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	
On successful completion of this module the learner will be able to:	
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 *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).*
No recommendations listed
Incompatible Modules *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.*
No incompatible modules listed
Co-requisite Modules
No Co-requisite modules listed
Requirements *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.*
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				
Workload Type	*Workload Description*	*Hours*	*Frequency*	*Average Weekly Learner Workload*
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