Course Outline

Semester 1 2017

Never Stand Still

Engineering | Mechanical and Manufacturing Engineering

MANF4611

PROCESS MODELING AND SIMULATION

Contents

1. Staff Contact Details

Contact details and consultation times for course convenor

Name: Erik van Voorthuysen
Office location: ME507
Tel: (02) 9385 4147
Email: erikv@unsw.edu.au

Name: Dr Ron Chan
Office location: ME507
Tel: (02) 9385 1535
Email: r.chan@unsw.edu.au

Consultation concerning this course is available immediately after the classes. Direct consultation is preferred.

2. Course details

Credit Points

This is a 6 unit-of-credit (UoC) course, and involves three hours per week (h/w) of face-to-face contact.

The UNSW website states “The normal workload expectations of a student are approximately 25 hours per semester for each UoC, including class contact hours, other learning activities, preparation and time spent on all assessable work. Thus, for a full-time

resourcing and processes in line with practical requirements and a constantly evolving set of task and operational requirements.

This course focuses on analytical techniques for decision making and solving complex

2.	Characterize the behavior of a system in terms of the nature of its variables, interactions using regression methods.	PE1.3, PE1.4
3.	Apply DoE techniques to efficiently analyze multi-variate systems.	PE1.2, PE2.3
4.	Apply simulation techniques to solve complex system issues and to select feasible, if not optimum, solutions and configurations amongst competing designs.	PE1.2, PE1.3, PE2.1, PE1.6

3. Teaching strategies

Lectures in the course are designed to cover the terminology and core concepts and theories in the area of statistical and simulation modelling. They do not simply reiterate the texts, but build on the lecture topics using examples taken directly from industry to show how the theory is applied in practice and the details of when, where and how it should be applied.

Teaching Strategies and their rationale

This course will be presented using PowerPoint presentations as well as case studies and real-life designs. The material will be presented in the lecture and the student is expected to actively participate in discussion, analysis and design. Assignments to develop the understanding of the key methodologies and theories and how to apply them will be provided as part of the course. There will be a final exam.

The major assignment is based on a real-life case study and has been developed in conjunction with a consulting company that specializes in developing simulation models for industry. The assignment has been designed to develop best practice skills directly relevant to industry requirements.

4. Course schedule

Date	Lecture Content (Colombo Theatre A) 10:00-12:00	Lab Content (Ainsworth 203/ 4) 12:30-14:00
Week 1 Thu 2/3/17	Introduction to Process and Operations Modeling x Characteristics of Processes and Operations x Flow Systems, Manufacturing Systems, Business Systems, Engineering Systems x What are Models x Stochastic Processes x Dynamic Models x Continuous – Discrete Time Models x Input, Output and Disturbance Variables x The Process of Modeling x Introduction to Operations Research x Introduction to Simulation and Arena	No labs in Week 1 (pe)10. iodela

Week 4 Thu 23/3/17	Application of Simulation Modeling x Modeling Production Systems in Arena x Arena variables, logic control and expressions: Variables, Attributes, Record, Assign, Expressions, While, Separate, Batch x Flow Control in Arena x Interfacing to Excel	Communicating between Arena and Excel Demonstration Set 3 Assignment Part 1 due
Week 5 Thu 30/3/17	Design of Experiment Theory (DOE) x Single factor experiments – ANOVA x Introduction to factorial designs x Response surface methods x Introduction to Minitab	Minitab Tutorial
Week 6 Thu 6/4/17	Analyzing Simulation Output 1 x Within – Across Replication Statistics x Types of Statistical Variables x Confidence Intervals and Determining the Number of Replications x Sequential Sampling x Interpreting Arena Output Files x Finite – Infinite Horizon Simulations x Effect of Initial Conditions, Warming-up Period x Comparison of Different System Configurations and Designs	Further Arena Modelling – Demonstration Set 4 On-going Arena support for Assignments
Week 7 Thu 13/4/17	Advanced Arena Concepts x Transportation x	

