**LELWD Engineering Dual Enrollment Program**

The Littleton Electric Light and Water Department has partnered with Littleton High School to create a dual enrollment program for Littleton High School students who are interested in pursuing college-level courses in the fields of engineering/technology or environmental sciences.

 The Dual Enrollment program provides opportunities for Littleton High School students to take college-level courses and earn credit toward their future college degrees. LELWD will cover the cost of the course as well as any books that the student may need.

**Requirements:**

* Littleton High School junior or senior student with a cumulative GPA of 3.0 or greater

**Process (To be completed in this order):**

* LHS student must submit a letter of recommendation from principal, guidance counselor or teacher to LELWD.
* LHS student to be interviewed by LELWD staff prior to being awarded.
* Once awarded the grant, LHS student must submit an application and high school transcripts with the Office of Undergraduate Admissions to the Dual Enrollment University.
* LHS student must provide a parental signature and a guidance counselor signature allowing them to take classes on campus.
* LHS Student must register and enroll in course. Students are limited to enrolling in 1000 and 2000 level courses in the fields of engineering/technology or environmental sciences.

**Deadlines:**

* LHS student to submit a letter of recommendation from principal, guidance counselor or teacher to LELWD prior to the following dates:
	+ - Fall Semester – April 1st
		- Spring Semester – October 1st
		- Summer Semester – February 1st
* LHS student will then be contacted by LELWD to set up an interview.
* Successful LHS students will then need to complete the appropriate applications required by the college by the appropriate deadlines.
* Upon being accepted by the Dual Enrollment University, LHS student then needs to register for classes by the Dual Enrollment University class registration deadlines.

**Possible Courses (UMass Lowell):**

**Electrical Engineering**

**For the most up-to-date course information please visit the following:**

<https://www.uml.edu/Catalog/Undergraduate/Engineering/Departments/Electrical-Computer-Engineering/Course-Listing.aspx>

**EECE.1070 Introduction to Electrical and Computer Engineering**

This course is divided into two parts in which students focus on core skills to help them thrive in electrical and computer engineering. The first half of the course focuses on application programming in Matlab where students learn basics of Programming, Digital Signal Processing, and Data Analysis. In the second part of the course students program a micro-controller and learn about the function of basic electronic components. Students learn to use basic test equipment such as an Oscilloscope, Function Generator and Volt Meter. This course is project and lab based.

**EECE.2010 Circuit Theory I**

Terminal characteristics of ideal elements, active and passive. Ohm's law and Kirchoff's laws. Introduction to network topology, independent variable, loop and nodal analysis with matrix methods. Definition and consequences of linearity. Superposition theorem. Concept of excitation and response. Passive equivalent circuits. Thevenin's and Norton's theorems. Ideal inductance and capacitance, volt-ampere characteristics, energy relations, graphical differentiation and integration. First order transients; initial conditions, natural response, and natural frequencies. Network response to unit step function and unit impulse. Second order transients: RLC circuits, natural frequencies and the complex-frequency s-plane. Pre-Requisite: 92.132 Calculus II with a grade of 'C' or better. Co-Requisite: 16.207 or 16.212 Basic EE Lab

**Prerequisites**

MATH 1320 Calculus ll, and ENGN/EECE 1070/1080 Introduction to Engineering l, and Co-req: EECE 2070 Basic Electrical Engineering Lab l, Grade of C or better in MATH 1320.

**EECE.2070 Basic Electrical Engineering Laboratory I**

Experimental work designed to verify theory and to acquaint students with electrical measurement techniques: experiments on meters, bridges, and oscilloscopes. Experiments are correlated with course 16.201 and concern: resistive measurements, Kirchhoff's laws, network theorems, conservation of power and maximum power transfer, inductance and capacitance, and first and second-order transients, operational amplifiers.

**Prerequisites**

Co-Req: EECE.2010 Circuit Theory I.

**EECE.2020 Circuit Theory II**

Discusses the sinusoidal forcing function, complex numbers, phasors, sinusoidal steady-state conditions, impedance, average real power, reactive power and rms values, exponential forcing function, poles and zeros in the s-plane, concept of the system function and its use in determining the forced response and resonance, reactance cancellation and concept of s-plane vectors. The course also covers Thevenin's and Norton's theorems, superposition, reciprocity, and maximum power in the frequency domain, impedance and admittance. Introduction to matrices and their use in circuit analysis, magnetic coupling, mutual inductance, and ideal transformer. Engineering Science (100%).

