

2022-23 Computer Science & Engineering Department

<u>Strong Values</u> STRONG WOMEN

FRESHMEN

Required Courses

Elective Courses

Computer Science Applications (.5 credit) Robotics: FIRST Tech Challenge Engineering (.5 credit)

SOPHOMORES

Computer Science Courses

Computer Languages: Web Development (.5 credit) Computer Languages: JAVA (.5 credit) **AP** Computer Science Principles (1 credit)

Engineering Courses

Robotics: FIRST Tech Challenge Engineering (.5 credit) **Principles of Engineering** Design(.5 credit) Engineering Methods (.5 credit)

Applied Courses

Digital Photography I (.5 credit)Technical Writing (.5 credit) Video Production (.5 credit)

JUNIORS

Computer Science Courses

Computer Languages: Web Development (.5 credit) Computer Languages: JAVA (.5 credit) **AP** Computer Science Principles (1 credit) AP Computer Science A (1 credit)

Engineering Courses

Robotics: FIRST Tech Challenge Engineering (.5 credit) Principles of Engineering Design Video Production (.5 credit) $(.5 \, credit)$ Engineering Methods (.5 credit) **Engineering and Design** Applications (1 credit)

Applied Courses

Digital Photography I (.5 credit)Technical Writing (.5 credit) ACP Digital Photography II (.5 credit)ACP Graphic Design (.5 credit)

SENIORS

Computer Science Courses

Computer Languages: Web Development (.5 credit) Computer Languages: JAVA (.5 credit) **AP** Computer Science Principles (1 credit) **AP** Computer Science A (1 credit)

Engineering Courses

Robotics: FIRST Tech Challenge Engineering (.5 credit) Principles of Engineering Design $(.5 \, credit)$ Engineering Methods (.5 credit) **Engineering and Design** Applications (1 credit)

Applied Courses

Digital Photography I $(.5 \, credit)$ Video Production (.5 credit) Technical Writing (.5 credit) ACP Digital Photography II (.5 credit)ACP Graphic Design $(.5 \, credit)$

GOAL STATEMENT

The goal of the Computer Science & Engineering Department is to provide our students with courses that develop the 21st century skills needed to be future ready in career pathways and college majors.

OBJECTIVES

- 1. Students will develop an understanding of computers, the design of computers, and computational processes.
- 2. Students will be able to demonstrate the processes needed for handling and manipulating information.
- 3. Students will be able to design and test solutions to problems in the world.
- 4. Students will be able to utilize computer technology and software that will increase their technical skills.
- 5. Students will be able to work collaboratively and communicate their findings with others.

REQUIREMENTS

One credit in CSE is required for graduation. All freshmen are required to take CSE Computer Science Applications, which earns .5 credit (unless they complete a skills survey and portfolio at admission and are determined to be capable of advancing to a higher level CSE course). Students may select any of the other CSE courses listed to fulfill the other .5 credit.

HONOR COURSE ELIGIBILITY POLICY

Registration for AP and ACP computer science courses requires students to meet specific grade requirements and prerequisites, as well as obtain departmental approval.

To be eligible for ACP courses, students must meet the criteria of the Dual Credit program through UMSL. Taking ACP credit for the courses are optional for the ACP courses. Taking the AP Exams are optional for the AP courses.

COMPUTER SCIENCE & ENGINEERING COURSE DESCRIPTIONS

COMPUTER SCIENCE COURSES

CSE COMPUTER SCIENCE APPLICATIONS

Grade 9

.5 credit

Semester course

This course is designed to expose students to the interdisciplinary nature of computer science in today's dynamic world. To create a foundation as a student at St. Joseph's Academy, students will be introduced to the school's learning management system, Canvas, and learn how to find class materials and upload assignments. Digital citizenship, media literacy, and the issues of safeguarding personal data and privacy will be highlighted and discussed. Students will be introduced to the basic computer science principles of creativity, abstract thinking, problem solving, analyzing data, coding, research skills, and reflection. Effective research skills will be developed in this course and a variety of digital tools will be used as students gather, analyze, and visually represent data using movies, infographics, and presentations. Basic coding skills will be developed through lessons from the code.org express course. Students will move on to Sphero robotic balls as they progress from block based code, and apply those skills to other projects focused on basic robotics programming. To build and foster a positive online community, students will use their knowledge of concepts of Digital Citizenship to create a blog, posting weekly reflections and comment on others' posts. Students will work independently and in collaborative teams on projects which develop these skills.

Prerequisite: none



CSE COMPUTER LANGUAGE: JAVA

Grade 10, 11, 12

CSE COMPUTER LANGUAGES: WEB DEVELOPMENT

Grade 10, 11, 12	.5 credit	Semester course
This class is currently virtual.		

