

Computer Science Principles / Digital Electronics

Course Syllabus 2024-25

Mission Valley Regional Occupational Program

Maurice Brittain, Instructor

- **Contact Information**
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Welcome to the class!

I am so happy that you have chosen my class for this year! I look forward to getting to know you and the others in class! I hope to be able to expose you to the many opportunities that lie within these two professions and also to answer any questions you might have that may help you with future decisions!

Course Description

From smartphones to appliances, computer code, programs and digital circuits are all around us. This course provides a foundation for students who are interested in computer science, electrical engineering, electronics, or circuit design. Students study digital electronics topics such as, combinational and sequential logic and are exposed to circuit design tools used in industry, including logic gates, integrated circuits, and programmable logic devices. The Computer Science Principles coursework is intended to replicate an introductory college computing course. Students will hone their computational skills by analyzing, visualizing and drawing conclusions from trends in large data sets. Students are asked to think creatively to solve problems and analyze patterns using computer software, programming, and other technology. **Computer Science Principles** provides students with an opportunity to learn about many ideas central to computer science. Students will develop computational thinking skills necessary for success in many disciplines. The course also strives to teach students to be creative and to use the creative process to solve computational problems. Students will construct and implement solutions to complex problems similar to what computer scientists and engineers face. This course demonstrates the relevance of computer science by highlighting the importance of computing in society. Students will study computing machines and systems, but also investigate how computing has affected a wide variety of fields and examine the ethical implications of new technologies.

MVROP "SLO" SCHOOL LEARNING OUTCOMES

WORKPLACE BASIC SKILLS AND BEHAVIORS

- Apply skills learned in class
- Analyze information and make decisions
- Communicate verbally and in writing
- Work independently and as a team member in a diverse workplace
- Work reliably, responsibly, and ethically

CAREER TECHNICAL SKILLS

- Demonstrate occupational competencies
- Use appropriate technology
- Understand and practice occupational safety standards
- Demonstrate an awareness of how a business or industry functions

JOB EMPLOYMENT SKILLS

- Develop a plan to achieve career goals
- Use effective job search strategies
- Demonstrate an awareness of the importance of lifelong learning

What are these courses about?

Digital electronics, digital technology or digital (electronic) circuits are electronics that operate on digital signals. In contrast, analog circuits manipulate analog signals whose performance is more subject to manufacturing tolerance, signal attenuation and noise. Digital techniques are helpful because it is a lot easier to get an electronic device to switch into one of a number of known states than to accurately reproduce a continuous range of values. Digital electronic circuits are usually made from large assemblies of logic gates (often on printed circuit boards) simple electronic representations of Boolean logic functions.

For many students, Digital Electronics (DE) is the first exposure to digital circuit design in high school. Students may have learned about electricity and circuits in previous courses such as Principles of Engineering or Physics, but this course is unique in that the focus is on circuit design, not just understanding the scientific principles that make a circuit work.

Additionally students will be using Arduino and Raspberry Pi microcontrollers throughout the year.

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Essential Questions

- How can computing and the use of computational tools foster creative expression?
- How does abstraction help us in writing programs, creating computational artifacts, and solving problems?

- How can computational models and simulations help generate new understanding and knowledge?
- How can computation be employed to facilitate exploration and discovery when working with data?
- What opportunities do large data sets provide for solving problems and creating knowledge?
- How are algorithms implemented and executed on computers and computational devices?
- Why are some languages better than others when used to implement algorithms?
- How are programs developed to help people, organizations, or society solve problems?
- How are programs used for creative expression, to satisfy personal curiosity, or to create new knowledge?
- How does abstraction make the development of computer programs possible?
- Which mathematical and logical concepts are fundamental to computer programming?
- What is the Internet? How is it built? How does it function?
- How is cybersecurity impacting the ever-increasing number of Internet users?
- How does computing enhance human communication, interaction, and cognition?
- How does computing enable innovation?
- What are some potential beneficial and harmful effects of computing?

