

# Data Structures and Algorithms

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# Outline

## 1 Administrative Details

- Meeting Times
- General Issues
- Assessment

## 2 Syllabus

## 3 Mathematics Review

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# Lectures, Labs and Tutes

Lecture Hours:		Tue. 11h00	<i>SG19</i>
		Fri. 09h00	<i>SG19</i>
Tutorials	<b>3A</b>	Thu. 09h00	<i>KB119</i>
	<b>3B</b>	Thu. 13h00	<i>KB118</i>
Labs	<b>2A</b>	Thu. 16h00	<i>CS244</i>
	<b>2B</b>	Thu. 17h00	<i>CS244</i>

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# Attendance

- Attendance at all lectures and labs / tutes is mandatory
- Handing up assigned lab exercises is mandatory

# Class Home Page

- 1 All lectures, homeworks, past exams, etc. can be found on the class home page:  
`garryowen.csisdmsz.ul.ie/~cs4115/`
- 2 Class lists and attendance records will also be available here

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# Assessment Instruments

Final:	60%	Week15
In-Term Projects	20%	Week{03,06,09,12} + others
“Mid-Term” Exam	20%	Week07

- September repeat exam will count for same as final

# Grade Bands

F	0 – 29
D2	30 – 34
D1	35 – 39
C3	40 – 47
C2	48 – 51
C1	52 – 55
B3	56 – 59
B2	60 – 63
B1	64 – 71
A2	72 – 79
A1	80 – 100

# Reading List

- ➡ *Data Structures and Algorithm Analysis in C++* by Weiss;  
On SL in Library
- *Introduction to Algorithms* by Cormen, Leiserson and Rivest

# Module Outline

- Mathematics Review
- Algorithm Analysis
- Recursion
- Lists, Stacks and Queues
- Graphs and Graph Algorithms
- Trees
- Sorting

# Learning Outcomes

<b>Learning Outcome</b>	<b>Ass. Meth.</b>
Given a function or functions in pseudo-code, analyse their asymptotic running time	Written exam
Given an executable program in black-box form, analyse its asymptotic running-time behaviour	Project work
Given a customer's requirements for data storage and their data retrieval patterns, propose appropriate data structures	Written exam
Identify appropriate sorting and searching algorithms for contrasting scenarios	Written exam
Understand the trade-offs of various graph representation schemes	Written exam
Formulate data access and optimisation problems	Written exam

# Exponents

$$x^a x^b = x^{a+b}$$

$$\frac{x^a}{x^b} = x^{a-b}$$

$$(x^a)^b = x^{ab}$$

$$x^n + x^n = 2x^n \neq x^{2n}$$

# Logarithms

By definition:

$$x^a = b \Leftrightarrow \log_x b = a$$

- $\log_c c = 1$
- $c^{\log_c a} = a$

$$\log_a b = \frac{\log_c b}{\log_c a}, c > 0$$

$$\log ab = \log a + \log b$$

$$\log \frac{a}{b} = \log a - \log b$$

$$\log(a^b) = b \log a$$

$$\log x < x, \forall x > 0$$

- logarithm most frequently used in Computer Science is base 2