

Department: Science

Course Name: Digital Engineering

Course Description:

Students will learn about digital engineering in common and rapidly advancing technologies of digital sound, imaging, and computer networking. The course emphasizes a hands-on connection between computer programming and application of programming in the real world. Students will gain a working knowledge of the LabVIEW graphical programming language used by professional engineers for digital signal processing, control, monitoring, robotics, testing and simulation of dynamical systems. Students will learn the fundamental of mechatronics through experiments and project development with Arduino technology kits, which incorporate basic electronics circuit construction, sensors/motors/LEDs/LCD displays/etc., and C/C++ programming in the Arduino IDE. Prerequisite math Algebra-II or higher.

Content:

The World of Modern Engineering

Creating Digital Music

Making Digital Images

Math You Can See

Digitizing the World

Coding Information for Storage and Secrecy

Communicating with Ones and Zeros

Networks

The Big Picture of Engineering (Disciplines and Current trends)

Skills:

Collaborate with others*

Use advanced features of a scientific graphing calculator

Understand fundamentals of LabVIEW programing

Construct and program Lego Mindstorms NXT robots

Produce and analyze analog and digital sound effects with LabVIEW

Utilize digital signal processing and digital image processing hardware and software

Build, program, test, and debug Arduino UNO circuit board projects

(both TinkerCad virtual simulation*, and physical device construction with kit components)

Text and Materials:

Geoffrey C. Orsak et al., Engineering Our Digital Future (Pearson Prentice Hall, 2004)

Geoffrey C. Orsak et al., Infinity Project Lab Manual (PDF file)

Programming Electronics Academy (PEA) student training videos and example code

National Instruments (NI) LabVIEW training videos and example code

Student Edition of LabVIEW 8.2 home computer installation program

TinkerCad (free online account) Arduino simulator and 3D CAD modeling program

Google SketchUp (free online account) 3D CAD modeling program

Methods of Instruction:

Utilize a Learning management system for accessing content, assignments, and assignment submission

Discuss quarter project, topics, guidelines, resources, and examples

Real time (live) demonstrations

Internet videos and tutorials*
Laboratory experiments*
Lab partner project and lab collaboration*
LabVIEW lab exercises*
LabVIEW programming tutorials*
Theory class discussion
Test review

Methods of Evaluation:

Laboratory experiments comprehension
Laboratory experiments collaboration*
Procedure accountability
Data analysis comprehension
Classwork productivity
Tests
Quarter project presentations
Robot challenges
Class participation

*In response to COVID students are required to wear masks in the classroom. Some online assessments and virtual lab activities implemented during remote learning have been incorporated into new online and computer-based classroom activities. Washing of hands after every lab is enforced.