Units of Study

Unit 1: Foundations in Electronics

Lesson 1: Introduction to Electronics

Lesson 2: Introduction to Circuit Design

Unit 2: Combinational Logic

Lesson 1: AOI Combinational Logic Circuit Design

Lesson 2: Alternative Design: Universal Gates and K-Mapping

Lesson 3: Specific Combinational Logic Designs

Lesson 4: Introduction to Programmable Logic Devices (PLDs)

Unit 3: Sequential Logic

Lesson 1: Sequential Logic Circuit Design

Lesson 2: Asynchronous Counters

Lesson 3: Synchronous Counters

Unit 4: Controlling Real World Systems

Lesson 1: Introduction to State Machines

Introduction to Microcontrollers

Field Trips

Field trips are special opportunities for students to gain insights into subject matter and industries not available in the classroom. Students are expected to participate and field trip opportunities are graded. Students that cannot attend will be provided with an opportunity to make up points.

Ethics and Technology

In addition to the previously mentioned areas of focus, this class will emphasize the importance of ethical practices when working with technology. This is an important area, which deserves special attention, and will be woven throughout the framework of the course. The intention is to address each of the issues numerous times, touching on at least one issue per lesson, and use case studies and examples and discussion points. The ethical areas that the class will look at are:

- Responsible and Ethical Use
- Economic and Legal Implications
- Safety and Harassment
- Intellectual Property Rights

Grading

Will be determined by percentage of accumulated points, out of total available points.

Students Earned Points / Total Possible Points = Grade %

Numbers represent student grade in % with corresponding letter grade.

98 > A+	78 - 79 C+
94 - 97 A	74 - 77 C
90 - 93 A-	70 - 73 C-
88 - 89 B+	65 - 69 D
84 - 87 B	55 - 64 D-
80 - 83 B-	

Grades will be based on.

Homework / Classwork 70%

Tests / Exam / Quiz 20%

Daily Professionalism 10%

Daily Professionalism constitutes regular acceptable workplace behavior. This includes regular attendance, on time, and ready to work. When you are not present at school you miss out on lectures, presentations and collaborative activities that cannot be repeated for your convenience. When in class, demonstrating the correct behavior that is conducive to learning is very important. Conduct that would be considered inappropriate will cause daily employability to be zero (0). Course expectations are listed below.

Course Expectations

- Students will be required to work on programming both in class and at home. Students should either have their school R: drive, a google drive or usb flash drive for easy access to projects from anywhere.
- Respect: For each Other, me as your Teacher, and for the Academic and Professional environment we are here to get as much out of as possible.
- Effort: Always put forth your best.
- Learn: You may not get something immediately, some things you will understand with ease. I am here to help.
- Do not download anything onto the computers unless you are explicitly told to do so.
- **NO FOOD OR DRINK AROUND THE COMPUTERS or inside the Building!**
- Bathroom - Only 1 student may leave the classroom at a time. No Exceptions! Students will use the sign out sheet and hall pass when leaving the classroom for any reason. Minimize time out of the classroom.
- Cell Phones – Class is not the time or place to be using your cell phone for personal reasons.
- Watching videos, playing games, or other inappropriate use of computers during class time will not be tolerated.
- Plagiarism of any kind, including attempting to pass off someone else's code as your own will result in an automatic zero for the assignment and a referral. See Academic Integrity on the last page.
- Attendance is mandatory. Students who miss class for any reason are expected to make up missed work on their own time and will not earn daily work experience points.

Reporting absences

To excuse an absence a parent or guardian must either email me directly or **call MVROP 510.657.1865**. **Calling your home school does not get the message relayed to us.** I need to hear from the parent or guardian by 5:00 pm on the day of absence. You can reach me at my email: mbrittain@mvrop.org

Return to Instructor:

Computer Science Principles / Digital Electronics 2024

Instructor: Mr. Brittain

Email: mbrittain@mvrop.org

Contract Agreement:

By signing this document, you are agreeing to the policies/regulations listed in the Course Syllabus/Outline. You also state that you fully understand the policies and consequences.

Student Signature

Date

Print Student Name

Parent Signature

Date

Print Parent Signature

Parent Email