

CS319: Scientific Computing (with C++)

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Week 12: Review

9am, 4 May, and 4pm, 5 May, 2021

- 1 Module review
 - THE END!!!!!!!!!!

Reminder: Assessment for CS319

The assessment for CS319 is based on

1. 50% based on lab assignments:
 - ▶ 10% for each of Lab 2 and Lab 3;
 - ▶ 15% for Lab 4+5 and
 - ▶ 15% for Lab 7 (**due today at 5pm**).
2. 50% based on your project work:
 - (i) Initial Project Plan/Discussion [**5 Marks**]
 - (ii) 250 word Project Proposal [**5 Marks**], detailing
 - (a) An external data source, so that you can show your expertise in read from and/or writing to files.
 - (b) A `class` (or set of classes) that you design yourself
 - (c) An algorithm that performs some type of useful calculation
 - (iii) 3 page project report [**15 Marks**]
 - (iv) Project code [**25 Marks**]

Proposed deadline for report and code is 5pm, Friday 14 May. OK??

Usual reminders...

	Mon	Tue	Wed	Thu	Fri
9 – 10		Recorded Class			
10 – 11		Project			
11 – 12					
12 – 1					
1 – 2		Project			
2 – 3					
3 – 4					
4 – 5			Project		

1. Just one, short recorded class this week (and this is it).
2. Three hours of lab times, to support your project work: **Tuesday 10.00-10.50 and 13.00-13.50** (with Niall and Róisín) and **Wednesday 16.00-16.50** (Just Niall)

Module review

The topics we have covered (not necessarily in order) are:

- (a) Basic I/O (`cin`, `cout`), and manipulators (`endl`, `setw`, ...);
- (b) Flow of control and looping (`if`, `for`, `while`, etc.)
- (c) Fundamental data-types (`int`, `float`, `double`, `char`, `bool`, ...). Arrays.
- (d) `string`, and C-style strings.
- (e) Computer representation of numbers (underflow, overflow, machine epsilon, ...)
- (f) Bit-wise operators
- (g) Dynamic memory allocation, including of multidimensional arrays

Module review

- (h) Functions: default parameter values, overloading, functions as arguments to other functions, recursion, pass by reference/value.
- (i) Classes, including the `private`, `public` and `friend` access specifiers.
- (j) Classes: constructors and destructors, including copy constructors.
- (k) `templates`.
- (l) Function and operator overloading (syntax, precedence, implicit/explicit arguments, the `this` pointer, unary/binary operators, assignment operators, ...).
- (m) The C++ preprocessor
- (n) The Standard Template Library (STL), including containers (especially `set`, `multiset` and `vector`), iterators, algorithms (but not functors); range-based loops.

Module review

- (o) Optimisation and bisection;
- (p) Sorting algorithms, and their complexities;
- (q) Stacks, and their applications;
- (r) Solving linear systems by the Jacobi and Gauss-Seidel methods;
- (s) Solving diagonal and triangular systems (back-substitution);
- (t) Sparse matrix representation, especially triplet and CCS; Matrix-vector multiplication
- (u) Representation of graphs as adjacency matrices;
- (v) PageRank and the Power Method;

Module review

- (w) Reading to and writing from files; Comma Separated Values (CSV) files;
- (x) Static variables, and class variables.
- (y) `const`
- (z) Inheritance (but not `virtual`).

I hope you have enjoyed CS319, and have learned something: I have!

Thank you for your participation, your forbearance, your willing to help each other, your enthusiasm, and your talent: it has been a pleasure to teach this course.

