COURSE DETAILS		
Units of Credit	6	
Contact hours	6 hours per week	
Class	Tuesday, 17:00 – 20:00	Weeks 1 - 5 & 7 – 10: Online through Blackboard Collaborate Ultra
Workshop	Thursday, 10:00 – 13:00 or 13:00 – 16:00	Weeks 1 - 5 & 7 – 10: Online through Blackboard Collaborate Ultra
Course Coordinator & Lecturer	Divya Jayakumar Nair email: divya.nair@unsw.edu.au office: Room 103, H20	
Lecturer	David Rey email: d.rey@unsw.edu.au office: Room 105, H20	

INFORMATION ABOUT THE COURSE

A course in optimization and modelling for first year engineering students who desire a higher capability in the application of the mathematical modelling of engineering systems, and seek to acquire a set of optimization tools which can be applied to various engineering applications.

This course is targeted to students in the Faculty of Engineering desiring a greater understanding of how to model various complex systems, including critical infrastructure (e.g., telecommunications, water supply, and transport). This course will provide an introduction to the interdisciplinary concepts and approaches applied by engineers in advanced systems modelling.

The expected outcomes of this course are reinforced capability in optimization theory with a view to apply the concepts learned to the analysis of engineering systems, the ability to implement mathematical models to represent, analyse and optimize various engineering systems, and gain the modelling and optimization tools needed for their studies in the field of Engineering.

HANDBOOK DESCRIPTION

OBJECTIVES

Learning objectives of the course are:

- To reinforce a student's capability in modelling and apply the concepts learned to the analysis of engineering systems.
- To introduce students to the fundamental optimization tools and concepts applied by engineers in advanced systems modelling.
- To abstract a complex technical system into quantitative models and/or qualitative frameworks that represent that system.
- To analyse and optimize various engineering systems with the abstracted models.

Provide a foundation in modelling and optimization tools needed for their studies in the field of Engineering.

TEACHING STRATEGIES5.1 u mi6.1i709Tdn miTc-13.325(r)4229T32.3met mieh79.1od[11 d79.1sd)09.1 frd4448od[2)9n d79.1in229rd4448et

COURSE PROGRAM

Term 2 2021

Date	Lecture Content	Demonstration Content
01/06/2021 (Week 1)	Introduction to linear and integer programming	Linear and integer programming: practice / Introduction to AMPL
08/06/2021 (Week 2)	Transportation and assignment problems	First steps in AMPL: practice problems
15/06/2021 (Week 3)	Network optimisation: shortest path, minimum cost flow and network design	Shortest path and network flow problems: practice
22/06/2021 (Week 4)	Packing the knapsack and portfolio optimisation	Knapsack problem: practice
01/07/2021 (Week 5)	Facility location problem & Group project briefing	Facility location problem: practice
06/07/2021 (Week 6)	Non-teaching week for all courses	
13/07/2021 (Week 7)	Travelling salesman problem & Group project Q&A	Travelling salesman problem: practice
20/07/2021 (Week 8)	Vehicle routing problem & Group project Q&A	The vehicle routing problem: practice
27/07/2021 (Week 9)	Project scheduling: time is money	Scheduling problems: practice
03/08/2021 (Week 10)	Introduction to multi-objective optimisation: transit route design & Course review	Multi-objective optimisation problems: practice

ASSESSMENT

The final grade for this course will be based on the sum of the scores from the assignments and the final examination. For the values of the single components see the table below:

Strand	Assessment	Weighting	Assessment Criteria
1	Moodle Quizzes	10%	Weekly online quizzes will be administered via Moodle during weeks 2, 4, 7, 8 and 10. Moodle quiz will be available on Thursdays' between 4PM and 6PM. The Moodle quizzes will be based on the material covered in lectures and workshops. The Moodle quizzes will be open book, and are intended to help prepare the students for the final examination. The weekly assessments also provide a means for continuous assessment and feedback for students throughout the cPTw 21.25349.1 (o)-7.1 (n)-9.1 (t5r(d)-t5r().6 (ot.3 (7.1 (n)-9)5

Appendix A: Engineers Australia (EA) Competencies

Stage 1 Competencies for Professional Engineers

	Program Intended Learning Outcomes
PE1: Knowledge and Skill Base	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals
	PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing
	PE1.3 In-depth understanding of specialist bodies of knowledge
	PE1.4 Discernment of knowledge development and research directions
	PE1.5 Knowledge of engineering design practice
	PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice
PE2: Engineering Application Ability	PE2.1 Application of established engineering methods to complex problem solving
	PE2.2 Fluent application of engineering techniques, tools and resources
	PE2.3 Application of systematic engineering synthesis and design processes
	PE2.4 Application of systematic approaches to the conduct and management of engineering projects
PE3: Professional and Personal Attributes	PE3.1 Ethical conduct and professional accountability
	PE3.2 Effective oral and written communication (professional and lay domains)
	PE3.3 Creative, innovative and pro-active demeanour
	PE3.4 Professional use and management of information
	PE3.5 Orderly management of self, and professional conduct
	PE3.6 Effective team membership and team leadership