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| Title: | Mathematics for Computing 3 APPROVED |
| Long Title: | Mathematics for Computing 3 |
| Module Code: | MATH8006 |
| Credits: | 5 |
| NFQ Level: | Advanced |
| Field of Study: | Mathematics |
| Valid From: | Semester 1 - 2009/10 (September 2009) |
| Module Delivered in | no programmes |
| Module Coordinator: | AINE NI SHE |
| Module Author: | MICHAEL BRENNAN |
| Module Description: | This module covers an introduction to queueing theory and elementary number theory. |
| Learning Outcomes | |
| <i>On successful completion of this module the learner will be able to:</i> | |
| LO1 | Recognise the basic types of queueing model. |
| LO2 | Derive steady state system performance characteristics for finite queues. |
| LO3 | Derive steady state balance equations. |
| LO4 | Apply various proof techniques, including direct, indirect, contradiction to problems on divisibility, primes, and modular arithmetic. |
| LO5 | State and apply basic theorems relating to elementary number theory including Bezout's Theorem, the Euclidean Algorithm, and the Chinese Remainder Theorem. |
| Pre-requisite learning | |
| Module Recommendations | |
| <i>This is prior learning (or a practical skill) that is strongly recommended before enrolment in this module. You may enrol in this module if you have not acquired the recommended learning but you will have considerable difficulty in passing (i.e. achieving the learning outcomes of) the module. While the prior learning is expressed as named CIT module(s) it also allows for learning (in another module or modules) which is equivalent to the learning specified in the named module(s).</i> | |
| No recommendations listed | |
| Incompatible Modules | |
| <i>These are modules which have learning outcomes that are too similar to the learning outcomes of this module. You may not earn additional credit for the same learning and therefore you may not enrol in this module if you have successfully completed any modules in the incompatible list.</i> | |
| No incompatible modules listed | |
| Co-requisite Modules | |
| No Co-requisite modules listed | |
| Requirements | |
| <i>This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed. You may not enrol on this module if you have not acquired the learning specified in this section.</i> | |
| No requirements listed | |
| Co-requisites | |
| No Co Requisites listed | |

Module Content & Assessment

Indicative Content

Queueing theory

Review of convergent series formulae. Axiomatic development of the Poisson arrival process. Steady state analysis of single server and multi-server queues. The steady state balance method. Finite queues, state dependant arrival, and service rates. Derivation of various measures of performance. Little's Formula.

Number Theory

Division algorithm, divisibility, prime numbers, fundamental theorem of arithmetic, greatest common divisors, Euclid's Lemma, Euclidean Algorithm, Bezout's Theorem, Diophantine equations. Congruences and modular arithmetic, Fermat's Little Theorem, Euler phi-function, primality tests, the Chinese Remainder theorem.

Assessment Breakdown

| | % |
|-------------|---------|
| Course Work | 100.00% |

Course Work

| Assessment Type | Assessment Description | Outcome addressed | % of total | Assessment Date |
|-----------------|----------------------------------|-------------------|------------|-----------------|
| Other | One hour written exam | 1,2,3 | 40.0 | Week 6 |
| Other | One and a half hour written exam | 4,5 | 60.0 | Sem End |

No End of Module Formal Examination

Reassessment Requirement

Repeat examination

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.

The institute reserves the right to alter the nature and timings of assessment

Module Workload

| Workload: Full Time | | | | |
|-----------------------------------------------|-----------------------------|--------------|------------------|----------------------------------------|
| <i>Workload Type</i> | <i>Workload Description</i> | <i>Hours</i> | <i>Frequency</i> | <i>Average Weekly Learner Workload</i> |
| Lecture | No Description | 3.0 | Every Week | 3.00 |
| Tutorial | No Description | 1.0 | Every Week | 1.00 |
| Independent & Directed Learning (Non-contact) | No Description | 3.0 | Every Week | 3.00 |
| Total Hours | | | | 7.00 |
| Total Weekly Learner Workload | | | | 7.00 |
| Total Weekly Contact Hours | | | | 4.00 |

This module has no Part Time workload.

Module Resources

Recommended Book Resources

- Bunday B. D. 1986, *Basic Queueing Theory*, Ed. Arnold [ISBN: 0-7131-3570-0]
- Burton, D.M. 1989, *Elementary Number Theory*, WCB [ISBN: 0-13-801812-X]

Supplementary Book Resources

- Rosen, K. 1999, *Discrete Mathematics and its Applications*, 4th Edition Ed., McGraw-Hill [ISBN: 0-07-289905-0]
- Kreyzig, E. 1999, *Advanced Engineering Mathematics*, 8th Edition Ed., Wiley [ISBN: 0-471-15496-2]

This module does not have any article/paper resources

Other Resources

- Website: *Maplesoft Applications Website*
<http://www.maplesoft.com>
- Website: *Rosen textbook website*
<http://www.mhhe.com/rosen>
- Website: *Wolfram's Mathworld website*
<http://www.mathworld.com>

