

Subject Information Guide

The probabilistic method

Semester 1, 2017

Administration and contact details

Host Department	School of Mathematical and Physical Sciences.
Host Institution	University of Newcastle
Name of lecturer	Thomas Kalinowski
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Subject details

Handbook entry URL	
Subject homepage URL	
Honours student hand-out URL	
Start date:	03/03/2017
End date:	02/06/2017
Contact hours per week:	2
Lecture day and time:	Friday, 9am-11am
Description of electronic access arrangements for students (for example, WebCT)	

Subject content

1. Subject content description

This is a course on the probabilistic method in combinatorics which was pioneered by Paul Erdős, and has proved to be a very useful tool in combinatorial number theory, graph theory and theoretical computer science. We will cover parts of the book "The probabilistic

method” by Noga Alon and Joel Spencer.. In particular, we will look at the first and second moment methods, Lovasz’ Local lemma, correlation and concentration inequalities, and random graphs.

2. Week-by-week topic overview

Topics covered are

- **Union bound, linearity of expectation and applications of the first moment method**
- **The second moment and the Rodl nibble**
- **The Local Lemma**
- **Correlation inequalities**
- **Martingales and tight concentration**
- **Random graphs**

3. Assumed prerequisite knowledge and capabilities

basic combinatorics and graph theory, probability, linear algebra, calculus

4. Learning outcomes and objectives

After successful completion of this subject, students will

- understand the key principles of the probabilistic method and know a range of examples for its application,
- be able to recognize problems where the probabilistic method might be useful
- be able to combine combinatorial and probabilistic arguments to solve such problems
- have gained some experience in presenting mathematical arguments clearly and logically in writing.

5. Learning resources

The book “The probabilistic method” by Noga Alon and Joel Spencer.

6. Assessment

Exam/assignment/classwork breakdown					
Exam	60%	Assignment	40%	Class work	0
Assignment due dates					
	Week 4	Week 8	Week 12		
Approximate exam date					
					5 June – 23 June.

Institution Honours program details

Weight of subject in total honours assessment at host department	1/8
Thesis/subject split at host department	Thesis 3/8; Coursework 5/8
Honours grade ranges at host department:	
H1	85-100
H2a	75-84
H2b	65-74
H3	50-64