

# MAST30013 Techniques in Operations Research

| <b>Credit Points:</b>                            | 12.50   |                |                            |                |  |            |       |
|--|---|----------------|----------------------------|----------------|--|------------|-------|
| <b>Level:</b>                                    | 3 (Undergraduate)   |                |                            |                |  |            |       |
| <b>Dates &amp; Locations:</b>                    | This subject is not offered in 2014. Lectures and practice classes.   |                |                            |                |  |            |       |
| <b>Time Commitment:</b>                          | Contact Hours: 3 x one hour lectures per week, 1 x one hour practice class per week Total Time Commitment: Estimated total time commitment of 120 hours   |                |                            |                |  |            |       |
| <b>Prerequisites:</b>                            | <table border="1"> <thead> <tr> <th>Subject</th> <th>Study Period Commencement:</th> <th>Credit Points:</th> </tr> </thead> <tbody> <tr> <td>MAST20018 Discrete Maths and Operations Research</td> <td>Semester 2</td> <td>12.50</td> </tr> </tbody> </table>   | Subject        | Study Period Commencement: | Credit Points: | MAST20018 Discrete Maths and Operations Research | Semester 2 | 12.50 |
| Subject  | Study Period Commencement:  | Credit Points: |                            |                |  |            |       |
| MAST20018 Discrete Maths and Operations Research | Semester 2  | 12.50          |                            |                |  |            |       |
| <b>Corequisites:</b>                             | None  |                |                            |                |  |            |       |
| <b>Recommended Background Knowledge:</b>         | None  |                |                            |                |  |            |       |
| <b>Non Allowed Subjects:</b>                     | None  |                |                            |                |  |            |       |
| <b>Core Participation Requirements:</b>          | For the purposes of considering request for Reasonable Adjustments under the Disability Standards for Education (Cwth 2005), and Students Experiencing Academic Disadvantage Policy, academic requirements for this subject are articulated in the Subject Description, Subject Objectives, Generic Skills and Assessment Requirements of this entry. The University is dedicated to provide support to those with special requirements. Further details on the disability support scheme can be found at the Disability Liaison Unit website: <a href="http://www.services.unimelb.edu.au/disability/">http://www.services.unimelb.edu.au/disability/</a>  |                |                            |                |  |            |       |
| <b>Contact:</b>                                  | Third Year Coordinator<br><b>Email: <a href="mailto:tycoord@ms.unimelb.edu.au">tycoord@ms.unimelb.edu.au</a> (mailto:tycoord@ms.unimelb.edu.au)</b>   |                |                            |                |  |            |       |
| <b>Subject Overview:</b>                         | <p>This subject introduces some major techniques and algorithms for solving nonlinear optimisation problems. Unconstrained and constrained systems will be considered, for both convex and non-convex problems. The methods covered include: interval search techniques, Newton and quasi-Newton methods, penalty methods for nonlinear programs, and methods based on duality. The emphasis is both on being able to apply and implement the techniques discussed, and on understanding the underlying mathematical principles. Examples involve the formulation of operations research models for linear regression, multi-facility location analysis and network flow optimisation.</p> <p>A significant part of the subject is the project, where students work in groups on a practical operations research problem.</p> |                |                            |                |  |            |       |
| <b>Learning Outcomes:</b>                        | <p>On completion of this subject students should develop</p> <ul style="list-style-type: none"> <li># skills in setting up operations research models;</li> <li># a knowledge of the most important techniques for solving nonlinear optimisation problems;</li> <li># an understanding of the role of algorithmic thinking in the solution of operations research problems;</li> <li># competence in the use of computer packages in operations research;</li> <li># an understanding of the factors and restrictions involved in building and using models for planning and management problems.</li> </ul>   |                |                            |                |  |            |       |
| <b>Assessment:</b>                               | Three written assignments due at regular intervals during semester amounting to a total of up to 50 pages (30%), a group project involving a written report of up to 20 pages due at the end of semester (15%) and a 15-minute oral presentation at the end of semester (5%), and a 2-hour written examination in the examination period (50%).   |                |                            |                |  |            |       |
| <b>Prescribed Texts:</b>                         | None  |                |                            |                |  |            |       |

|   |  |
|---|--|
| <b>Recommended Texts:</b>                     | <p>H. A. Taha, Operations Research: An Introduction, McMillan, 5th Ed,1992.</p> <p>W. L. Winston, Operations Research: Applications and Algorithms, PWS-Kent, 1987.</p> <p>R. Fletcher, Practical Methods of Optimization, 2nd Ed, John Wiley &amp; Sons, NY, 1987.</p>  |
| <b>Breadth Options:</b>                       | <p>This subject potentially can be taken as a breadth subject component for the following courses:</p> <ul style="list-style-type: none"> <li># <b>Bachelor of Arts</b> (<a href="https://handbook.unimelb.edu.au/view/2014/B-ARTS">https://handbook.unimelb.edu.au/view/2014/B-ARTS</a>)</li> <li># <b>Bachelor of Commerce</b> (<a href="https://handbook.unimelb.edu.au/view/2014/B-COM">https://handbook.unimelb.edu.au/view/2014/B-COM</a>)</li> <li># <b>Bachelor of Environments</b> (<a href="https://handbook.unimelb.edu.au/view/2014/B-ENVS">https://handbook.unimelb.edu.au/view/2014/B-ENVS</a>)</li> <li># <b>Bachelor of Music</b> (<a href="https://handbook.unimelb.edu.au/view/2014/B-MUS">https://handbook.unimelb.edu.au/view/2014/B-MUS</a>)</li> </ul> <p>You should visit <b>learn more about breadth subjects</b> (<a href="http://breadth.unimelb.edu.au/breadth/info/index.html">http://breadth.unimelb.edu.au/breadth/info/index.html</a>) and read the breadth requirements for your degree, and should discuss your choice with your student adviser, before deciding on your subjects.</p> |
| <b>Fees Information:</b>                      | <p>Subject EFTSL, Level, Discipline &amp; Census Date, <a href="http://enrolment.unimelb.edu.au/fees">http://enrolment.unimelb.edu.au/fees</a></p>   |
| <b>Generic Skills:</b>                        | <p>In addition to learning specific skills that will assist in their future careers in science, students will have the opportunity to develop generic skills that will assist them in any future career path. These include:</p> <ul style="list-style-type: none"> <li># problem-solving skills: the ability to engage with unfamiliar problems and identify relevant solution strategies;</li> <li># analytical skills: the ability to construct and express logical arguments and to work in abstract or general terms to increase the clarity and efficiency of analysis;</li> <li># collaborative skills: the ability to work in a team;</li> <li># time-management skills: the ability to meet regular deadlines while balancing competing commitments;</li> <li># computer skills: the ability to use mathematical computing packages.</li> </ul>   |
| <b>Notes:</b>                                 | <p>This subject is available for science credit to students enrolled in the BSc (both pre-2008 and new degrees), BAsc or a combined BSc course.</p>  |
| <b>Related Majors/Minors/Specialisations:</b> | <p>Discrete Mathematics / Operations Research<br/> Discrete Mathematics / Operations Research<br/> Discrete Mathematics and Operations Research (specialisation of Mathematics and Statistics major)<br/> Science credit subjects* for pre-2008 BSc, BAsc and combined degree science courses<br/> Science-credited subjects - new generation B-SCI and B-ENG.<br/> Selective subjects for B-BMED</p>  |