

Computer Science & Engineering

Requirements:

One-half credit course in grades 9-12

Courses Offered in 2021-22

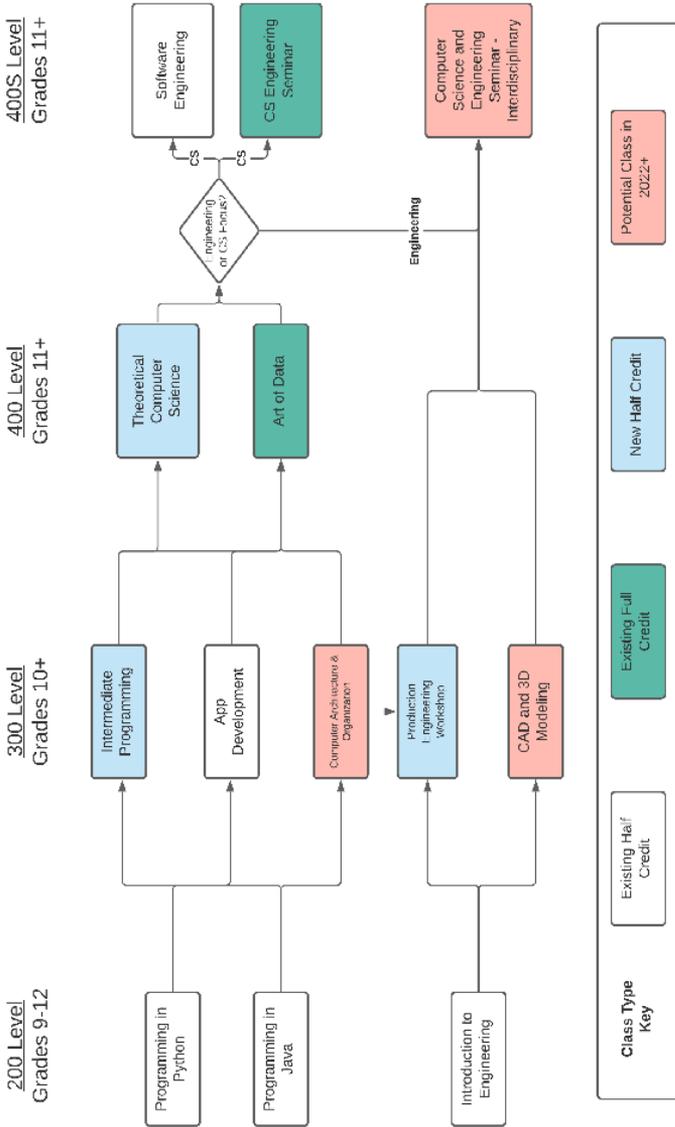
Half-credit courses

- Programming in Python (CMPE 210.01)
- Programming in Java (CMPE 210.02)
- Introduction to Engineering (CMPE 215)
- App Development (CMPE 310)
- Intermediate Programming (CMPE 320)
- Production Engineering Workshop (CMPE 325)
- Theoretical Computer Science (CMPE 410)
- Software Engineering (CMPE 430S)

Full-credit courses

- Art of Data (CMPE 411)
- Computer Science Seminar (CMPE 431S)

**Computer Science & Engineering
Course Offerings 2021-2022**



Computer Science & Engineering

At a time when technology in the modern world is rapidly evolving, the curriculum in the Department of Computer Science & Engineering fosters the technical proficiency that will enable our students to use and produce applications and solutions effectively. To this purpose, the sequence of courses is continuously adapted in accordance with current advances in technology, while building on historical best practices. The primary focus of the curriculum remains the development of skills and habits of thought that will enable our students to put forth theory and application in an effective, precise, and ethical manner. Students will be able to experience an introduction to the intellectual enterprises of computer science, the art of programming, and the processes of engineering.

The Department of Computer Science & Engineering offers a range of introductory and advanced opportunities in the field of computer technology and methodical thinking. These courses cover topics including programming, robotics and engineering.

Requirements:

One-half credit course in grades nine through twelve.

200-level courses:

CMPE 210.01 - Programming in Python

One-half credit, meets every other day

Prerequisites: None

In this introductory-level course, students will create computational artifacts using the programming language of Python. An artifact might be creating a computer program, designing a website or prototyping a new gadget. The student becomes the producer by studying the insides of the computer from hardware to software. Students will explore how they interact with technology including both the physical buttons and icons they press and the societal and ethical implications of their actions. Programming in Python takes students beyond being just users of technology, to becoming computer scientists. Topics will include exposure to programming principles, data representation, and engineering tasks through physical computing. This course is appropriate for students who have no previous programming experience. Students with some experience in Python are thus encouraged to also consider Programming in Java to provide exposure to a new programming language.

