

## H6DISMTHS: Discrete Mathematics

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|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| Module Code:                                                                | H6DISMTHS                                                                                                          |
| Long Title                                                                  | Discrete Mathematics <b>APPROVED</b>                                                                               |
| Title                                                                       | Discrete Mathematics                                                                                               |
| Module Level:                                                               | LEVEL 6                                                                                                            |
| EQF Level:                                                                  | 5                                                                                                                  |
| EHEA Level:                                                                 | Short Cycle                                                                                                        |
| Credits:                                                                    | 5                                                                                                                  |
| Module Coordinator:                                                         | MICHAEL BRADFORD                                                                                                   |
| Module Author:                                                              | MICHAEL BRADFORD                                                                                                   |
| Departments:                                                                | School of Computing                                                                                                |
| Specifications of the qualifications and experience required of staff       | Master's degree in mathematics, computing or cognate discipline. May have industry experience also.                |
| <b>Learning Outcomes</b>                                                    |                                                                                                                    |
| <i>On successful completion of this module the learner will be able to:</i> |                                                                                                                    |
| <b>#</b>                                                                    | <b>Learning Outcome Description</b>                                                                                |
| LO1                                                                         | Construct logical mathematical arguments and proofs.                                                               |
| LO2                                                                         | Apply set algebra and logic operations to demonstrate problem solving and mathematical reasoning capabilities.     |
| LO3                                                                         | Associate the rules of sets and operations to the areas of Relations and Functions.                                |
| LO4                                                                         | Construct and investigate a range of functions and describe their representations.                                 |
| LO5                                                                         | Apply set theoretical concepts and methods of counting to solve combinatorial problems.                            |
| LO6                                                                         | Apply graph theory concepts to represent a set of finite objects and their inter-relationships.                    |
| <b>Dependencies</b>                                                         |                                                                                                                    |
| <b>Module Recommendations</b>                                               |                                                                                                                    |
| No recommendations listed                                                   |                                                                                                                    |
| <b>Co-requisite Modules</b>                                                 |                                                                                                                    |
| No Co-requisite modules listed                                              |                                                                                                                    |
| <b>Entry requirements</b>                                                   | See section 4.2 Entry procedures and criteria for the programme including procedures recognition of prior learning |

# H6DISMTHS: Discrete Mathematics

| Module Content & Assessment                                                                                                                                                                                          |                       |                           |             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------------------|-------------|
| <b>Indicative Content</b>                                                                                                                                                                                            |                       |                           |             |
| <b>Logic &amp; Proof</b><br>Propositional Logic. Boolean Operators. Truth Tables. Boolean Expressions                                                                                                                |                       |                           |             |
| <b>Logic &amp; Proof</b><br>Predicates and Quantifiers. Methods of Mathematical Proof                                                                                                                                |                       |                           |             |
| <b>Set Theory</b><br>Naïve Set Theory. Finite and infinite sets. Set Operations                                                                                                                                      |                       |                           |             |
| <b>Set Theory</b><br>Partitions . Product Set and Power Set                                                                                                                                                          |                       |                           |             |
| <b>Relations &amp; Functions</b><br>Binary Relations. Properties of Relations. Equivalence Relations .                                                                                                               |                       |                           |             |
| <b>Relations &amp; Functions</b><br>Partial Orders. Properties of Functions. Composition of Functions. Inverse Functions                                                                                             |                       |                           |             |
| <b>Recurrence Relations &amp; Generating Functions</b><br>Polynomials. Ordinary and Exponential Generating Functions                                                                                                 |                       |                           |             |
| <b>Recurrence Relations &amp; Generating Functions</b><br>Sequences and Recurrence Relations. Solution of Recurrence Relations. Linear Homogeneous Recurrence Relations. Linear Non-Homogeneous Recurrence Relations |                       |                           |             |
| <b>Combinatorics</b><br>The Sum Rule and the Product Rule. The Pigeonhole Principle. The Inclusion-Exclusion Principle                                                                                               |                       |                           |             |
| <b>Combinatorics</b><br>The Factorial Function. Permutations and Combinations                                                                                                                                        |                       |                           |             |
| <b>Graph Theory</b><br>Definition and Examples. Directed Graphs. Walks, Trails, Paths, Circuits, and Cycles                                                                                                          |                       |                           |             |
| <b>Graph Theory</b><br>Trees. Planar Graphs. Colouring and Matching Graphs.                                                                                                                                          |                       |                           |             |
| <b>Assessment Breakdown</b>                                                                                                                                                                                          |                       |                           | <b>%</b>    |
| Coursework                                                                                                                                                                                                           |                       |                           | 40.00%      |
| End of Module Assessment                                                                                                                                                                                             |                       |                           | 60.00%      |
| <b>Assessments</b>                                                                                                                                                                                                   |                       |                           |             |
| <b>Full Time</b>                                                                                                                                                                                                     |                       |                           |             |
| <b>Coursework</b>                                                                                                                                                                                                    |                       |                           |             |
| <b>Assessment Type:</b>                                                                                                                                                                                              | Formative Assessment  | <b>% of total:</b>        | Non-Marked  |
| <b>Assessment Date:</b>                                                                                                                                                                                              | n/a                   | <b>Outcome addressed:</b> | 1,2,3,4,5,6 |
| <b>Non-Marked:</b>                                                                                                                                                                                                   | Yes                   |                           |             |
| <b>Assessment Description:</b><br>Ongoing independent and group class activities and feedback.                                                                                                                       |                       |                           |             |
| <b>Assessment Type:</b>                                                                                                                                                                                              | Continuous Assessment | <b>% of total:</b>        | 40          |
| <b>Assessment Date:</b>                                                                                                                                                                                              | n/a                   | <b>Outcome addressed:</b> | 1,2,3,4,5   |
| <b>Non-Marked:</b>                                                                                                                                                                                                   | No                    |                           |             |
| <b>Assessment Description:</b><br>A set of questions relating to Logic, Set Theory, Relations & Functions, and Recurrence Relations & Generating Functions, and Combinatorics.                                       |                       |                           |             |
| <b>End of Module Assessment</b>                                                                                                                                                                                      |                       |                           |             |
| <b>Assessment Type:</b>                                                                                                                                                                                              | Terminal Exam         | <b>% of total:</b>        | 60          |
| <b>Assessment Date:</b>                                                                                                                                                                                              | End-of-Semester       | <b>Outcome addressed:</b> | 1,2,3,4,5,6 |
| <b>Non-Marked:</b>                                                                                                                                                                                                   | No                    |                           |             |
| <b>Assessment Description:</b><br>Written examination with questions from all module topic areas.                                                                                                                    |                       |                           |             |
| No Workplace Assessment                                                                                                                                                                                              |                       |                           |             |
| <b>Reassessment Requirement</b>                                                                                                                                                                                      |                       |                           |             |
| <b>Repeat examination</b><br><i>Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework element.</i>                 |                       |                           |             |
| <b>Reassessment Description</b><br>The repeat strategy for this module is an examination. All learning outcomes will be assessed in the repeat exam.                                                                 |                       |                           |             |