Students will create web pages using HTML and Cascading Style Sheets (CSS). Students will also use a variety of web layouts, color, and formatting components important in web design. Students will manipulate and embed images and videos. Students will learn to validate their web pages to assure compliance with World Wide Web Consortium (W3C) standards. Prerequisite: none

.5 credit

Semester course

This class is currently virtual.

This course includes an introduction to structured programming and a basic understanding of Java syntax. Students will study the fundamental concepts of computer systems, procedures, functions, methods, repeat loops, logic statements, files, and arrays. Emphasis will be on problem-solving skills and variable tracing in completing selected programming assignments. Students will use NetBeans IDE software.

Prerequisite: A in Geometry or B+ in Honors Geometry

COMPUTER SCIENCE & ENGINEERING COURSE DESCRIPTIONS

COMPUTER SCIENCE COURSES

CSE AP COMPUTER SCIENCE PRINCIPLES

Grade 10, 11, 12 1 credit Year-long course

This class is currently virtual.

AP Computer Science Principles introduces students to the foundational concepts of computer science and explores the impact which computing and technology have on our society. With a unique focus on creative problem solving and real-world applications, this course gives students the opportunity to explore several important topics of computing using their own ideas and creativity, use the power of computing to create artifacts of personal value, and develop an interest in computer science that will foster further endeavors in the field. *Prerequisite: B+ in Geometry or B in Honors Geometry and departmental approval*



Year-long course

Taking the AP Exam, AP Computer Science Principles, is optional for this course.

CSE AP COMPUTER SCIENCE A

Grade 11, 12

This class is currently virtual.

Students will use the object-oriented paradigm of the Java programming language and mathematical principles to address important computer science topics of static and dynamic arrays, recursion, algorithm efficiency, elementary data structures, searching and sorting, and others. Students will be required to complete a significant amount of programming in the course and will practice for the AP Computer Science A exam.

1 credit

 $Prerequisite: {\it B+} or \ higher \ in \ Computer \ Languages: Java \ and \ departmental \ approval.$

Taking the AP exam, AP Computer Science A, is optional for this course.

COMPUTER SCIENCE & ENGINEERING COURSE DESCRIPTIONS

ENGINEERING COURSES

CSE ROBOTICS: FIRST TECH CHALLENGE ENGINEERING

Grade 9, 10, 11, 12

This course may be repeated for credit.

All students are welcome as members of the JoeBotics team. Those students wishing to earn credit for this graded course must register for the team when registering for the next year's classes. This project-based learning course integrates physics, math, coding, teamwork, creative problem solving, and the engineering design process in the building of a functional FTC Robot, which will compete in a number of qualifying events leading up to the State competition. In order to receive a grade of "Pass," students are expected to attend this course on Tuesdays after school for two hours, on two or three Saturday mornings per month, and every Saturday morning during the robotics season (September–March). Students are also expected to be present during competitions in which the team participates, and to work at the "Robos at Joe's" League meet held at SJA. The "Pass" grade will also be based on their participation, and demonstration of fundamental design, engineering, and computer programming skills needed in robotics. *Prerequisite: concurrent membership on the JoeBotics Team*

.5 credit (Pass/Fail)

CSE PRINCIPLES OF ENGINEERING DESIGN

Grade 10, 11, 12

This hands-on, project-based course allows students to explore the engineering design process while solving real-world problems. Students will work individually and in collaborative teams using their math and science skills while designing engineering products. They will be introduced to the wide variety of careers available in the field of engineering. They will develop their problem-solving skills along with those used for researching answers and techniques for documenting their progress, and communicating the results of their design testing. Through multiple projects that vary each semester, students will be introduced to electrical and hand tools, along with 3-D modeling software, to craft their products. This course will touch upon various branches of engineering, which may include aerospace, biomedical, civil, mechanical, and electrical. This course assumes no previous knowledge of engineering. *Prerequisite: Algebra I and Biology or freshmen with departmental approval*

.5 credit

CSE ENGINEERING METHODS

Grade 10, 11, 12

To keep up with the challenging demands and technical innovations in the world, students will benefit greatly from this course rooted in problem-based learning (PBL) and STEM/STEAM (Science, Technology, Engineering, Arts, and Math). Building these skills involves recognizing a need/identifying a problem, creating a solution, prototyping, testing, and redesigning. It also requires collaborating, and documenting procedures and solutions. In this mechanical and biomedical engineering-based course, students will experiment with CAD (computer-aided design) and create virtual models using Fusion 360 from Autodesk, SketchUp Make, and AutoCAD. Students will then render physical models through CAM (computer-aided manufacturing) employing processing software such as Vectric VCarve Desktop, for files used with CNC (Computer Numerical Control) machines. Students will utilize PrusaSlicer for files used with 3-D printers.

