2024 / 25

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South East Technological University

Module Descriptor

Network Theory Fundamentals (Computing and Mathematics)

Network Theory Fundamentals (A13554)

Short Title: Network Theory Fundamentals
Department: Computing and Mathematics
Credits: 5 **Level:** Intermediate

Description of Module / Aims

This module will introduce students to the principles of graph/network models and information theory. The module will focus on the practical application of the fundamental concepts to problems in computing, such as, resource allocation, planning, optimization problems, and software testing.

Programmes

		stage/semester/status
COMP-0658	BSc in Applied Computing (WD_KCOMP_D)	2 / 3 / M
COMP-0658	BSc in Information Technology (WD_KINFT_D)	2 / 3 / M

Indicative Content

- Graph and Network Models: Network algorithms for applied problems; Minimal spanning tree and shortest route problems; project networks; application of network models
- Information Theory: Information measure and entropy; source coding; Shannon theory and Huffman codes; noisy channel coding theorem; error correcting codes
- Finite-State Machines: Network and matrix representation; equilibrium and absorbing states, applications to software testing; cellular automata models

Learning Outcomes

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

1. Use mathematical software to solve network based optimisation problems and interpret solutions generated.
2. Apply appropriate algortihms to solve graph/network theory problems.
3. Apply fundamental concepts and techniques of information theory.
4. Apply finite-state machine techniques to problems in computing, such as software testing.

Learning and Teaching Methods

- The lectures will be used to present mathematical concepts.
- The tutorials are used to reinforce material covered in lectures by practicing solving problems.
- The practicals will help students investigate and study real world problems using industry based software.

Learning Modes

Learning Type	F/T Hours	P/T Hours
Lecture	24	12
Tutorial	12	6
Practical	12	6
Independent Learning	87	111

Assessment Methods

	Weighting	Outcomes Assessed
Final Written Examination	60%	2,3,4
Continuous Assessment	40%	
In-Class Assessment	15%	2
Practical	25%	1

Assessment Criteria

<40%: Inability to demonstrate knowledge or understanding of the fundamental concepts in graph and network models, information theory and finite state machines, as outlined in the syllabus content, inability to apply concepts to selected problems.

40%–49%: Able to demonstrate a basic understanding of the fundamental concepts in graph and network models, information theory and finite state machines, as outlined in syllabus content.

50%–59%: In addition to above, able to find the complete solution set to basic problems, and in addition, able to supply a reasonable interpretation of generated results.

60%–69%: All the above, in addition be able to independently determine appropriate mathematical techniques to analyse applied problems and to express their work with rigour and precision.

70%–100%: All the above to an excellent level. Demonstrates an ability to put a solution into a context and assess whether such solutions are meaningful.

Supplementary Material(s)

- Johnsonbaugh, R. *Discrete Mathematics*. 7th Edition. New Jersey: Pearson, 2009.
- Jones, G. and J. Jones. *Information and Coding Theory*. New York: Springer, 2000.
- Narsingh, D. *Graph Theory with Applications to Engineering and Computer Science*. New York: Dover Publications, 2016.

Requested Resources

- Room Type: Computer Lab