

Fall 2021 Computer Science Advising Newsletter

Early Enrollment

Registration for fall classes begins Monday, November 8th. You can find your enrollment window (the time you are allowed to register) on MyMadison. Freshmen will be registering on their own for the first time. Freshmen need to see Professors Bowers or Mayfield or Molloy to determine what to take in the spring.

If you are in CS 159 then you will not be able to enroll in any more CS classes until you are fully admitted to the CS major or minor. This will not occur until after final grades for CS 159 are posted at the end of the semester. Therefore, you will have to register for CS classes in December, not during early enrollment in November. Leave space in your schedule for CS 240, CS 261, or CS 345. Because there are so many students coming into the CS major, we usually have to apportion people into these classes, so when you are admitted into the major, you will likely also be told which two of these three classes to enroll in for the fall; you can enroll in the other ones in the following semester.

Newly Admitted Students

If this fall semester is your first as a fully admitted CS major, then you are probably taking one or more of CS 240, CS 261, and CS 345. In the spring you should probably take whichever of these you have not already taken, and possibly also CS 327 if you have had CS 240, or maybe CS 361 if you have had both CS 240 and CS 261. Exactly what to take is a topic you can discuss with your advisor.

Advising Appointments

The CS advising team wants to see every non-graduating student this semester:

Freshmen – Please make an appointment to see your advisor individually.

Sophomores and Juniors – Registration for spring semester begins November 8th, so you need to discuss your plans for next semester (and thereafter) with your advisor to make sure that you are on track to graduate on time

Paige Normand, our CS Advisor, will be offering drop-in advising Nov 8th – 11th via Zoom.

<https://jmu-edu.zoom.us/my/paigenormand>

Monday 11/8 2pm-4pm

Tuesday 11/9 3pm-5pm

Wednesday 11/10 3pm-5pm

Thursday 11/11 3pm-5pm

Applications for Full Admission

If you are taking CS 159 this semester and want to continue in the CS major or minor, you have to apply for full admission to the major or minor this semester. All application must be received by the last day of classes (Friday, December 10th, 2021).

You will be guaranteed full admission to the CS major or minor, if your average grade in CS 149 and CS 159 is a 3.0 or better, and if you have not repeated either of the two courses. Students who are not guaranteed full admission will be granted full admission to the CS major or minor as space permits based on their GPA in CS 149 and CS 159 and faculty evaluation of their potential to succeed in the CS major or minor.

All students who want to be fully admitted to the major or minor must apply, regardless of whether or not you will be guaranteed admission! The application is done electronically through an online survey (see link below). You will need to upload a PDF file of your unofficial transcript along with the other information we request, so make sure you have that ready.

<https://jmu.questionpro.com/t/ARXgAZpg6K>

When you complete the application, you will receive an email confirmation, which you should review to make sure all the information is correct.

Graduation Applications

Graduation applications need to be done electronically via MyMadison. Before you can submit an application you need to make sure that all the graduation requirements in the Academic Requirements are listed as “satisfied.” This may not happen until you actually enroll for classes for next semester. However, there may be some issues you need to work out with your adviser first, so if you think you have met all the requirements but not everything is listed correctly, please get in touch with your advisor to fix things.

Technical writing requirement for older catalog years

For reasons beyond the control of the department we will not be able to offer CS 332 (Technical Writing) this coming spring semester. If your catalog year is 2018-19 or older, and you have not yet taken the Technical Writing class, then you **must switch to a newer catalog year**. Please contact your advisor about switching.

MATH 229 to count as statistics requirement

Since the 2020-21 catalog, we have included MATH 229 (Introduction to Applied Statistics Using R) in the list of courses that fulfill the CS major statistics requirement. If your catalog year is 2019-20 or older, and have taken MATH 229, please contact your advisor for a course directive.

Spring Schedule

The spring schedule for CS courses is accompanying this newsletter as a separate document. You will see that there are several electives, many of which are described below.

Note that there has been some confusion in the past on how to properly use JMU’s wait list for sections that are full. If you are hoping to switch between different sections of the same course, or to switch between classes that are offered at the same time, make sure you use the SWAP option when entering the wait list. For more information, please see the detailed description on the CS Wiki:

<https://wiki.cs.jmu.edu/department/waitlist/start>

Electives

CS 347 Web-Based Information Systems (Prof. Richards)

This course is an opportunity to learn about full stack web development. In our fast-paced class we will work to develop web applications using a client-server architecture. The clients will be written in HTML+CSS+JS, and the server-side application will expose a REST API with which the client can interact. The server will persist data to a database. Students completing this class will be able to build their own web applications.

Prerequisites: Grades of C- or better in CS 159 and CS 345.

CS 374: Database Systems (Prof. Mayfield)

Databases are essential to nearly every business today. The goal of CS 374 is to give you an understanding of how data should be stored and used in real world contexts along with hands-on experience with fundamental data management techniques. We will focus mainly on the relational model and the use of SQL, a declarative programming language for writing queries. You will learn how to use standard database systems, which may include PostgreSQL, MySQL, SQLite, and Oracle. We may also explore NoSQL systems like MongoDB and Neo4j in the second half of the semester...

The course will focus on data modeling and database development with some application development. The knowledge and skills you acquire in CS 374 will open the door to solving interesting and challenging problems not to mention summer internships and networking opportunities. Database programming and database administration in an exciting and growing job sector.

Prerequisites: Grade of C- or better in either CS 240 or CS 345 or equivalent

CS 444: Artificial Intelligence (Prof. Molloy)

What is intelligence? Is it possible for a computer to possess intelligence or be intelligence? How do we measure this quality about a non-human, or inanimate object?

