

Study Guide 2004 FC

ENGSCI 255 Modelling in Operations Research

STATS 255 Introduction to Operations Research

The STATS 255 course is an introduction to Operations Research modelling and its application to practical problems. The emphasis of the course is on developing skills in model formulation rather than teaching mathematical techniques of Operations Research. At the end of the course students should be able to recognise and formulate a variety of operations research models, apply standard computer packages to these formulations, and interpret and analyse the results. The ENGSCI 255 course extends the STATS 255 course by including the Extension Modules.

Course outline

Section 'LP': *Deterministic Optimisation Models*: (16 lectures)

Linear programming, integer linear programming, the transportation problem, the assignment problem, network flow models.

Section 'I+D': *Inventory Models, Distance Networks & Simulation*: (16 lectures)

Deterministic and probabilistic inventory control models, shortest and longest path problems, models for project scheduling, minimum and maximum spanning trees, the travelling salesman problem, introduction to simulation

Section 'Q+S': *Probabilistic Operations Research Models*: (16 lectures)

Queuing models, simulation.

The order of these sections may be changed if required.

Timetable

The course is divided into three equal sections typically taught by different lecturers. The same course will be taught on the City Campus in the first and second semesters and at Tamaki during the second semester.

First Semester, City (FC):

Lectures:	Mon 2 pm – LibB10 (Library Basement) Tue 2 pm – MLT1 (Ground Floor of Building 303 Science Centre) Wed 2 pm – MLT1 Thu 2 pm – LLT (Lower Lecture Theatre)
Tutorial:	Fri 2 pm – MLT1
Computers:	Tutor availability to be advised (Statistics Computer Lab , Basement of Building 303, Science Centre, see maps on page 7. Note that the lab will not be open until Wednesday 3 March 2003).
Statistics Assistance Room:	Tutor availability to be advised (Basement of Building 303, Science Centre, B09, see map on page 7).

Workbook and Textbook

This course will be accompanied by a workbook that can be purchased for a minimal fee of \$30 from the Student Resource Centre in the Basement of Building 303, Science Centre. (This fee covers the extra photocopying costs above those allowed for in the enrolment fees). It is expected that students will purchase this workbook and bring it to lectures to reduce the quantity of material that needs to be copied down during lecture time. This workbook includes all tutorial material (questions and answers), further problems and solutions plus previous tests and exams.

Recommended textbook: Render, Barry and Stair, Ralph M., Jr. (1999). *Quantitative Analysis for Management*. Prentice Hall: New York.

- The textbook is available from SHORT LOAN in 2 hour blocks from the Kate Edger Information Commons (Level 1). The Call Number is 658.403 R39 2000.
- The textbook has a website associated with it: <http://www.prenhall.com/render>.

Web Access to Lecture and other Course Material

This paper provides extensive support through the Web using CSL (Cecil or Computer Supported Learning - see below). Our aim is to ensure completed lecture notes, assignments, model answers and course notices are available on Cecil shortly after being given out in lectures. If you miss a lecture, this is the place you should turn to first. Note, however, that students are expected to attend all lectures as the lectures define the course content.

What is Cecil?

Cecil is a web based information system. Cecil is designed to support learning within the university and at a distance.

The benefits of using Cecil include:

- Your on-line course material becomes available from anywhere, 24 hours per day.
- Enhanced communication between you and your course instructors via announcements.

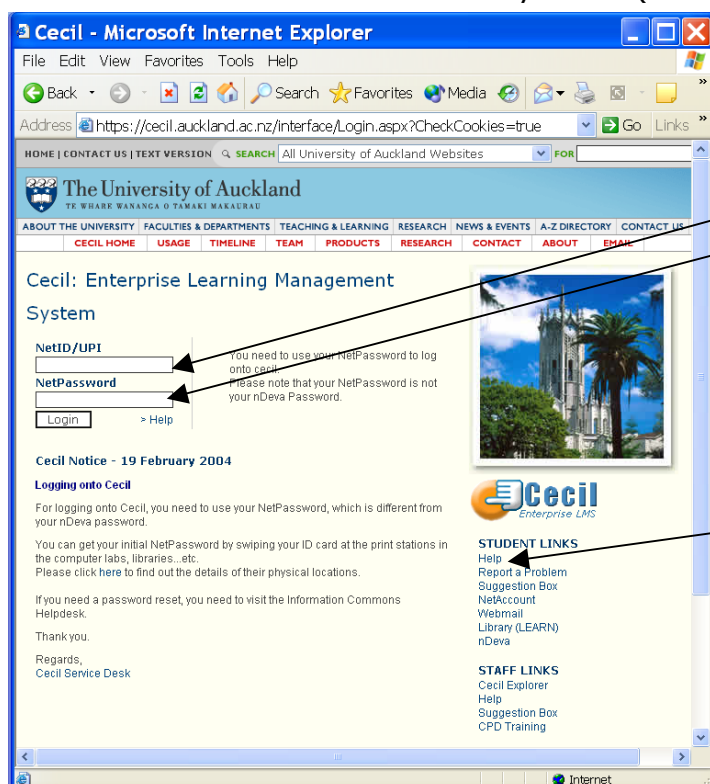
How do I access Cecil?

Access Cecil via a browser from anywhere (inside or outside the university):

<https://cecil.auckland.ac.nz/>

Log on to Cecil using your **NetID** and **NetPassword** (note that this is not the same as your nDeva password).

Click on **Help** to access an on-line *Tutorial* page, a *Frequently Asked Questions (FAQs)* page and a *Search* engine.



The following course information and resources can be accessed via Cecil:

- Course description
- Course announcements
- Your course marks
- Assignment questions
- Assignment answers (these will be posted when marked assignments have been returned)
- Filled-in lecture notes
- Tutorial material and solutions
- Further problems and solutions
- Previous tests and exams (with answers)
- Tables and formulae

Using Your Electronic Campus E-mail Account

Course announcements are accessed under **Communications** on Cecil. All announcements will also be emailed to all students enrolled in the course. To receive these emails you can use the University's Webmail server. To access your e-mail, go to <http://webmail.ec.auckland.ac.nz/>. Your **username** is your *NetID* (eg *jblo123*). Your **password** will be your *Netpassword*. You can contact a helpdesk for clarification. Your e-mail address is NetID@ec.auckland.ac.nz, (eg jblo123@ec.auckland.ac.nz).

There is technical support available. Faults should be reported to the local IT support staff or to the IT HelpDesk (e-mail: helpdesk@auckland.ac.nz phone: extn. 85100). After hours critical faults should be reported to IT Operations (e-mail: operators@auckland.ac.nz phone: extn. 87914). Student queries should be directed to the Electronic Campus HelpDesk (e-mail: echelpdesk@auckland.ac.nz phone: extn. 82333) or your local support centre.

Each mailbox has an associated storage quota, or limit to the volume of messages that can be stored. It is the user's responsibility to manage the volume of the messages that are stored in their mailbox by down loading and deleting messages as required. Your quota is 100 MB.

There is no charge for all messages sent from or received by the student e-mail service. Note that students who use an external mail service will incur Internet traffic charges when they access their mail from a computer within the University.

You can change your email address to receive course email on your own mail server (eg hotmail.com). Look under **Preferences**  on Cecil. If you don't want any Cecil announcements via email for ENGSCI 255/STATS 255 or any of your other Cecil based courses, you can delete your email address under **Preferences** on Cecil (i.e., make sure the email field is blank).

Tutorial and Review Problems

This course operates with one **optional** tutorial a week. Please note you **don't** have to be enrolled in the tutorial through nDeva to attend. Tutorial problems are included in the course workbook (Section D), and should be completed independently. Model answers are included in the course workbook (Section E). The tutorial material is an important part of the course, and fully examinable. There will also be time in the tutorial to discuss and get individual help with assignment problems, test and exam questions, and any other information regarding the material in the course.

