

Computer Systems

MSc-CS: 34221/ICY: 34212/MSc-CS & MSc-AI&CS (Dubai): 34224

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Module Team

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- Dubai:
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- Teaching Assistants
- Taught concurrently to MSc-CS, YiCS, MSc-CS (Dubai), MSc AI&CS(Dubai)



Welcome to the exciting module of Computer Systems!

- Course team
- Motivation
- Learning Outcomes
- Course Structure
- Resources
- Assessment
- How to study?



Motivation

- Computer Systems are enormously complex:
 - Hardware – many billions of components
 - Software – billions of instructions
 - Networks – most of the operations that we perform involve interactions from many machines
- We cannot understand all of this complexity:
 - But we must understand the principles:
 - To design software architectures & software systems
 - To build efficient and robust systems
 - To test and evaluate and also maintain and extend these systems
 - We usually layer abstractions with well-defined interfaces to hide this complexity



Example

Let's take a trivial example:

How are numbers represented?

- In real life, it's easy! We just write a string of digits!
- Inside our computers we (usually) have a fixed representation.
What happens if we:
 - Try to represent an integer which is too big?
 - Try to represent a real number that is too big or small or cannot be represented precisely?
 - Try to divide by 0?
- All of these cause problems:
 - A system error or the wrong answer:
 - with, possibly, fatal consequences!
- So, we need to understand the representation, so we can make the right design choices and avoid problems



Learning Outcomes

- On successful completion of this module, the students should be able to:
 1. Demonstrate understanding of the fundamental principles of computer hardware
 2. Explain the relationship between computer hardware and software and be able to analyse a computer program in terms of the hardware operations required
 3. Reason about and analyse the complexity and performance of computer programs
 4. Describe the role of an operating system, explain its component parts, and reason about its behaviour.
 5. Demonstrate and apply an understanding of the core principles of computer networks



Course Structure

- Hardware and software Architectures
 - Data representation and manipulation
 - Numbers, characters etc.
 - Memory, CPU & Program Execution
 - Instructions Assembly and Machine Code
 - High and low level: Compilation and Interpretation
 - Subroutines and Stacks
 - Java Virtual Machine (JVM) and Bytecode
- Analysing Algorithms
 - Efficiency (Algorithm Complexity)
- Introduction to Operating Systems and their Elements
 - Computer Systems' Architecture and OS Structures
 - Process Management
 - Process Scheduling
- Multithreading and its Challenges:
 - Concurrency and Synchronization
 - Deadlocks
- Introduction to Networks
 - Application Layer
 - Transport Layer
 - Network Layer
 - Network Security



Resources

- Lecture & Tutorial
 - Tuesday 10:00
 - Tuesday 1:00
 - Thursday 10:00
- Course materials:
 - Canvas:
 - Lecture slides
 - Exercises
 - Further materials:
 - Books, online materials, videos etc.
 - Discussion Groups for offline Q&A, announcements etc.
 - Teams



Assessments

- 50% coursework
 - 4 online tests:
 - Tuesdays (3pm-4pm (UK) / equivalent time in Dubai), 50 minutes
 - No extensions are possible
 - Students with RAPs
 - Quiz 0: Week 3, Material from topics 1-3
 - not counted towards final assessment
 - Quiz 1: Week 5, Material from topics 1-5
 - 30% of coursework mark (=15% of module marks)
 - Quiz 2: Week 8, Material from topics 6-11
 - 35% of coursework mark (=17.5% of module marks)
 - Quiz 3: Week 11, Material from topics 13-17
 - 35% of coursework mark (=17.5% of module marks)
 - See module Canvas page for details.
- 50% Final Examination:
 - May / June Exam Period



How to Study

- Each component will explain what you should do:
 - Attend the lectures
 - Read the course material
 - Do the exercises
 - Look at the further work.
- If you have any questions, then ask for help:
 - Lectures/Tutorials, Office hours, TA sessions, **Teams** ...
- Work with other students:
 - Explain your understanding, help them to understand, 'criticise' their work ...
- **Remember:** This module is 20 credits (1/3 of your workload), so you should be devoting 12/13 hours per week to it.



Any Questions?