CMPR 210.02 - Programming in Java

One-half credit, meets every other day

Prerequisites: None

In this introductory-level course, students will create computational artifacts using the programming language of Java. An artifact might be creating a computer program, designing a website or prototyping a new gadget. The student becomes the producer by studying the insides of the computer from hardware to software. Students will explore how they interact with technology including both the physical buttons and icons they press and the societal and ethical implications of their actions. Programming in Java takes students beyond being just a user of technology, to becoming computer scientists. Topics will include exposure to programming principles, data representation, and engineering tasks through physical computing. This course is appropriate for students who have no previous programming experience. Students with some experience in Java are thus encouraged to also consider Programming in Python to provide exposure to a new programming language.

CMPE 215 - Introduction to Engineering

One-half credit, meets every other day

Prerequisites: None

This course encourages creativity and celebrates ingenious solutions to engineering and mechanical problems through the design and construction of purpose-built devices. Students in this course will learn the Engineering Design Process through project-based lessons and will then apply that knowledge in our Robotics Innovations Lab where they will research design, construct, and improve upon new and existing physical objects.

This course would be an appropriate entry point for a ninth grader interested in joining the robotics team. The team participates in regional and national competitions such as F.I.R.S.T. (For Inspiration and Recognition of Science and Technology). However, participation in the robotics teams is open to all students.

300-level courses:**CMPE 310 - App Development**

One-half credit, meets every other day

Prerequisites: 200-level Computer Science course

The App Development course will give students practical experience with the tools, techniques, and concepts needed to design and build basic apps from the ground up. This is a project-based course that will allow students to explore user-centered design strategies, consider ethical questions in software development, and dive deeper into programming fundamentals.

CMPE 320 - Intermediate Programming

One-half credit, meets every other day

Prerequisites: 200-level Computer Science course.

Intermediate Programming builds on foundational programming concepts covered in the introductory classes. This course prepares students to quickly and confidently translate their programming skills from one language to another. Students will also learn how to design and organize complex programming projects. Topics include using the terminal, object oriented programming techniques, functional programming techniques, and data structures. Readings explore the socio-political impacts of technology on the world. This course is taught in Scala.

CMPE 325 - Production Engineering Workshop

One-half credit, meets every other day

Prerequisites: Introduction to Engineering

Students will learn how to bring a *physical product to life*. From the drawing board to the customer's hands - how is a product successfully mass produced? In the Production Engineering Workshop, students will work together as a team to design a product to be manufactured entirely within our Robotics and Innovation Lab. Students will learn and then apply the theories of production, procurement, and design engineering to fabricate a product of their own development. From the ideation of the product, through the purchasing of materials, to the design, build and running of the assembly line, to the storage and distribution of product, students will execute all aspects of the Production Engineering process in this student-run course. This course is designed to engage a variety of students with interests ranging from engineering, design, and fabrication to entrepreneurship, business management, budgeting, and more.

400-level Full-credit courses:**CMPE 411 - Art of Data**

Full credit, meets 4 days/week

Prerequisites: A- or higher in Intermediate Programming or App Development

Art of Data prepares students to approach, investigate, and present their findings of data, with the understanding that it is not enough to look only at the numbers. This course teaches students how to use their computer science skills to interpret the many statistics and graphs they encounter in their everyday lives. Students learn not only how to answer questions with data, but also how to ask good questions. Readings about both historic and current events are assigned to explore the social impact of data, and students are tasked with thinking about strategies to tackle the many inequities

that data science perpetuates. Students finish this course with a comprehensive portfolio.

CMPE 431S - Computer Science Seminar

Full credit, meets 4 days/week

Prerequisites: A- or higher in Art of Data or Theoretical Computer Science and departmental approval.

The Computer Science and Engineering Seminar course is designed to provide students with the opportunity to engage with complex topics and apply them in practical applications. This course will emphasize the importance of the collaboration and combination of both the software and hardware components of any technological project. Students, no matter their interest, will complete the course with respect for both Software and Hardware, and a stronger understanding of how both work together to advance technology. The Computer Science topics will vary from year to year.

400 level Half-credit courses:

CMPE 410 - Theoretical Computer Science

One-half credit, meets every other day

Prerequisites: A- or higher in Intermediate Programming

Theoretical Computer Science provides students with an overview of the theoretical underpinnings of computer science, as well as the skills necessary to pursue further research on their own. This course focuses on how abstractions of real-world situations lead to algorithms and mathematical proofs of correctness and efficiency. Students gain a nuanced understanding of the questions “What is a computer, and what can it do?” through the study of theoretical models of computing. Readings provide insight into the image of computer science in broader contexts, including current events articles, science fiction, and research publications.

CMPE 430S - Software Engineering

One-half credit, meets every other day

Prerequisites: A- or higher in Art of Data or Theoretical Computer Science, and departmental approval.

Software Engineering immerses students in the process of creating software and highlights how the field is one that walks a fine line between the creative and scientific. Students engage in a series of projects that hone their ability to design, document, and test their code. These projects require students to work in teams, as they learn how to effectively communicate and delegate. Topics include user-centered design, version control systems, optimization techniques, and code review. This course is taught using multiple programming languages, and projects will vary from year to year.