**Prerequisites**

Pre-Req: C- or better in EECE 2010 Circuit Theory I; Co-Req: EECE 2080 Basic EE Lab II.

**EECE.2080 Basic Electrical Engineering Lab II**

Presents experimental work designed to emphasize electrical measurement techniques of linear systems with time-varying signals. Waveform measurements with dc and ac meters as well as advanced use of the oscilloscope are also discussed. Experiments are integrated with course 16.202. Experiments cover: Kirchhoff's laws for phasors, bode plots, magnitude and phase measurements of impedance, network theorems, frequency response, resonance, inductance, maximum power transfer, and MATLAB techniques. Engineering Science (50%); Engineering Design (50%).

**Prerequisites**

Pre-Req: EECE 2070 Basic EE Lab I; Co-Req: EECE 2020 Circuit Theory II.

**EECE.2110 Fundamentals of Electricity I**

Serves as an introduction to direct current and alternating current analysis of electric circuits, with emphasis on energy and power. Covers design and use of multi-range voltmeters, ammeters, and ohmmeters, the use of bridges and oscilloscopes, phasor analysis of AC circuits, Trigonometric Fourier series, BODE plots, transformers, relays, solenoids, mechanical analogs and magnetic analogs with the application of Fourier and BODE techniques. Students will also be introduced to DC and AC motors and generators, residential circuits, equipment protection, and introduction to digital logic including minimization techniques. Availability and cost of instruments and components is stressed throughout this course. Not for EE majors. Engineering Science (100%).

**Prerequisites**

Pre-Req: MATH 1320 Calculus II with a grade of 'C' or better.

**EECE.2120 Fundamentals of Electricity**

Lab for 16.211 Fundamentals of Electricity. See course description for 16.211. Not for EE majors.

**Prerequisites**

Co-Req: EECE 2110 Fund of Electricity; Pre-Req: PHYS 1410 Physics I.

**Mechanical Engineering**

**MECH.1010 Kinetic Projects**

Kinetic Projects is a hybrid course designed for a variety of majors to explore the intersections between mechanical engineering and sculpture. In this project-driven class, students will learn principles and practice in both the fields of engineering and art, and put them into practice by creating functioning kinetic objects to be displayed in a public setting. The course will also include guest lectures from practitioners in Art and Engineering. The course also provides an introduction to technical communications, teamwork, data analysis, computer coding, and introduction to CAD prototyping, report-writing and/or oral presentation.

**MECH.1070 Introduction to Mechanical Engineering**

This course provides a hands-on introduction to mechanical engineering and the engineering design process. Through assignments and projects, students learn how to: identify a problem, develop alternative solutions, select the best alternative, make critical decisions, and work as a team. Lecture and lab component.

**MECH.2010 Computer Aided Design**

Course emphasis is on introducing the use of computer aided design tools in the engineering problem solving process. Assigned design projects require the use of both wire frame and solid modeling tools. Lecture and lab activities are used to support project requirements, and to provide more in-depth understanding of computer aided engineering design and drawing.

**Prerequisites**

Pre-Requisite Introduction to Engineering I MECH.1070 or ENGN.1070.

**MECH.2020 Manufacturing Laboratory**

This is an introductory course in manufacturing processes covering the basic machine tool practices utilized in the manufacturing of a product. The objective of the course is to develop a broad understanding of manufacturing operations and their relationship to engineering product design. Students manufacture, fabricate and measure the accuracy of a mechanical assembly from design drawings, using lathes, milling machines, drill presses and other conventional processes.

**Prerequisites**

Pre-Req: MECH.1070 Intro to Mechanical Engin or ENGN/EECE.1070.

**MECH.2420 Thermodynamics**

The first and second laws of thermodynamics are introduced and applied to the analysis of thermodynamic systems in terms of work, heat, energy transformation, and system efficiency. The use of tables, graphs, and equations of state is introduced to obtain various properties of pure substances. The concepts of work, heat and energy, as well as their relationships, are studied. The theory and application of reversible and irreversible thermodynamic process, Carnot cycles, and entropy are studied in relation to the energy analysis of engineering systems. Energy balances and ideal efficiencies of steady flow engineering systems are analyzed.

**Prerequisites**

Pre-Req: MATH 1320 Calc II or MATH 1420 Honors Calc II, or Calc A,B,C, and PHYS 2450 Physical Properties of Matter, and CHEM 1210 Chemistry I or CHEM 1350 Honors Chemistry I.

