MODULE SPECIFICATION

Name of Module	Discrete Mathematics						
Parent School/Dept	Computer Science/Information Systems						

Programme(s) where module is offered	BSc Computer Science with Electrical Engineering;
	BSc Computer Science with Economics;
	BSc Computer Science with Business;
	BSc Computer Science with International Relations;
	BSc Computer Science with Political Science;
	BSc Information Systems with Electrical Engineering;
	BSc Information Systems with Economics;
	BSc Information Systems with Business;
	BSc Information Systems with International Relations;
	BSc Information Systems with Political Science;						

Status (core, option, free choice)		Core		**Pre-Requisite Modules or Qualifications**		None	
FHEQ Level	4	**Unit Value**	8 ECTS	**Module Code**	**Math180**	**Module coordinator**	Dr. Mirna Udovicic
Term taught		Spring		**Applicable From**		2016	

Educational Aims of the Module

This is an undergraduate module that covers the fundamentals of discrete mathematics. The primary aim is to familiarise students with mathematical concepts that are central to those disciplines, including logic, sets, proofs, graphs, and general mathematical maturity.

Module Outline/Syllabus

- Statements, conjunction, disjunction, negation, implication, equivalence
- Quantifiers, validity of arguments
- Sets, subsets, set operations
- Weak induction, strong induction, well-ordering principle
- Divisibility, remainders, quotient-remainder theorem
- Primes, prime factorisation, unique prime factorisation, GCD, LCM
- Relations, equivalence relations, partial order relations, classes of equivalence
- Functions, injective, surjective, bijective
- Basic counting, combinations, permutations, multisets
- Basic probability related to counting techniques
- Axioms of probability, properties
- Conditional probability
- Bayes theorem
- Binomial theorem and applications
- Graphs, connectedness, connected components
- Eulerian cycles, Hamiltonian cycles
- O,o, theta classes of functions, applications to running time of algorithm
- Introduction to game theory

Student Engagement Hours

Type	**Number per Term**	**Duration**	**Total Time**
Lectures	30	2 hours	60 hours
Tutorials	15	2 hours	30 hours
Total Guided/Independent Learning Hours			**110**
Total Contact Hours			**90**
Total Engagement Hours			**200**

Assessment Method Summary

Type	Number Required	Duration / Length	Weighting	Timing/Submission Deadline
Problem solving	3	700 words	15%	Weeks 5, 10, 14
Mid-term exam	1	90 minutes	20%	Mid-semester
Quiz	4	120 minutes	15%	Weeks 4, 6, 12, 14
Final Exam	1	180 minutes	50%	End of semester

Module Outcomes

Intended Learning Outcomes: 1. Understand basic fundamental discrete mathematics concepts 2. Understand the significance of efficient algorithms 3. Understand the range of applications of various algorithms and methods 4. Understand and evaluate current research trends 5. Ability to prove simple statements directly, indirectly, by contradiction 6. Demonstrate basic knowledge of number theory (divisibility, prime factorisation) 7. Understanding some basic concepts in graph theory-connectedness, Eulerian cycles, Hamiltonian cycles 8. Ability to distinguish theta classes of functions (related to algorithms)	→	**Teaching and Learning Strategy:** 1. Lectures (ILO: 1-8) 2. Tutorials and discussions emphasising a large number of problems related to material covered in lectures (ILO: 1-8) 3. Activities in the laboratory related to the core material (mostly group and individual projects especially in the area of algorithms and number theory) (ILO: 1-8)
	→	**Assessment Strategy** 1. Final Exam (ILO: 1-8) 2. Mid-term exam (ILO: 1-3, 5) 3. Quiz (ILO: 1-8) 4. Problem solving (ILO: 1-8)
Practical Skills 1. Ability to apply theoretical concepts in solving programming problems 2. Ability to recognise and interpret graph data 3. Ability to apply basic set operations and properties	→	**Teaching and Learning Strategy:** 1. Laboratory sessions with tutor-lead support (PS: 1-3) 2. Use of quizzes to test student subject knowledge (PS: 1-3) 3. Lectures and tutorials (PS:1-3)
	→	**Assessment Strategy** 1. Problem solving (PS: 1-3) 2. Quiz (PS: 1-3) 3. Mid-term exam (PS: 2, 3) 4. Final exams (PS: 1-3)
Transferable Skills 1. Problem solving skills 2. Communication skills 3. Presentation skills 4. Numeracy skills	→	**Teaching and Learning Strategy:** 1. Lab exercises (TS: 1-3) 2. Lectures (TS: 1-4)
	→	**Assessment Strategy** 1. Problem solving (TS: 1-4) 2. Quiz (TS: 1, 4) 3. Mid-term exam (TS: 1, 4) 4. Final Exam (TS:1, 4)

Key Texts and/or other learning materials

Set Texts

- Johnsonbaugh, R.,(2005), *Essential Discrete Mathematics*, MacMillan Publishing

Supplementary Materials

- Rosen, K., (2012), *Discrete Mathematics and its Applications*, Global Edition, McGraw-Hill
- Scheinerman, E., (2006), *Mathematics: A Discrete Introduction*, Cengage
- Discrete Mathematics (Journal), http://www.elsevier.com/mathematics
- SIAM Journal on Discrete Mathematics (SIDMA), http://www.siam.org/journals/sidma.php/
- Epp, S., (2011), *Discrete Mathematics with Applications,* 4th Edition, Brooks & Cole
- MIT, (2014), *Mathematics for Computer Scientists lecture series*, [online], http://ocw.mit.edu/modules/electrical-engineering-and-computer-science/6-042j-mathematics-for-computer-science-fall-2010/video-lectures/ (Accessed 24th November 2015).

Please note: This specification provides a concise summary of the main features of the module and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of each module and programme can be found in the departmental or programme handbook. The accuracy of the information contained in this document is reviewed annually by the University of Buckingham and may be checked by the Quality Assurance Agency.

Date of Production	Autumn 2016
Date approved by School Learning and Teaching Committee	28th September 2016
Date approved by School Board of Study	12th October 2016
Date approved by University Learning and Teaching Committee	2nd November 2016
Date of Annual Review	December 2017