IMD-3006 A (0.5 credit)
Software Design for Multimedia Applications
Winter 2019

Instructor: Ali Arya
Office: CB-4202
Office Hours: Tuesday, 13:30-15:00
Lecture: T/Th, 10:30-12:00
Location: AP-236
Tutorial/Lab: T/Th, 9:30-10:30
Location: AP-236
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TA: TBD

Course Description:

This course provides students with knowledge and expertise to design and develop complex software systems and programs for common multimedia applications. Topics include: data structures, system and requirement analysis, component identification, common design patterns, and working with reusable components. Prerequisite: BIT 2400

Course Objectives/Learning Outcomes:

1. Understand the basic concepts of software development life cycle
2. Design a complex multimedia application based on given requirements
3. Describe a software in terms of components and architecture
4. Use modularization to create efficient and reusable applications
5. Utilize common software design patterns for multimedia applications
6. Practice software design principles using common programming languages

Textbook/Equipment/Material:

- *Starting Out with C++: From Control Structures through Objects*, Tony Gaddis, 2017
    o Basic reference for C/C++ programming
- *Game Programming for Artists*, Jarryd Huntley, 2017
    o Review of game development using C# and Unity
- *Programming Language Explorations,* Ray Toal, 2016
    o Quick review of common programming languages
- *Software Engineering*, Ian Sommerville, 2015
    o Fundamental concepts for software projects
- *Design Patterns: Elements of Reusable Object-Oriented Software*, Erich Gamma and Richard Helm, 1994
    o Common software patterns
- *Game Programming Patterns*, Robert Nystrom, 2014

- o   Common patterns in games
- Further Reading
    - o   *Clean Architecture: A Craftsman's Guide to Software Structure and Design*, Robert C. Martin, 2017
    - o   *A Philosophy of Software Design*, John Ousterhout, 2018
    - o   *Introduction to Programming Languages,* Arvind Kumar Bansal, 2013
- Online Resources
    - o   https://www.w3schools.com
    - o   https://www.tutorialspoint.com
    - o   https://www.youtube.com/user/crashcourse/playlists
    - o   http://www.cplusplus.com
    - o   http://www.cprogramming.com
    - o   http://www.learn-c.org
    - o   http://www.learn-cpp.org
    - o   http://www.learncs.org
    - o   https://www.onlinegdb.com/online_c_compiler

Grading Scheme:

	%
Project (three reports of equal value)	30
Assignments (six topics)	30
Midterm Exam	30
Class Participation (reflection and discussion)	10

See Course Schedule below for due dates.

Course Policies:

- Students have to form groups of 2 members for projects (pair programming). Topic is selected by students and approved by the instructor. There will be peer evaluation for project as a scaling factor for group mark.
- Students must achieve a minimum grade of 50% overall and half of each evaluation item to pass the course.

Course Schedule/List of Topics by Week:

- January 8-10: Introduction
    - o   What is Design?
    - o   Multimedia Applications
    - o   Fundamentals of Programming
    - o   Tutorial A: Visual Studio and C Console Programming
- January 15-17: Structured Programming and Design
    - o   Modularization of code and data
    - o   Functions, Structures, and Arrays
    - o   Tutorial B: Javascript
    - o   **Assignment 1 (due in two weeks)**

- January 22-24: Software Lifecycle
  - From Requirements to Design (and to Development and Evaluation)
  - Tutorial C: Python
  - **Assignment 2 (due in two weeks)**
- January 29-31: Object-Oriented Programming and Design
  - Objects as modules with code and data
  - Tutorial D: C++ and OpenFrameworks
  - **Assignment 3 (due in two weeks)**
- February 5-7: Introduction to Design Patterns
  - Common Code Structures
    - Command, Double Buffer, Game Loop, Update
- February 12-14: Midterm
  - Review (Tuesday)
  - **Midterm Exam (Thursday)**
- February 19-21: Winter Break
- February 26-28: Software Architecture
  - Software Design Principles and Considerations
  - Components and Architectures
  - **Assignment 4 (due in two weeks)**
- March 5-7: Design Patterns (part 2)
  - Data Structures
    - Arrays, Records, Stacks, Queues, Linked lists, Trees, Graphs
  - Tutorial E: Java and Eclipse
  - **Assignment 5 (due in two weeks)**
- March 12-14: Design Patterns (part 3)
  - Code Structures
    - Flyweight, Spawn, State
  - Tutorial F: C#, .NET Framework, and Unity
  - **Assignment 6 (due in two weeks)**
- March 19-21: Review and Project Work
- March 26-28: Advanced Topics
  - Events, Callbacks, and GUI
  - Multi-threading and Synchronization
  - Networking
  - Tutorial G: C++ Programming in Unreal Engine
- April 2-4: Review and Project Work
- **April 27: Due Date for Final Project**

Note:
- No class on Feb 19 and 21 (Fall Break)
- There is an individual Reflection assignment every week worth 1 point.
- All regular assignments are individual and have 5 points. They will be given on Thursdays and due in 15 days (Friday night).
- While every attempt will be made to keep to the schedule listed above, circumstances may necessitate modifications throughout the semester.

ACADEMIC ACCOMMODATION

You may need special arrangements to meet your academic obligations during the term. For an accommodation request, the processes are as follows:

Pregnancy obligation:

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website **carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf**.

Religious obligation:

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website **carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf**

Academic Accommodations for Students with Disabilities:

If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation arrangements are made. For more details, visit the Paul Menton website **carleton.ca/pmc**.

Survivors of Sexual Violence:

As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and where survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit **carleton.ca/sexual-violence-support**.

Accommodation for Student Activities:

Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit **https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf**

ACADEMIC INTEGRITY

The University Senate defines plagiarism in the regulations on instructional offenses as: "to use and pass off as one's own idea or product work of another without expressly giving credit to another."
Borrowing someone else's answers, unauthorized possession of tests or answers to tests, or possession of material designed in answering exam questions, are also subject to university policy regarding instructional offences. For more information on Carleton University's Academic Integrity Policy, consult
https://carleton.ca/secretariat/wp-content/uploads/Academic-Integrity-Policy.pdf

COURSE COPYRIGHT

Student or professor materials created for this course (including presentations and posted notes, labs, case studies, assignments and exams) remain the intellectual property of the author(s). They are intended for personal use and may not be reproduced or redistributed without prior written consent of the author(s).

IMPORTANT DATES TO REMEMBER – Academic Year 2018-19

WITHDRAWALS
The last day to withdraw from winter courses or the winter portion of two-term courses with a full fee adjustment is **January 31, 2019**.   Withdrawals after this date will create no financial change to winter term fees and will result in a permanent notation of WDN appearing on your official transcript.

The last day to withdraw from winter courses or a fall/winter courses without academic penalty is **April 9, 2019**.

OFFICIAL FINAL EXAMINATION PERIOD
Winter term and fall/winter courses: **April 12-27, 2019 –** Examinations are normally held all seven days of the week.

For a complete listing of academic and financial dates and deadlines for the 2018/2019 academic year, please visit https://carleton.ca/registrar/registration/dates-and-deadlines/.