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Module Descriptor

Mathematics for Problem Solving (Computing and Mathematics)

Mathematics for Problem Solving (A13783)

Short Title: Maths for Problem Solving
Department: Computing and Mathematics
Credits: 5 **Level:** Introductory

Description of Module / Aims

This module introduces students to problem solving techniques using algebraic, linear programming, calculus and graph theory methods. Students will experience an applied element to the module which will involve creating pseudocode for the implementation of appropriate problem solving methods.

Programmes

		stage/semester/status
MATH-0028	BSc (Hons) in Creative Computing (WD_KCRCO_B)	1 / 2 / M
MATH-0028	BSc in Multimedia Applications Development (WD_KMULA_D)	1 / 2 / M

Indicative Content

- Elementary Algebraic Techniques: Solving problems modelled by simultaneous or quadratic equations
- Constrained Optimization – Linear Programming: Problem formulation; Specification of objective function and constraints; Determination of the optimal solution using the graphical method
- Constrained Optimization – Calculus: Problem formulation; Elementary differentiation – finding and classifying turning points; Finding and interpreting the optimal solution
- Graph Theory: Network algorithms for applied problems; Minimal spanning tree and shortest route problems; Creating pseudocode for the implementation of network algorithms

Learning Outcomes

On successful completion of this module, a student will be able to:

1. Solve practical problems using simultaneous or quadratic equations.
2. Solve optimization problems using the graphical method for linear programming.
3. Use calculus methods to solve optimization problems.
4. Apply appropriate graph theory algorithms to solve network problems.
5. Construct and apply appropriate pseudocode for network algorithms.

Learning and Teaching Methods

- In lectures the mathematical problem solving techniques will be presented and then used to solve appropriate problems.
- In tutorials students will solve problems which will be based on material covered in the lectures.

Learning Modes

Learning Type	F/T Hours	P/T Hours
Lecture	36	
Tutorial	12	
Independent Learning	87	

Assessment Methods

	Weighting	Outcomes Assessed
Final Written Examination	60%	1,3,4
Continuous Assessment	40%	
In-Class Assessment	20%	2
In-Class Assessment	20%	5

Assessment Criteria

<40%: Unable to interpret and describe key mathematical problem solving concepts.

40%–49%: Be able to interpret and describe key mathematical problem solving concepts.

50%–59%: Ability to discuss key mathematical concepts and ability to discover and integrate related knowledge in other knowledge domains.

60%–69%: Be able to solve problems by experimenting with appropriate mathematical problem solving techniques.

70%–100%: All the above to an excellent level. Be able to analyse and design solutions to a high standard for a range of both complex and unforeseen problems through the use and modification of appropriate mathematical problem solving techniques.

Supplementary Material(s)

- "Mathematics for Problem Solving." Waterford Institute of Technology. http://moodle.wit.ie
- Johnsonbaugh, R. *Discrete Mathematics*. 7th ed. New Jersey: Pearson, 2009.
- Strang, G. *Calculus*. 2nd ed. Wellesley MA USA: Wellesley, 2010.