CMSC4xx Information Session

Spring 2024

Welcome!

- The department offers ~37 upper level CS courses
    - You need 7
- How to pick?
    - Make sure you know what you need for your degree
    - Follow your interests
    - Let the distributive areas be your guide
    - Consider specializing

Distributive Areas

Area 1: Systems

- Similar Lower Level: CMSC216
- Operating systems, cybersecurity, networking, parallel computing, big data

Area 2: Information Processing

- Similar Lower Levels: CMSC216 AND CMSC330
- Machine learning, AI, databases, computer vision/graphics, bioinformatics

Area 3: Software Engineering and Programming Languages

- Similar Lower Level: CMSC330
- Compilers, programming technologies, HCI, software development

Area 4: Theory

- Similar Lower Level: CMSC250, CMSC351
- Algorithms, computability, cryptography, quantum computing, game theory

Area 5: Numerical Analysis

- Numerical computation, numerical analysis

Area 1: Systems

CMSC 416: Introduction to Parallel Computing

Content

- Intro to parallel computing, parallel architectures and networks, shared-memory programming, distributed-memory programming, GPU programming, parallel algorithm design, debugging and instrumentation, performance tools, performance optimizations, parallel I/) and networks, scientific and other applications

Structure

- 4 projects, 2-3 quizzes, midterm and final

Programming Languages

- Programming assignments are in C or C++, using MPI, OpenMP, and CUDA for parallel/distributed programming on the campus Linux cluster. You will use many CPU cores, and also one or more GPUs.

Who Should Take This One?

- students interested in building on their Systems knowledge from CMSC216, students curious about the theory and practice of high performance and parallel computing

Area 2: Information Processing

CMSC 424: Database Design*

Content

- Database design, SQL (creating the database, writing to it, reading from it, simple and complex SQL queries), performing SQL queries from a software program, PHP/web programming, NoSQL, some cybersecurity (one way encryption, sql injection), SQL query optimization, concurrency and deadlock

Structure

- Exam based

Programming Languages

- SQL, PHP

Who Should Take This One?

- Students who want a better understanding of what is involved in a software program: including the client side software, database in the background, and server side software
- Every software program uses data, and databases are the best way to store that data

*Information applicable to Herve’s sections of CMSC424

Area 3: Software Engineering and Programming Languages

CMSC 436: Programming Handheld Systems

Content

- What makes mobile different from traditional computing, what the standard principles of mobile programming are, and how to develop complex applications

Structure

- Project Based

Programming Languages

- Depends on the semester! Kotlin for Android, Swift for iOS, or Dart for the cross-platform Flutter SDK

Who Should Take This One?

- Students who want to know more about the technology that lives in their pockets
- Students who want self-designed group work experience, with the opportunity to design and monetize their own mobile ap

Area 4: Theory

CMSC 452: Elementary Theory of Computation

Content

- Study of several classes of languages including Regular, Context Free, P, NP, Decidable, and Undecidable
  - study which languages are IN that class, which languages are NOT IN that class, and what questions are UNKNOWN TO SCIENCE

Structure

- Exam and homework based, with 1 small project

Programming Languages

- The small programming project can be in any language, though most students do it in C, C++, Java, or Python

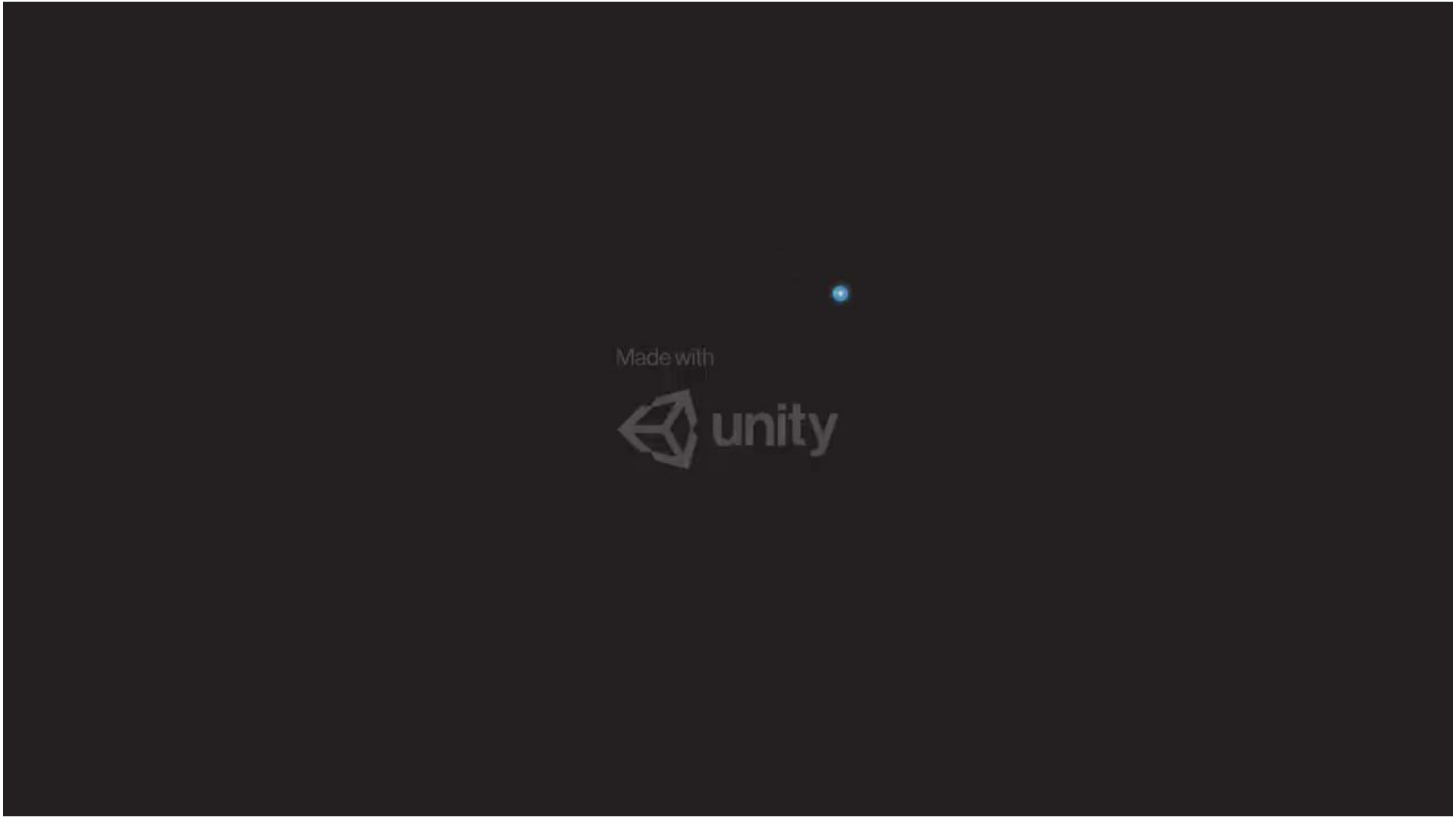
Why take this class?