Week 9 Thu 4/5/17	Regression Analysis x Simple linear x Polynomial regression x Multiple linear x Principal component analysis	Regression Tutorial On-going Arena support for Assignments Assignment Part 2 due
Week 10 Thu 11/5/17	Decision Analysis x Overcoming risk and uncertainty x Decision Trees x Decision tables x Decision methods: Maximax, Maximin, Equally Likely x Expected monetary value x Value of information	Ongoing Arena support for Assignments
Week 11 Thu 18/5/17	Partial Least Squares x PLS regression x PLS path modeling	Ongoing Arena support for Assignments
Week 12 Thu 25/5/17	Summary of the course	Ongoing Arena support for Assignments
Week 13 Thu 1/6/17	Tutorial support	Ongoing Arena support for Assignments Assignment Part 3 due

5.

Each part of the assignment requires a write-up and these are due in week 4, 9 and 13.

You need to ensure that you use both an appropriate writing style as well as professional formatting and editing of style and content in your report.

The assignments will be posted on Moodle and discussed in class (as shown in the teaching schedule) and the due dates shown are firm. Completed assignments will be submitted electronically on Moodle by the end of the week the assignment is due. The assignments support the learning outcomes by incorporating an appropriate mix of analytical techniques, enabling software, data analysis that supports achievement of appropriate solutions.

Presentation

All submissions are expected to be neat and clearly set out. Your results are the pinnacle of all your hard work. Presenting them clearly gives the marker the best chance of understanding your method; even if the numerical results are incorrect.

Submission

Late submissions will be penalised at the rate of 10% per calendar day (including weekends), limited to 7 days, after which the mark awarded for that assignment will be zero. An extension may only be granted in exceptional circumstances. Where an assessment task is worth less than 20% of the total course mark and you have a compelling reason for being unable to submit your work on time, you must seek approval for an extension from the course convenor before the due date . Special consideration for assessment tasks of 20% or greater must be processed through student.unsw.edu.au/special-consideration.

It is always worth submitting late assessment tasks when possible. Completion of the work, even late, may be taken into account in cases of special consideration.

Where there is no special consideration granted, the ‘deadline for absolute fail’ in the table above indicates the time after which a submitted assignment will not be marked, and will achieve a score of zero for the purpose of determining overall grade in the course.

Marking

The following criteria will be used to grade assignments:

- t Analysis and evaluation of requirements by integrating knowledge and methods learned in lectures and demonstrations.
- t Sentences in clear and plain English—this includes correct grammar, spelling and punctuation
- t Correct referencing in accordance with the prescribed citation and style guide
- t Appropriateness of engineering techniques and methodologies used
- t Accuracy of numerical answers and comprehensiveness of methods and techniques employed.
- t Evidence of quality data and analysis

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Marking guidelines for assignment submissions will be provided at the same time as assignment details to assist with meeting assessable requirements. Submissions will be marked according to the marking guidelines provided.

References:

Simulation modeling and analysis with Arena, Tayfur. Altiok Benjamin Melamed, Warren, N.J. : Cyber Research and Enterprise Technology Solutions, 2001. UNSW Library – High Use Collection.

Design and Analysis of Experiments, Douglas C. Montgomery, Wiley,

resources, attend the Learning Centre, or sometimes resubmit your work with the problem fixed. However more serious instances in first year, such as stealing another student's work or paying someone to do your work, may be investigated under the Student Misconduct Procedures.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis) even suspension from the university. The Student Misconduct Procedures are available here: www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Further information on School policy and procedures in the event of plagiarism is available on the intranet.

9. Administrative Matters

All students are expected to read and be familiar with School guidelines and polices, available on the intranet. In particular, students should be familiar wi Scfff¥rV…cg§ P ,àÀ ˆ nÂÀÁ`\ƒx

Appendix A: Engineers Australia (EA) Professional Engineer Competency Standards

	Program Intended Learning Outcomes
PE1: Knowledge and Skill Base	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals