

Introductory information about: Advanced Programming

Computer Science Department — Fall 2023

Staff

Subject Coordinator: Dr. Hossein Hojjat

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Class Information

Dates: Starting on October 7 2023

Time: Saturday and Wednesday from 18:00 to 19:30

Classroom: 3006

Contacting us

General enquiries about the subject should be submitted to the relevant discussion forum on the LMS. If you have a personal or confidential concern, please contact the coordinator directly. If you contact the staff directly and we feel that your message is better sent to the forum, we reserve the right to answer your message merely by asking you to post it to the forum. Most face-to-face enquiries should be handled during or immediately after the lectures. Other consultations will be held at a weekly consultation time, or by appointment only.

Seeking assistance

There are a number of mechanisms available for assistance detailed on LMS and the TeIAS website. You should also feel free to approach your subject coordinator. He is the final arbiter of all that happens in the subject, and if he cannot answer your question, he will refer the matter on, or it may be that no one can. Again, it may be necessary to approach the subject coordinator briefly in the first instance to set a time for a consultation. Finally, note that you may also contact the subject coordinator using the email address above if you need to arrange an appointment.

Textbook

[BS] Bjarne Stroustrup: C++ Programming Language, The 4th Edition

[WS] Walter Savitch: Absolute C++ 6th edition

[IA] Cormen et al. Introduction to Algorithms.

[SHP] Sarel Har-Peled. CS473: Algorithms.

[GoF] Design Patterns: Elements of Reusable Object-Oriented Software, by Erich Gamma, Richard Helm, Ralph Johnson, and John Vlissides, with a foreword by Grady Booch

[DP] Domain-Driven Design: Tackling Complexity in the Heart of Software, by Eric Evans

Lectures

Lecture slides will be provided in advance of the lecture, on the LMS. However, these versions should be considered drafts. We may edit the slides and notes after they are delivered, somewhat like the *Hansard* tradition.

Lectures will be recorded; these recordings will be available to students via the LMS. If you are in Tehran, we strongly recommend attending lectures in person.

Syllabus/Schedule

The intended lecture plan is as follows. This subject is being offered for the first time by the teaching staff; there will therefore be some flexibility in the exact topics covered and the order in which they are covered. In all weeks, Mr. Kazemi will be the attending lecturer, unless otherwise specified.

Week 01-01: 07 Oct Overview; Computational Model; Asymptotic Notation; OO Languages (Chapter 1-3 of [IA], also Chapter 1 of [WS])

Week 01-02: 11 Oct Structure of a program, Variables and types, Constants, Operators, Basic I/O (Chapter 2 of [WS])

Week 02-01: 14 Oct Control Structures, Functions (Chapter 3 of [WS])

Week 02-02: 18 Oct Overloads and templates, Name visibility (Chapter 4 of [WS])

Week 03-01: 21 Oct Arrays, Character sequences, Pointers (Chapter 5 of [WS])

Week 03-02: 25 Oct Dynamic Memory, Structures, Other data types (Chapter 5 of [WS])

Week 04-01: 28 Oct Classes, Special members, Pointer to Functions (Chapter 6 of [WS])

Week 04-02: 01 Nov Friendship and inheritance, Polymorphism (Chapter 15 of [WS])

Week 05-01: 04 Nov Type conversions, Exceptions, Preprocessor directives

Week 05-02: 08 Nov Mid-semester Test

Week 06-01: 11 Nov Containers (I) (Chapter 19.2 of [WS])

Week 06-02: 15 Nov Containers (II), Useful Libraries in C++ (e.g. Cgal) (Chapter 19.2 of [WS])

Week 07-01: 18 Nov Performance (I)

Week 07-02: 22 Nov Performance (II)

Week 08-01: 25 Nov Memory Consumption (I): Variables in classes, Valgrind

Week 08-02: 29 Nov Memory Consumption (II): Massif

Week 09-01: 02 Dec 2-universal hash functions, k-independent hash functions, Chi-Squared Test, Balls and Beans Problem (Chapter 11 of [SHP], Chapter 11 of [IA])