- Practical: it is good to know what problems are (or thought to be) hard to solve so that instead you will try to solve variants of them
- Intellectual: Proving that certain problems CAN'T be solved, or are hard to solve is an intellectual counterpoint to the (also fine courses) where you show what CAN be solved

Upper Level CS Eletives

CMSC425: Game Programming

- Content
    - Mix of theoretical and practical concepts
    - 3D math and coordinate systems
    - Programming methods and concepts useful to game creation
    - Industry preparation
- Structure
    - Focus on projects
- Programming Languages
    - C#
- Who Should Take This One?
    - Students interested in game development, in the entertainment industry and beyond it
    - Students who want more interactive coding



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Upper Level Concentration

ULC Requirements

- 12 credits (most often 4 courses)
- All in the SAME area
  - unless you have declared a minor/double-major which requires courses from multiple areas, required courses for declared programs are eligible even with variation.
  - ex. a Sustainability minor can use AGNR and PLCY courses
- CAN’T be CS or overly similar
  - Computer Engineering, Information Science, several IMD courses, DATA courses, etc. are ineligible
  - Some programs also have ineligible courses, check the ULC website
- Talk to your advisor before getting started to make sure your plan will work!

Make the ULC work for you

- Students usually approach the ULC in 1 of 3 ways:

    1. I hate this requirement so much pls make it stop
        a. These students usually choose MATH or STAT since they have already completed the prerequisites with their CS coursework
    2. CS is hard and I need a break
        a. These students choose something they like to build in a break during rigorous upper-level semesters
    3. I want something that supports my CS interests
        a. These students choose a ULC that helps them build a niche. For example, students interested in NLP can choose linguistics, students interested in game design can choose art or english, students interested in cybersecurity can choose criminal justice, students interested in HCI can choose sociology, etc.

Immersive Media Design

- What’s the program all about?
  - IMD is great for students who want to apply their creative and technical skills to develop AR/VR/XR applications and large scale immersive experiences
  - The intersection of Computer Science, Design, and Art
- What lower levels should I take to access upper-level coursework?
  - IMDM101, IMDM150
- Why might CS students be interested?
  - Learn about new ways to creatively apply what you learn in your CS courses
- Not all IMDM courses are applicable to the ULC, so be ready to mix-and-match with Art

Digital Storytelling and Poetics Minor

- What’s the program all about?
  - Interpreting, creating, and imagining writing in new digital media spaces
  - Building skills to critically analyze digital culture, narrative, poetics, and rhetoric
  - Crafting creative expression in digital platforms, leading to the build up of a portfolio
- What lower levels should I take to access upper-level coursework?
  - ENGL295: Intro to Digital Storytelling and Poetics (for the minor)
  - ENGL3xx courses are open to all students
- Why might CS students be interested?
  - Write and design creatively using digital tools (code, AI text generators, social media)
  - Supports interest in fields like content creation, game design, software design, web dev, UX, and more

Astronomy

- What’s the program all about?
  - Opening new frontiers-especially in data science
  - Connecting students with high-level research and engagement
  - Exploring the universe
- What lower levels should I take to access upper-level coursework?
  - At least 1 1xx level course (ASTR100, ASTR101, transfer equivalents)
  - At least 1 2xx course (ASTR220 or 230)
  - Conveniently, these are also gen eds!
- Why might CS students be interested?
  - Job security: With many of the advances in space technology, there will be mountains of data to analyze and plenty of coding jobs
  - Opens doors to new fields like aerospace and aeronautical engineering, policy around privacy and data, and the very emerging space economy
  - CS and Astro are very interconnected
  - Root your love of science in something physical to balance out your CS work

Business

- What’s the program all about?
    - The study skills and technologies that enable students to operate and lead in the corporate world. There is variety depending on the area of business you focus on!
- How do students access upper-level coursework?
    - Declare a minor: General Business, Innovation and Entrepreneurship,Computational Finance (needs 1 extra course after completing minor for ULC), Business Analytics (choose courses very carefully, many aren’t eligible for the ULC)
    - Minor applications open each Winter
- Why might CS students be interested?
    - Students can develop an understanding of finance, management, and economics that will help them thrive in the corporate world, and find intersections of CS and Business like CompFin