

Fall 2020 Computer Science Advising Newsletter

Early Enrollment

Registration for fall classes begins Monday, November 9th. 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 Hazard or Mayfield 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 4th, 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

Enrollment Advice with the CS Ambassadors

Tuesday, Nov. 3 12:15-1:15

We'll have break-out rooms for Freshmen, Transfer students, and upper CS classmen.

Drop-in at any point if you have questions about your spring courses!

<https://jmu-edu.zoom.us/j/84882336312>

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 (Wednesday, December 9th, 2020).

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. If you took CS 149 in Spring 2020 and received a grade of CR, then you need a grade of B or better in CS 159. If you took CS 159 in Spring 2020 and needed to repeat it in Fall 2020, then we are not counting this as a repeat. 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://www.questionpro.com/t/ARXgAZjXmj>

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

Starting this year, graduation applications need to be done electronically via My-Madison. 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.

Networking systems elective

If you took CS 480 (Networking) with Prof. Aboutabl in Fall 2019 or are taking CS 455 (Advanced Computer Networking) in Fall 2020, then this course counts as a CS systems elective, but the Academic Requirements system may not recognize this. Please contact your advisor for a directive for that requirement.

Technical writing requirement for older catalog years

For reasons beyond the control of the department we will not be able to offer CS 332 this coming spring semester. Last year we let you know that CS 260 was going away and that the Spring 2020 CS 280 class was your last opportunity to fulfill the Technical Writing requirement if your catalog year was older than 2019-20. For those of you who took that CS 280 class, we are working with the Registrar’s office to count it toward the requirement, so please hold off contacting your advisor about that.

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.

Spring Schedule

The spring schedule for CS courses is attached with this newsletter. You will see that there are several electives, many of which are described below.

Electives

CS 330: Societal and Ethical Issues in Computing (Kirkpatrick)

Computing has changed all facets of our lives, allowing us to maintain interpersonal connections with distant family and friends, adjust our workplace to our individual preferences, and share information that challenges the balance of power with police and governments. In many cases, these changes may create a great benefit to one group of individuals while extracting a great cost for others. We will use the tools of critical inquiry, ethical frameworks, and legal policies to assess how computing has and will continue to change your life and the lives of people around the world. The topics that we will discuss include the foundations of computing ethics, intellectual property, security & cybercrime, privacy, freedom of expression, AI ethics, gender & race in computing, and the future of work.

Prerequisite: Fully admitted Computer Science majors or minors

CS 349: Developing Interactive Multimedia (Bernstein)

This course considers both theoretical and practical aspects of digital media. In particular it considers: object-oriented programming techniques used in multimedia applications, event-based programming, a variety of different individual media (both auditory and visual), the issues that arise when combining multiple media, and dynamic (a.k.a., time-based) media.

Prerequisite: Grade of C- or better in CS 240

CS 374: Database Systems

Sections 2 and 3 (K. Richards)

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 (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 problems 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 445: Machine Learning (Sprague)

Some computational problems are too complex to solve with human-designed algorithms. For example, imagine trying to write an algorithm that can reliably locate chairs in images. There is no simple definition of how a chair is structured or how it will look. A chair may be obscured by other objects in the image or seen from unexpected angles. Humans solve problems like this effortlessly by drawing on a lifetime of experience. The goal of machine learning algorithms is to give computers that same capability. Instead of explicitly developing algorithms to solve specific problems, we design algorithms that can extrapolate and draw inferences from large amounts of data.

This course will explore the field of machine learning from both a theoretical and applied perspective. We will study the mathematical foundations of key algorithms like neural networks, decision trees, and support vector machines. We will practice implementing these algorithms and applying them to real data sets.

Prerequisite: Grade of C- or better in CS 327 and one of the following: MATH 318, MATH 220 or MATH 229.

CS 455: Advanced Computer Networking (Aboutabl)

Do you aspire to become the senior network engineer of your organization? Are you eager to know how the protocols that govern computer networks internally work (or not work)? Are you interested in analyzing the traffic captured during some network

activity to learn how you can better operate / understand your network? Would you like to learn how the routers of a big network collaborate to route/deliver traffic? Have you ever wondered how it is feasible to reliably deliver data across a network that is inherently unreliable? Would you like to learn the design and implementation approaches for a networked, e.g. client-server, application? Are you a strong C programmer who prefers coding over sleeping/eating? If you answer “YES!” to all of the above, then this class is built for you. Yes, YOU!

Prerequisite: Grade of C- or better in CS 361

This course counts as an advanced system elective.

CS 458: Cyber Defense (Heydari)

This is a lab based course. We introduce several Cybersecurity tools and use around 12 labs to practice these tools on. All labs are done remotely from wherever you are. So you are not required to be on-campus to do your projects.

Prerequisite: CS 457

CS 470: Parallel and Distributed Systems (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 (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 four 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 for data confidentiality, secure electronic transactions, and digital privacy. Present-day cryptographic applications in our daily lives

include HTTPS, TLS, SSH, IPsec; Kerberos; wireless LAN encryption; blockchain, Bitcoin, Ethereum; Android/iPhone drive encryption; hard disk encryption such as BitLocker/TrueCrypt/FileVault; TOR; and encrypted malware.

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. 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). Future of cryptography in the quantum computing age, including quantum-resistant cryptography and quantum key exchange, will be discussed as well. This is a once-in-a-lifetime opportunity.

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

CS 482: Special Topics in Information Security – Security Seminar (Tjaden)

This course will be a seminar that will allow us to read and discuss some of the current research being done in the field of security. We will discuss network security, cloud security, intrusion detection, forensics, and many other topics. The course will be organized around in-class discussions. Each week there will be a number of research papers. Students will be responsible for thoroughly reading and understanding the papers assigned for a given week and participating in the in-class discussion of them. For each discussion, you will be divided into groups. Upon completion of this course, students should have an understanding of some of the open questions currently in the field of digital security as well as some of the approaches that are being pursued.

Prerequisite: CS 457

CS 488: Computer Graphics Applications (Johnson)

In CS 488, we will learn the core concepts of computer graphics: 3D model representation, transformations, lighting, and texturing. As we have time, we will discuss advanced topics like shadows, water, procedural noise, and skeletal animation. For programming assignments, students will write a set of interactive 3D programs and their own library of graphics routines, all written in JavaScript and WebGL. Students should expect a fair bit of applied mathematical discussion, with a focus on algebra, geometry, and trigonometry. The course will be online. Monday and Wednesday meetings will be synchronous lectures over Zoom, and Friday meetings will be cooperative lab exercises.

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

CS 497: Independent Study – Autonomous Vehicles for the Elderly, 3 credits (Sprague)

This is an independent-study research course focused on refining the JMU JACart autonomous taxi system and conducting experiments to improve its user interface. Enrollment will be limited to 4-7 computer science students and will be by permission of the instructor. Preference will be given to students who have experience with ROS programming, user interface design or other relevant skills. Contact Dr. Sprague for more information. If you would like to register for the course, send him an email describing your relevant experience (spragunr@jmu.edu).

Prerequisites: Permission of the instructor