance product sales and revenues. Dr. Wu leads a team of seven post-graduate researchers who have specialised skills to deliver values for industry partners through world-class aviation research at UNSW Australia.

Dr. Wu has spent time both in the public and private sector in transport and aviation. Wu's research is innovative and highly relevant to the industry. Recent projects in his lab include a fuel optimisation project for Qantas, an aircraft line maintenance scheduling project for Qantas, a passenger choice project for Virgin Australia, and some airport retail simulation projects. Wu's research outputs have been used by aviation insurance companies, consulting firms, airlines, ground handling companies, and airports. The most recent example is Wu's work in 2014 on airline alliance terminal co-location being applied by the Chicago Aviation Department on improving the terminal planning of Chicago O'Hare Airport in 2016/2017. Recent publications in 2015 and 2016 on airline network modelling are being assessed by Sabre and Southwest Airlines in the U.S.

Course Information

Aims

This course is offered in S1 and focuses on: airline ground operations (incl. pax facilitation and aircraft turnaround operations), delay data collection, delay data analysis, delay development modelling, airline networks and the emerging concept of robust airline scheduling. The rationale of this course is to provide students with practical airline operations knowledge, coupled with the use of math models in delay analysis, leading to the study of ways to improve the robustness of airline schedule in actual operations. Hence, some units of this course may contain mathematical models that require extra efforts in self-study. On-going assistance and classroom discussion on Moodle will be organised. Basic statistical knowledge is ideal for this course. Students with airline operations experience may be able to grasp this course quickly; however, prior operations experience is not essential for studying this course.

The objectives of this course are to:

- provide students with advanced understanding of airline operations and the concept of schedule planning,
- explore the role of uncertain disruptions in daily airline operations,
- focus on improving airline schedule robustness by considering operational uncertainties,
- develop mathematical models that can solve operational issues,
- understand how schedules can be improved by the emerging concept of robust scheduling.

Learning Outcomes

On completion of this course students should be able to:

- acquire advanced understanding of airline operations and the feedback to airline schedule planning,
- have good understanding of the role of uncertainties in daily airline operations and how airline schedules should be designed to mitigate effects from unexpected disruptions,
- identify why delays occur in airline operations, to model delays and how delay propagate through an airline network due to resource connections,
- develop math model to model airline delays and understand how schedules can be adjusted to reflect delay risks in operations,
- understand the emerging concept of 'robust airline scheduling' and how this concept is rooted in the feedback from airline operations and delay management.

Location

This course runs for the duration of Semester 1 and is delivered via distance education. Course materials are supplied via the Moodle platform.

Learning and Teaching Philosophy

The learning and teaching strategy of this course is to bring the practical airline operations context into a rigorous analytical framework that is increasingly important for airline scheduling and operations. This allows students to develop good understanding of airline operations and scheduling principles by using practical examples of airline operational activities such as flight dispatch, ground operations, aircraft turnaround and passenger facilitation. The teaching rationale is to use this knowledge and lead students into the development of math models that can be used to solve real-world operational issues in airline operations such as schedule improvement and delay management.

Internet

Online content and study materials can be accessed via Moodle at:
<https://moodle.telt.unsw.edu.au/>

Assessment

The MScTech (Aviation)/MAvMgmt Program's approach to assessment closely follows that of the Australian Open Learning Program of the Australian Graduate School of Management. At all times assessment is intended to form a component of the learning process and assignments are designed to encourage you to apply what you have learnt to your own organisation. Assignments will be assessed on the basis of how you apply subject materials to gaining new insights into airline operations, and ideally your works and organisation. Written comments will accompany your return assignments or exercises and should provide useful feedback. The examination will provide you and UNSW with feedback about your comprehension of the subject contents.

Criteria for Assessment

Unless otherwise specified, the following criteria will be applied in assessing your written work:

- Evidence of understanding of the concepts, theories and ideas developed in the subject;
- Ability to apply these concepts to situations from your own experience;
- Capacity to structure an exercise or assignment logically and limit it to the length required;

Course Contents and Schedule

| Units | Topics | Sections of study from the text |
|---------|--|---------------------------------|
| Unit 1 | -Introduction to airline operations and the operating environment - Airline scheduling and aircraft turnaround operations | §1, §2.1, §2.2 |
| Unit 2* | Schedule constraints and delay modelling | §2.3 |
| Unit 3* | The optimal turnaround time- empirical method | §2.4 |
| Unit 4 | -Issues in aircraft turnaround operations -Collecting service data | §3.1, §3.2 |
| Unit 5* | Modelling ground services | §3.3 |
| Unit 6* | Tutorial on PERT | §3.3 |
| Unit 7 | Managing passenger flows at airports | §3.5 |
| Unit 8 | Network complexity & operations | §4.1- §4.3.2 |
| Unit 9* | Delay propagation modelling | §4.5 |
| Unit 10 | On-time performance management | §5.1, §5.2 |
| Unit 11 | Inherent delays | §5.4 |
| Unit 12 | Robust airline scheduling | §6 |

Note: Some units (denoted by * in the table) contain technical and mathematical modelling materials and may take longer to study and comprehend. This course schedule is subject to change. Any change will be announced on Moodle and a revised course outline will be available together with the announcement.

Academic Honesty and Plagiarism

The MScTech (Aviation)/MAvMgmt Postgraduate Program requires compliance with the UNSW Policy on Academic Honesty and Plagiarism.