In this class, we will explore methods to solve problems that seemingly require intelligence, focusing on problems where the best known algorithms we have to "solve" these problem are intractable. We will then proceed to develop knowledge bases, that is, sets of facts that, allow for computations to infer new facts from existing ones. Finally, we will focus on utilizing a probabilistic representation of the world, so that we can develop more advanced intelligent "agents".

Prerequisite: Grade of C- or better in CS 240

CS 446 Software Analysis and Design (Prof. Bernstein)

This course provides students with the opportunity to participate in a semester-long, team-based, software design (both product design and engineering design) and construction project. Students will gain experience with various architectural styles and design patterns. They will also gain practical experience with Scrum and a variety of design and construction tools.

Prerequisites: Grades of C- or better in CS 240 and CS 345.

CS 447 Interaction Design (Prof. Stewart)

Let's take the Computer Science expertise we have been building in our curriculum, and apply it to understanding people! What can we learn about the people making, using, and being used by the systems computer scientists and their collaborators build? Many of us who remain in the field of computer science after completing our undergraduate studies find ourselves in a design role. However, computer scientists do not typically conceive of ourselves as "designers". The goal of this course is to facilitate the development of your designerly lens, design thinking, and designer identity.

Through in-class activities (including sketching, discussion, design exercises, wall "crits", and presentations) and projects (including studying human subjects and designing interfaces to support them) we will gain experience with modern approaches to designing interactive systems. Professionally, the experiences of our class will prepare you for varying degrees of collaboration with your company's design team. These experiences also prepare you well for research in the field of Human Computer Interaction.

Prerequisite: Grade of C- or better in CS 345.

CS 456 Computer Architecture (Prof. Weikle)

How can my computer perform calculations so much faster than anyone I know? Yet, still suddenly slow down when I save a picture? Did you know that computers make mistakes all the time - and then fix them - as a part of their normal operation? Computers as different as Google servers, the microprocessors in your cell phone, or those that predict weather and launch satellites are all organized in essentially the same way. In this class you will learn this basic organization down to the gate level, build circuits to implement the abstract components of a processor such as the arithmetic logic unit, control unit, data path, and memory system, then write high level description language code to configure those designs on a field programmable gate array. During this class you will experience the challenges of hardware design, simulation, testing and debugging. At the end, you will also discover the beauty of using abstraction to reduce complexity, value designing systems for speed and power

performance, and appreciate the tradeoffs that must be made by system designers.
Prerequisite:

Prerequisite: Grade of C- or better in CS 361.

This course counts as an advanced system elective.

CS 458: Cyber Defense (Prof. Heydari)

This course is part of the Cybersecurity certificate program. Cybersecurity is one of the fastest growing technology fields. There is a huge shortage of cybersecurity professionals and the job market is great. This is a lab based course. We introduce several Cybersecurity tools and use around 12 labs to practice these tools on.

Prerequisite: CS 457

CS 470: Parallel and Distributed Systems (Prof. Lam)

Have you ever written a program that runs on more than one computer at a time? In this course, we will explore parallel and distributed systems with an emphasis on high-performance computing. Building from the topics covered in CS 361, we will explore various shared-memory and distributed-memory models as well as other related topics. We'll work with concrete development technologies including Pthreads, OpenMP, and MPI, and you will write software and run experiments on a 16-node distributed cluster. If time allows, we will explore other popular parallel or distributed technologies such as GPU and cloud computing as well as other topics on the cutting edge of modern high-performance computing. In addition to several significant standardized programming projects, you will also complete a larger, semester-long research project on a topic of your choice.

Prerequisite: Grade of C- or better in CS 361

This course counts as an advanced system elective.

CS 482: Special Topics in Information Security – Cryptography (Prof. Wang)

In the movie *The Matrix*, what is the name of the bad guy who sells Morpheus out to the agents? Yes, cypher, which is a cryptographic algorithm for secret writing. Over the past forty-six years, the cryptography genie has gradually broken free of the bottle of 2000-year government monopoly and has become a powerful and indispensable tool to ordinary people in daily lives for data confidentiality, data integrity, secure electronic transactions, digital currency, and digital privacy.

This course will introduce you to the oxymoron-style cryptographic concepts and the disruptive real-world cryptographic applications. You will experiment with breaking weak ciphers & insecure applications of strong ciphers and developing new cryptographic applications. Example topics include quantum-resistant lattice-based cryp-

tography schemes, cryptography-based computer program breaking, mix-net and Tor hidden service, Bitcoin, and quantum key exchange. The intrinsic relationship between cryptography and computer science will also be explored (Colossus, the first programmable electronic computer, was developed to crack the German Lorenz SZ42 cipher; most modern cryptographic concepts are essentially computational; many historical CS figures, including Alan Turing and Claude Shannon, left footprints in cryptography too). This is a once-in-a-lifetime opportunity.

Prerequisites: Grades of C- or better in CS 240 and CS 261

CS 488: Computer Graphics Applications (Prof. Johnson)

In this course you will learn the foundational concepts of interactive 3D computer graphics: model representation, transformations, lighting, and texturing. We will also discuss advanced topics like shadows, water, procedural noise, and skeletal animation. Students will develop enough 3D modeling skills to create their own objects and characters. For programming assignments, students will write 4-5 renderers using their own library of graphics routines. All code will be written in JavaScript. Students should expect to encounter a fair bit of applied math, with a focus on algebra, geometry, and trigonometry. In one of the meetings each week, students will collaborate on lab exercises.

Prerequisites: Grades of C- or better in CS 240 and CS 261