Term's Test

First semester term's test: Provisional date is Monday 10 May, 6:30pm

Rooms and confirmation of times will be given in lectures, on Cecil and via email announcement. The test will cover all material taught up to the last lecture in the previous week. Please contact Leila Boyle if this test clashes with other course commitments. The term's test will be worth **20%**. Please note that the term's test will be run under examination conditions, and any cheating will be dealt with accordingly.

Inability to sit the Term's Test

If you know in advance that you are not going to be able to sit the term test, please contact Leila Boyle or Andrew Mason (see page 8 for contact details) as soon as possible. Alternative times may be arranged for the sitting of the test. If you miss the test and had a valid excuse or were impaired when you sat it, apply for either an aegrotat or borderline assessment through Registry.

Please note that if you are unable to sit the term test, then it is imperative that you sit the exam. Any examination aegrotats are based solely on term test marks, as this is the only form of controlled assessment on which we can base assessments.

Calculator Restrictions

This paper is designated 'unrestricted calculators' which means that you may take one unrestricted calculator into the exam. A student taking more than one calculator into the examination or term's test will be in breach of examination regulations, and treated as such by the University authorities.

Assessment

The coursework mark is based on one term's test and 5 (or 6 for ENGSCI 255) equally weighted assignments. The final grade is computed according to the following formula:

$$\text{Coursework Grade} = \text{Max}\{(0.6)E + (0.2)T + (0.2)A, (0.8)E + (0.2)A\}$$

where E = % mark in final exam, T = % mark in term test, A = % mark in assignments.

You must obtain at least 50% overall and at least 45% in the final exam alone to pass.

Assistance Room

There are limited hours (to be advertised in class, on Cecil and via email announcement) where Statistics Assistance Room staff are available for STATS/ENGSCI 255 help. They will help you with any aspect of the course that you are having difficulty with including assignment problems. However, the following rules apply:

1. Staff are not permitted to give you assignment answers. They are only *allowed to help you to work them out* for yourself.
2. Staff are only permitted to help you with an assignment problem if you have read the relevant section of the workbook (or textbook). Otherwise, they may only tell you which section you should read.

Computer Access for Storm, Excel and Web pages

Students in this course will be expected to make use of the PC packages STORM and Excel in their assignments, and also to access Cecil using Netscape or Internet Explorer.

Students will have access to the PCs in the Statistics Lab in the basement of Building 303 Science Centre (see the maps on page 7). Engineering students also have access to their PC labs. Please see the instructions in the rooms for details of logging into the computers. Note pages for printing in the labs may be purchased from the Student Commons.

Assignments

The assignments in this course form an important part of the learning program, and should be completed by all students who wish to pass the course. Assignment question sheets will only be available from Cecil.

Help with Assignments

Help with assignments will be available at the tutorial sessions, and in the assistance room listed above. You may also wish to ask the lecturer before or after class.

Completion of Assignments

The following instructions must be followed when preparing assignments. Failure to follow these will result in penalty marks being deducted.

1. Use (standard) A4 sized paper.
2. Number each page in the top centre and legibly print your name at the top right-hand corner with the surname or family name underlined. [If you are using poor quality paper where the writing from one side soaks through to the other, write on one side of the paper only].
3. Most of the assignments will include computing exercises using the PC packages STORM and Excel, and will require the submission of sections of printed output. When handing in your answers, *do not hand in all the reports that STORM/Excel can generate*, but only include output that is specifically asked for. Your print outs must include your ID number as entered by you on the Excel spreadsheet or into the problem description area within STORM.

If your computer output does not include your ID number as entered by you on the Excel spreadsheet or into the problem description area within STORM you will get zero marks for the output and any questions which interpret that output.

4. Attach a *Department of Statistics Assignment Cover Sheet* (available from the basement of Building 303, Science Centre) to the front of the assignment. Staple the assignment together in the top left-hand corner.
5. Fold the paper lengthwise so that the printed side of the cover sheet faces out.
6. Print the following details on the *outside* of the coversheet:
 - Your name.
 - The paper name and number.
 - The assignment number.

Print your student ID number on the *inside* of the coversheet.

