Staff

Position	Name	Email	Room & Phone
Lecturer-in-charge	Professor Jeya Jeyakumar	v.jeyakumar@unsw.edu.au	RC-2073 (02) 9385 7046

Please refer to your Timetable on MyUNSW for your Lecture Tut, Lab enrolment days and times.

Timetable weblink:

MATH3161: http://timetable.unsw.edu.au/2023/MATH3161.html

MATH5165: http://timetable.unsw.edu.au/2023/MATH5165.html

The lectures will be common to both MATH3161 and MATH5165 students. Students in the graduate version (MATH5165) are expected to display much more independence, working through all tutorial problems in their own.

Administrative Contacts

Please visit the School of Mathematics and Statistics website for a range of information on School Policies, Forms and Help for Students.

For information on Courses, please go to "Current Students" and either Undergraduate and/or Postgraduate", Course Homepage" for information on all course offerings,

The "Student Notice Board" can be located by going to the "Current Students" page; Notices are posted regularly for your information here. Please familiarise yourself with the information found in these locations. The School web page is: https://www.maths.unsw.edu.au

If you cannot find the answer to your queries on the web you are welcome to contact the Student Services Office directly.

By email	Undergraduate	ug.mathsstats@unsw.edu.au
	Postgraduate	pg.mathsstats@unsw.edu.au

By phone: 9385 7053

Should we need to contact you, we will use your official UNSW email address of in the first instance. **It is your responsibility to regularly check your university email account. Please state your student number in all emails.**

Course Information

Units of Credit: 6

Assumed knowledge / Pre-Requisite: 12 units of credit in Level 2 Mathematics courses including MATH2011 or MATH2111 or MATH2510, and MATH2501 or MATH2601, or both MATH2019(DN) and MATH2089, or both MATH2069(CR) and MATH2099.

Exclusions: MATH3181

We are aware some course exclusions on the Handbook may be different to the School website. We are in the process of updating this information. Meanwhile, students should be following the

To ensure effective learning, students should participate in class as outlined below.

We believe that effective learning is achieved when students attend all classes, have prepared effectively for classes by reading through previous lecture notes, in the case of lectures, and, in the case of tutorials, by having made a serious attempt at doing for themselves the tutorial problems prior to the tutorials.

Furthermore, lectures should be viewed by the student as an opportunity to learn, rather than just copy down lecture notes.

Effective learning is achieved when students have a genuine interest in the subject and make a serious effort to master the basic material.

The art of logically setting out mathematics is best learned by watching an expert and paying particular attention to detail. This skill is best learned by regularly attending classes and watching supplementary course videos.

Assessment and Deadlines

Assessment	Week	Weighting %	Course Learning Outcome (CLO)
Class Test 1; 50 minutes	5	15%	
Class Test 2; 50 minutes	9	20%	
Assignment	10	5%	
Final Exam		60%	

Starred Materials:

No Assistance

Course Learning Outcomes (CLO)

Students taking this course will develop an appreciation of the basic problems of optimization and skills to solve optimization problems.

By the end of the course students should be able to:

1. State definitions and theorems in the syllabus and apply them to specific examples.
2. Apply the concepts and techniques of the syllabus to solve appropriate mathematical problems.
3. Solve optimization problems via analytical, numerical and computational methods.
4. Recognize and create valid optimization models and apply correct mathematical techniques.
5. Use technology as an aid to solve optimization models and communicate mathematical outcomes.

Course Schedule

The course will include material taken from some of the following topics. This should only serve as a guide as it is not an extensive list of the material to be covered and the timings are approximate. The course content is ultimately defined by the material covered in lectures and provided in Moodle.

Weeks	Topic
1 Lecture 1-4	**Optimization**- What is it? Modelling; standard form formulations, norms, existence, relaxation, gradients and Hessians; positive definite matrices.
2 Lecture 5-8	**Convexity of Sets and Functions**: Convex stes, extreme points, convex combinations, convex functions, epigraphs, extrema of convex functions
3 Lecture 9-12	**Optimization: unconstrained & Equality constraints:** First order optimality principles; Second-order optimality principles; necessary conditions; sufficient conditions; convexity and global optimality conditions, Equality constraints, regularity conditions, method of Lagrange multipliers; first-and second-order optimality conditions
4 Lecture 13-16	**Optimization: inequality constraints, global optimality and duality:** KKT conditions; convex optimization; necessary and sufficient global optimality conditions; duality; right-hand side perturbations
5 Lecture 17-20	**Numerical Methods**: Rates of convergence, iterative methods, descent methods, line search methods; steepest descent methods.
6 TERM BREAK	
7 Lecture 21-24	**Newton and conjugate gradient methods:** Basic Newton's methods, conjugate gradient methods
8 Lecture 25-28	**Penalty methods & introduction to optimal control:** Penalty functions, penalty function methods for constrained optimization, optimal control models.

The School of Mathematics and Statistics will assume that all its students have read and understood the School policies on the above pages and any individual effectively and efficiently find appropriate information sources and evaluate relevance to your needs

Please adhere to the Special Consideration Policy and Procedures provided on the web page below when applying for special consideration.

https://student.unsw.edu.au/special-consideration

Please note that the application is not considered by the Course Authority, it is considered by a centralised team of staff at the Nucleus Student Hub.

The School will contact you (via student email account) after special consideration has been granted to reschedule your missed assessment, for a only.

For applications for special consideration for , please note that the new submission date and/or outcome will be communicated through the special consideration web site only, no communication will be received from the School.

For Dates on Final Term Exams and Supplementary Exams please check the “Key Dates for Exams” ahead of time to avoid booking holidays or work obligations.

https://student.unsw.edu.au/exam-dates

If you believe your application for Special Consideration has not been processed, you should email specialconsideration@unsw.edu.au immediately for advice.

Course Evaluation and Development (MyExperience)

Student feedback is very important to continual course improvement. This is demonstrated within the School of Mathematics and Statistics by the implementation of the UNSW online student survey , which allows students to evaluate their learning experiences in an anonymous way. survey reports are produced for each survey. They are released to staff after all student assessment results are finalised and released to students. Course convenor will use the

References

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4. J. E. Dennis and R. B. Schnabel, Numerical Methods for Unconstrained Optimization and Nonlinear Equations, SIAM Publications, Classics in Applied Mathematics, 1996.
5. R. Fletcher, Practical Methods of Optimization, 2nd Edition, John Wiley, 2000.
6. P. E. Gill, W. Murray, and M. H. Wright, Practical Optimization, Academic Press, New York and London, 1981.
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9. L. M. Hocking, Optimal Control: An Introduction to the Theory with Applications, Oxford University Press, Oxford, 1991.
10. MathWorks, MATLAB & Simulink Student Version R2012A, Englewood Cliffs, 2012.
11. J. Nocedal and S. J. Wright, Numerical optimization, Springer, (2nd edition) 2006.
12. E. R. Pinch, Optimal control and the calculus of variations, Oxford University Press, Oxford, 1995.
13. R. Pratap, Getting started with MATLAB: A Quick Introduction for Scientists and Engineers, Oxford University Press, 2009.
14. G. Strang, Linear Algebra and its Applications, Harcourt Brace Jovanovich, San Diego, 3 ed., 1988.
15. D. G. Zill, Differential equations with boundary-value problems, Second Edition, PWS-Kent Publishing company, Boston, 1989.