Week 09-02: 06 Dec Perfect Hashing (Simplified) (Chapter 11 of [SHP], Chapter 11 of [IA])

Week 10-01: 09 Dec SOLID Principles

Week 10-02: 13 Dec An Introduction to Design Patterns (I) (See [GoF])

Week 11-01: 16 Dec An Introduction to Design Patterns (II) (See [GoF])

Week 11-02: 20 Dec An Introduction to Software Testing (I)

Week 12-01: 23 Dec An Introduction to Software Testing (II)

Week 12-02: 27 Dec Domain Driven Design (I) (See [DP])

Week 13-01: 30 Dec Domain Driven Design (II) (See [DP])

Week 13-02: 03 Jan Exam Revision (I)

Week 14-01: 06 Jan Exam Revision (II)

Assessment

Unless otherwise specified, all work is to be done on an individual basis. Academic Integrity is of utmost importance, and we will all follow the policies of the University. For the purpose of ensuring academic integrity, all submission attempts by a student may be inspected, regardless of the number of attempts made.

Homeworks There will be ten homeworks, due at the end of every week starting from week 2 (each one worth 2.25%). The exact timing and more detail of the form of these assessments will be issued within the weeks of the semester. Note that there will be no homework during the corresponding week of mid-semester exam. Also, the teaching staff would consider the last week of the semester and one more week as no-homework weeks.

Should you submit a document derived (in part) from handwriting, ensure that the document is a clear image or scan of your writing, and in particular keep a copy of the original until final marks are released.

Computer Assignments There will be five computer assignments, due at the end of weeks 3, 5, 7, 9, and 11 (each one worth 4.5%). The exact timing and more detail of the form of these assessments will be issued within the semester.

Examination

Mid-semester Test There will be a 60-minute mid-semester test, worth 15% of your final mark in week 7. Details of the mid-semester test will be available in the first two weeks of the semester (including for those students unable to be in Tehran). To help you prepare, sample questions will

also be provided. To pass the subject, you must attempt the mid-semester test and pass the hurdle, that is receive a mark of at least 35% of the 70% combined with the final exam, unless you have been awarded a dispensation as a result of an application for special consideration based upon medical or personal reasons.

Final Exam A three-hour examination at the end of the semester is worth the remaining 40% of your final mark. The exam will require detailed knowledge of the assessments during the semester. So it is important that you work steadily.

Hurdles

Students who fail the test/exam hurdle or the assignment hurdle, but receive at least 50% for the subject as a whole, will receive a failing grade. Regardless of your mark in the project component, you must sit the final examination, as all decisions are based on the totality of the marks. For example, a student with 26/55 marks on the test + exam and 25/45 on the assignments would fail (due to the test + exam mark), despite achieving a total of 51/100. In another example, a student with 30/55 on the exams, and 21/45 on the assignments would fail (due to the non-exam total being less than 22.5), despite achieving a total of 51/100. Finally, a student with 30/55 on the exams, and 16/45 on the assignments would simply fail because their total is less than 50.

Summary

All marks are provisional until confirmed through the issue of final results.

Component	%	Note
Homeworks	22.5%	Must obtain at least
Computer Assignments	22.5%	22.5/45 to pass the subject
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Mid-term Exam	15%	Must obtain at least
Final Exam	40%	27.5/55 to pass the subject

Use of email

Remember that the LMS forum is your first port of call when contacting the staff. Whenever you send email from outside the university account system, please be sure to identify who you are by full name and student number, and make sure the subject line is Advanced Programming query: we employ a strict spam filter, and mail from bigbadbob@hotmail.com on the subject Need help may well get deleted without being read.

Again, in line with University requirements, you will be expected to read your student email account at least twice a week and take note of the information sent there.