Handing in Assignments

All assignments are due at 4 pm sharp on the due date. Late assignments will not be marked. Due dates are shown on the Course Calendar on page 8. Make sure all

assignments are handed in to the correct box. Assignments handed in to boxes for other papers will *not* be marked.

Hand-in boxes are in the foyer of the basement of Building 303, Science Centre.

Model Answers

Model answers will only be available from Cecil for printing at home or in the computer labs.

Collecting Marked Assignments

Assignments will typically be marked within 2 weeks of handing in. A Cecil announcement will be sent out when assignments have been returned. *Please pick up your assignment scripts promptly* as old scripts will eventually be disposed of.

Assignment-return pigeonholes are in the foyer of the basement of Building 303, Science Centre.

Checking Recorded Marks

Assignment marks will be available on Cecil a few days after marking is completed. Please check that your mark has been recorded correctly.

Inability to complete and submit

If you cannot complete an assignment or need an extension due to illness or for some other reason then contact Leila Boyle as soon as possible. Where assignments are missed and a student has a sufficient excuse (with proof – usually a medical certificate), the assignment mark will be excluded from the coursework average calculation. *Pressure of course load is not an acceptable excuse.* You are advised to check the records on Cecil to confirm your assignment has been excluded.

Problems with the marking and queries about late hand-ins

Problems with assignment marking such as incorrectly totalled marks, unmarked material, or discrepancies in marking can be taken to Leila Boyle directly. Check Cecil to confirm corrections have been made.

Notes:

1. Operations Research is about summarising, analysing and communicating information. Communication is an important part of operations research. For this reason you will be expected to write answers which clearly communicate your thoughts. The mark you receive will be based on your written English as well as your mathematical/technical work.
2. To protect against loss, students are strongly advised to make photocopies of assignments before handing them in, and to retain all marked and returned assignments.
3. Cover sheets will be available free from the Student Resource Centre.

Working Together versus Cheating

You are encouraged to discuss problems with one another and to work together on assignments, but you must not copy another person's assignment. Assignment marks will contribute to the final mark you receive in this course. *We view cheating on assignment work as seriously as cheating in an examination.*

Generally acceptable forms of collaboration:

- Getting help in understanding from staff and tutors.
- Discussing assignments and methods of solution with other students.

Generally unacceptable forms of collaboration ("cheating"):

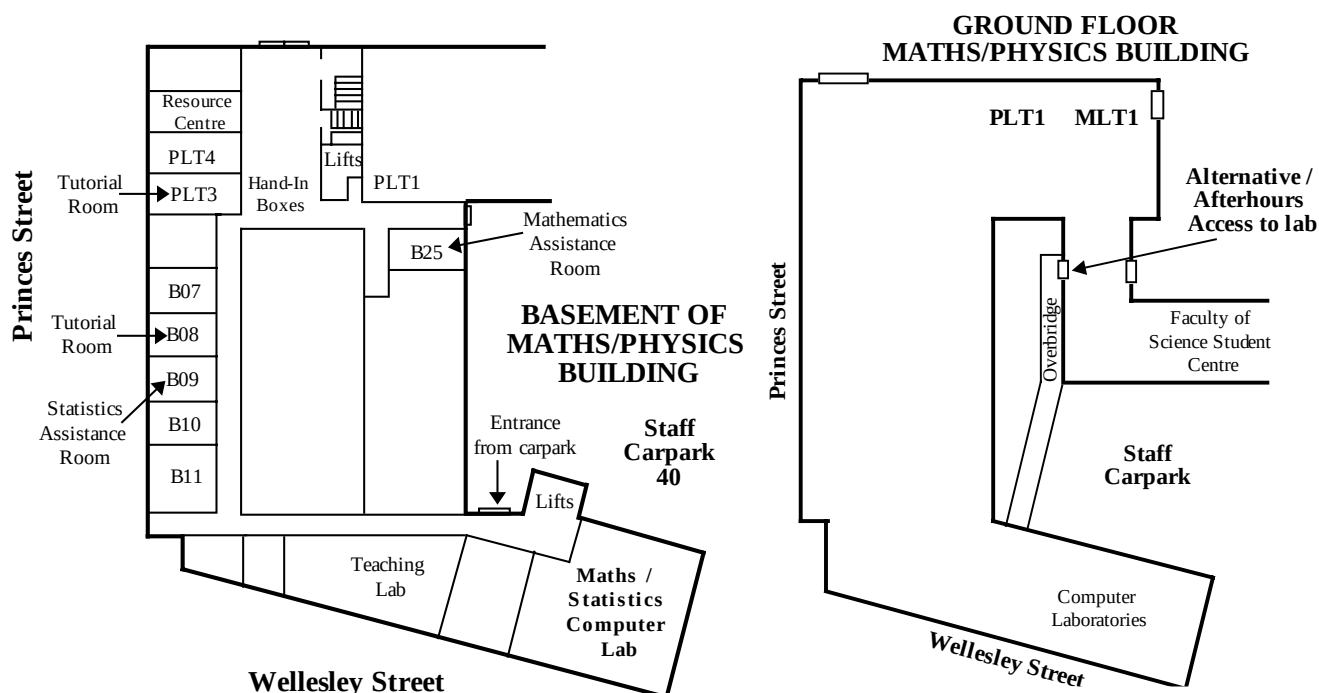
- Copying all or part of another student's assignment, or allowing someone else to do all or part of your assignment for you.
- Allowing another student to copy all or part of your assignment, or doing all or part of an assignment for somebody else. This is treated as seriously as copying another student's assignment.
- Sharing your computer files and/or printouts.