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Prerequisite: Geometry or Honors Geometry

Semester course

Year-long course

.5 credit

Semester course

COMPUTER SCIENCE & ENGINEERING COURSE DESCRIPTIONS

ENGINEERING COURSES

CSE ENGINEERING AND DESIGN APPLICATIONS

Grade 11, 12

This civil engineering-based course deals with real-world problems and how to tackle them. An understanding of math and science as applied to real systems will be developed. Critical thinking and problem solving skills will be emphasized in a STEM approach using an engineering design model through individual and group projects. Projects will include the application of algebra, trigonometry, and numerical analysis as related to topics in biology, chemistry, and physics. Students will be exposed to various activities that might include: site surveying, making proposals, working on permits, final design, and building. Engineering graphics and design software will be used when applicable. *Prerequisite: Algebra I, Geometry, and prior to concurrent enrollment in Physics*

I credit

APPLIED COURSES

CSE DIGITAL PHOTOGRAPHY I

Grade 10, 11, 12

May be taken for Computer Science & Engineering or Fine Arts credit, but not both. In this visual arts and applied computer science course, students will learn about and understand how to control the digital camera. They will begin to develop their photographic aesthetic as they explore a variety of subject matter, with an emphasis on composition. Students will learn about the historical development of photography and the camera. As they edit their photographs, they will learn to operate computer software, such as Adobe Photoshop.

Camera requirement: DSLR or Point and Shoot with manual capabilities. A limited number of school cameras are available to rent.

Prerequisite: none

CSE TECHNICAL WRITING

Grade 10, 11, 12

May be taken for Computer Science & Engineering credit or English credit, but not both.

Technical writing offers the skills and practices of writing in various workplace environments and professional communities. The main objective of this course is to introduce students to the "real-world" writing they will see in their future science, business, industry, or government fields. This course will address the importance of good writing and reaching an intended audience in professional disciplines where writing is not normally considered an important skill. Students will produce and analyze technical definitions, abstracts and summaries, mechanism descriptions, instructions, process analyses, technical reports, proposals, correspondence, and job procurement. Projects may include writing a step-by-step guide of a technical or science-based procedure, writing definitions for science jargon, writing letters, memos, or emails in regard to a technical problem, creating resumes and cover letters, and responding to a request for a business proposal. *Prerequisite: none*

Semester course

Semester course

Year-long course

.5 credit

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.5 credit

COMPUTER SCIENCE & ENGINEERING COURSE DESCRIPTIONS

APPLIED COURSES

CSE VIDEO PRODUCTION

Grade 10, 11, 12

May be taken for Business or Computer Science & Engineering credit, but not both.

This course introduces all three stages of creating a video: pre-production, production and shooting, and postproduction. Students will select and operate appropriate computer software and hardware to create the videos they envision. Students will break down the steps needed through planning their creations by writing scripts, developing shot lists and storyboards, while also learning how to manipulate film and technology to achieve their expected outcomes. Everyone will have the opportunity to experiment with various filming and audio hardware, including cameras, gimbals, microphones, audio recorders, and smartphones. Through using Adobe Premiere Pro, students will discover how to evaluate raw clips to create profession level video both collaboratively and independently. Students will produce a music video, how-to video, and a final St. Joe video.

.5 credit

Prerequisite: none

CSE ACP DIGITAL PHOTOGRAPHY II

Grade 11, 12

May be taken for Computer Science & Engineering credit or Fine Arts credit, but not both. In this course, students will move beyond the basic camera operations and photographic compositions introduced in Digital Photography I. This course will focus on students learning to communicate themes, messages, and ideas through their photography while using the skills learned in Digital Photography I. Students will employ advanced Adobe Photoshop techniques. Adobe Lightroom will be introduced as a method for RAW file editing and organization. The final assessment for this course will be a long-term photo project in which students create a final cohesive printed and digital portfolio utilizing Adobe InDesign. For this course, students must provide their own digital cameras along with other class specific supplies.

.5 credit

Prerequisite: 3.0 GPA, Digital Photography I, and instructor/departmental approval Students have the opportunity to earn 3 college credits for this semester course through UMSL: STUDIO ART 2260 Photography

CSE ACP GRAPHIC DESIGN

Grade 11, 12

May be taken for Computer Science & Engineering credit or Fine Arts credit, but not both. In this visual arts and applied computer science course, students will learn the role that graphic design plays in media, advertising, and design. They will rely on design theory and photographic skills as they are introduced to a variety of computer software applications, and tools such as Adobe Photoshop and Illustrator to develop projects. Students must provide their own digital cameras (or phone cameras) along with other class-specific supplies.

.5 credit

Prerequisite: 3.0 GPA, FA Design, and instructor/departmental approval Students have the opportunity to earn 3 college credits for this semester course through UMSL: STUDIO ART 2205 Graphic Design I

Semester course

Semester course

Semester course