

## Subject Information Guide

### The probabilistic method

**Semester 1, 2017**

#### Administration and contact details

<b>Host Department</b>	School of Mathematical and Physical Sciences.
<b>Host Institution</b>	University of Newcastle
<b>Name of lecturer</b>	Thomas Kalinowski
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#### Subject details

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

#### 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

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

## Institution Honours program details

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