The Department has a number of ways of dealing with students caught cheating, eg:

- Give *negative* marks of 5/10 for each assignment caught.
- Loss of additional coursework marks.
- Requesting that the student(s) involved withdraw from the paper.
- Referral of the student(s) involved to the University Discipline Committee followed by a reprimand, fine or expulsion from the University.

If you are in any doubt about the permissible degree of collaboration, then please discuss it with a staff member.

Maps showing location of the Statistics Assistance Room and Statistics Computer Lab



Course Staff

Course Organiser: Dr Andrew Mason (see below for contact details)

Course Coordinator: Leila Boyle (see below for contact details)

Course Lecturers: Dr Andrew Mason – teaching Section A → 'LP'

Department of Engineering Science

Room 4.606 (Engineering), Ext 87909

a.mason@auckland.ac.nz

Office hours: call or email for an appointment

Geoff Leyland – teaching Section B → 'I + D'

Department of Engineering Science

Room 4.613 (Engineering), Ext 82472

g.leyland@auckland.ac.nz

Office hours: Tuesdays and Thursdays 3 – 4pm

Leila Boyle – teaching Section C → 'Q + S'

Department of Statistics

Room 221 (2nd floor, Building 303, Science Centre), Ext 88755

leila@stat.auckland.ac.nz

Office hours: Tuesdays 11.30am – 12.30pm, Thursdays 3.30-4.30pm or email for an appointment

Course Calendar

Week	Starting	Monday	Tuesday	Wednesday	Thursday	Friday
	Feb 23					
1	Mar 1	A	A	A	A	Tutorial
2	8	A	A	A	A	Tutorial
3	15	A	A	A	A	Tutorial
4	22	A	A, Ass 1 due	A	A	Tutorial
5	29	B	B	B	B	Tutorial
6	Apr 5	B	B, Ass 2 due	B	B	Good Friday
	12	Easter Monday	University Holiday	Break Starts		
	19					Break ends
7	26	B	B	B	B	Tutorial
8	May 3	B	B, Ass 3 due	B	B	Tutorial
9	10	C, Term Test	C	C	C	Tutorial
10	17	C	C, Ass 4 due	C	C	Tutorial
11	24	C	C	C	C	Tutorial
12	31		C, Ass 5 due	C	C	NO Tutorial
	Jun 7	Queen's B'Day	Study break starts		Exams start	
	14					
	21	255 exam 2.15pm				Exams end (Sat)

Note: Dates are subject to confirmation in lectures.

A, B and C designate different course sections.