Students are referred to the University's rules on academic conduct, which are contained within the *Student Handbook*. Put simply, plagiarism is intellectual dishonesty and the theft of other people's work. Consequences for students caught plagiarising or stealing the work of others can include failure of the course or even exclusion from the University.

Plagiarism is the presentation of the thoughts or work of another as one's own¹. Examples include:

- direct duplication of the thoughts or work of another, including by copying work, or knowingly permitting it to be copied. This includes copying material, ideas or concepts from a book, article, report or other written document (whether

¹ Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle.

- published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, web site, Internet, other electronic resource, or another person's assignment without appropriate acknowledgement;
- paraphrasing another person's work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
 - piecing together sections of the work of others into a new whole;
 - presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and
 - claiming credit for a proportion of work contributed to a group assessment item that is greater than that actually contributed.²

Submitting an assessment item that has already been submitted for academic credit elsewhere may also be considered plagiarism. The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does not amount to plagiarism. Students are encouraged to seek advice from academic staff whenever necessary to ensure they avoid plagiarism in all its forms.

The Learning Centre website is the central University online resource for staff and student information on plagiarism and academic honesty. It can be located at:

www.lc.unsw.edu.au/plagiarism

Open Book Examinations and Plagiarism

Open book examinations are examinations which allow students to refer to notes/texts/etc to assist in preparing answers. They allow students, in effect, to research answers during the period of examination. Students in open book examinations are, however, expected to submit their own work as answers to examination questions. Students in open book examinations who merely copy portions of notes/texts into their answers rather than submitting their own work are plagiarising or stealing the copied material and will receive no marks for such answers and, in addition, will be subject to the University sanctions for plagiarism.

Informal feedback

As well as the formal assessment procedure, every attempt will be made to give informal feedback during the instruction sessions. This might consist of students swapping exercises to comment on each other's work, or it might consist of group discussion. It is essential that all the set exercises be attempted in order to achieve a satisfactory level of understanding of the basic concept of the subject.

Internet

² Adapted with kind permission from the University of Melbourne.

Of increasing importance and relevance in studying is of course the Internet. A good starting point of using internet for study is UNSW Library (<https://library.unsw.edu.au>). Resources and materials are available for your study and access may require you to go through the portal of UNSW Library for different services. Online reference materials for the course is helpful but must be viewed and examined carefully. Please ensure you fully cite any web references you use in your assignments and the date on which you referenced the material.

As a final comment, it is of paramount importance with any research but in particular with online research, that the reference source be verified and checked to ascertain its accuracy and authenticity. Obviously the official websites of governments, educational institutions, agencies and reputable organisations are usually the best and most reliable source of information but most references still need to be checked for currency, especially in relation to legislation in aviation. It is also common practice to state the date of viewing or referencing of online information sources.

Studying and Research

To supplement the course materials, references to particular sections of the textbook, *Airline Operations and Delay Management* will be made. The following symbol instructs a student to finish the unit with further reading of section §2.3 of the textbook.



Please read your textbook, §2.3

Textbooks

The prescribed text for this course is:

→ **Wu, C. L., 2010. *Airline Operations and Delay Management*, Taylor & Francis Publishing, UK.**

This text can be borrowed from UNSW library both in hard copy and soft copy forms (e.g. e-books). It is essential that students have a copy of this text as the teaching of this course closely follows the structure and contents of the prescribed text. E-books of this text are available for download for UNSW students via the Library portal, so please visit UNSW Library and download a copy of e-book before starting this course. This text can also be purchased from UNSW Bookshop: <https://www.bookshop.unsw.edu.au>, where this text is usually in stock and readily available. Books are also available for purchase online:

- Taylor & Francis: <http://www.tandfebooks.com/isbn/9781315566467>.

- Amazon: <https://www.amazon.com/Airline-Operations-Delay-Management-Economics/dp/075467293X>.

Other texts and journal papers that may be of assistance are referenced in the various sections of each unit or made available via UNSW Library. You may find that some of these publications are also useful references in areas other than the extracted sections. The use of library resources is essential for your study in this course.

Report Writing

Report writing standards and requirements vary in the University environment and within industry and Government. It is not expected that students will be perfect in this area. The standards in this course are similar to the author's experience in producing action-orientated papers for the industry and technical papers for international aviation journals. The standards for referencing etc are not critical as long as you do use quotes where appropriate and acknowledge other people's ideas where necessary, i.e. proper citation and references.

Continual Course Improvement

Periodically, student evaluative feedback on the course is gathered, using among other means, UNSW's Course and Teaching Evaluation and Improvement (CATEI) Process. Student feedback is taken seriously, and continual improvements are made to the course based in part on such feedback. Significant changes to the course will be communicated to subsequent cohorts of students taking the course

Teaching Strategies

The Master of Science and Technology in Aviation and its associated programs, the Graduate Certificate in Aviation Management and the Graduate Diploma in Aviation Management, are offered through distance education and have been specifically designed for students who are unable to attend weekly sessions at the university. The MScTech (Aviation)/MAvMgmt is targeted towards professionals and managers who work in aviation related environments.

Administrative Matters

Students should be familiar with the information contained in <https://my.unsw.edu.au> regarding expectations of students, assignment submission, examination procedures, equity and diversity and other policies that affect you. A Postgraduate Aviation

Student Guide can be obtained from the School of Aviation and the guide is also available on Moodle. Please contact Ms. Jamie LIM at: aviam@unsw.edu.au for any administrative enquiries.

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