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| Module Workload                      |                                    |       |              |                                 |
|--------------------------------------|------------------------------------|-------|--------------|---------------------------------|
| Module Target Workload Hours 0 Hours |                                    |       |              |                                 |
| Workload: Full Time                  |                                    |       |              |                                 |
| Workload Type                        | Workload Description               | Hours | Frequency    | Average Weekly Learner Workload |
| Lecture                              | Classroom & Demonstrations (hours) | 24    | Per Semester | 2.00                            |
| Tutorial                             | Other hours (Practical/Tutorial)   | 36    | Per Semester | 3.00                            |
| Independent Learning                 | Independent learning (hours)       | 65    | Per Semester | 5.42                            |
| Total Weekly Contact Hours           |                                    |       |              | 5.00                            |
| Workload: Part Time                  |                                    |       |              |                                 |
| Workload Type                        | Workload Description               | Hours | Frequency    | Average Weekly Learner Workload |
| Lecture                              | No Description                     | 24    | Every Week   | 24.00                           |
| Tutorial                             | No Description                     | 36    | Every Week   | 36.00                           |
| Independent Learning                 | No Description                     | 65    | Every Week   | 65.00                           |
| Total Weekly Contact Hours           |                                    |       |              | 60.00                           |

| Module Resources                                                                                                                                                                                                                                                                   |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <i>Recommended Book Resources</i>                                                                                                                                                                                                                                                  |  |
| <p>Ferland K.. (2017), Discrete Mathematics and Applications (2nd ed), Chapman and Hall/CRC.</p> <p>Kenneth H. Rosen. (2018), Discrete Mathematics and Its Applications, 8th Edition. McGraw-Hill Education, [ISBN: 978-1260091991].</p>                                           |  |
| <i>Supplementary Book Resources</i>                                                                                                                                                                                                                                                |  |
| <p>Oscar Levin. (2016), Discrete Mathematics, Createspace Independent Publishing Platform, p.342, [ISBN: 978-1534970748].</p> <p>Jonathan L. Gross,Jay Yellen,Mark Anderson. (2018), Graph Theory and Its Applications, Chapman &amp; Hall/CRC, p.577, [ISBN: 978-1482249484].</p> |  |
| <i>This module does not have any article/paper resources</i>                                                                                                                                                                                                                       |  |
| <i>This module does not have any other resources</i>                                                                                                                                                                                                                               |  |
| <b>Discussion Note:</b>                                                                                                                                                                                                                                                            |  |