**Environmental Sciences**

**For the most up-to-date course information please visit the following:**

<https://www.uml.edu/Catalog/Undergraduate/Sciences/Departments/Environmental/Course-listing.aspx>

**ATMO.1200 The Nature of Science**

In this course students are introduced to the role of critical thinking in the development of scientific theories. Several major areas of science are explored with a focus on the link between conceptual thought and the resulting physical laws. The importance to society of scientists and citizens making informed decisions on science/technology issues are examined. Methods to gather and assess data are discussed and a number of examples of the use of scientific principles to prove fact or fraud are studied. The students will learn how to question propositions put before them.

**ATMO.1410 Weather and Climate**

Serves as a general meteorology course for the non-science major. Topics include: atmospheric composition, solar radiation, temperature, moisture and condensation relationship between air pressure and wind, weather patterns, severe weather, optical phenomena in the atmosphere, and the behavior and possible change of climate. This course satisfies the Gen Ed science requirement, but not specific science requirements for majors in the Division of Science.

**ATMO.1430L Weather and Climate Laboratory**

The laboratory encourages students to apply knowledge from the lectures to a variety of atmospheric and climatic phenomena developed from data analysis, experimentation, and maps. Synthesis and critical thinking are encouraged in the solution of problems.

**Prerequisites**

Co-req: 85.141 Weather & Climate.

**ENVI.1010 Environmental Science Seminar**

A survey of the field of environmental science, curriculum options, and career opportunities. Presentations by members of the department and guest speakers. This course is intended primarily for students majoring in the various options of environmental science. It does not satisfy specific science requirements for majors in the Division of Science. Meets Core Curriculum Essential Learning Outcome for Information Literacy (IL).

**ENVI.1020 Environmental Problems Seminar**

A survey of environmental problems and issues. Topics include air, water, and noise pollution; solid and liquid waste disposal; and the social, political, and economic implications of these issues. Readings, discussions, guest speakers, and field trips. This course is intended primarily for students majoring in the various options of environmental science. It does not satisfy specific science requirements for majors in the Division of Science.

**ENVI.1100 Global Environmental Studies**

This course investigates how human activities impact the earth's environment on a local, national, and global scale. Topics covered include the scientific method, population, fresh water resources, air and water pollution, climate change, energy, biodiversity, food security, solid waste management and sustainable living. As Lowell is often described as the birthplace of the industrial revolution, we will also examine the development, consequences, and cleanup in the context of Lowell MA. This course satisfies the required Breadth of Knowledge (BOK) STEM Perspective (Science, Technology, Engineering, & Mathematics) (STEM).

**Prerequisites**

Co-req: ENVI.1120L Global Environmental Studies Lab.

**ENVI.1120L Global Environmental Studies Lab**

This course investigates how human activities impact the earth's environment on a local, national, and global scale. Topics covered include the scientific method, population, fresh water resources, air and water pollution, climate change, energy, biodiversity, food security, solid waste management and sustainable living. As Lowell is often described as the birthplace of the industrial revolution, we will also examine the development, consequences, and cleanup in the context of Lowell, MA. This course satisfies the required Breadth of Knowledge (BOK) STEM Perspective (Science, Technology, Engineering, & Mathematics) (STEM).

**Prerequisites**

Co-req: ENVI.1100 Global Environmental Studies.

**ENVI.1110 Sustainable Solutions for People and the Planet**

This course explores some of the most challenging questions of our times: How can modern society thrive on a finite and changing planet? In what ways is our climate changing and what is causing those changes? How will human society be impacted: What could a transition to a sustainable, green, low-carbon economy consists of? We will explore these questions through a combination of simulations, serious games, and 'systems thinking' - building a skill set to think strategically about complex, dynamic problems. The course considers current events as they relate to climate change and sustainability and introduces students to real-world, interactive tools that allow them to explore scenarios and solutions for themselves.

**ENVI.1200 Principles of Environmental Science**

In this course, we will approach Environmental Science from an interdisciplinary viewpoint and use quantitative approaches to understand the physical, chemical, and biological environment and their interactions. A critical emphasis through this course will be on ecosystem services and how climate change, land use change, and pollution affect these. We will further review environmental law and policies and address concepts of sustainability and resource conservation.

**ENVI.2010 Earth Systems: Geosphere**

Earth Systems: Geosphere deals with the origin of the universe, solar systems and planet earth, the solid earth and processes at the earth's surface, geological hazards, coastal processes, deep sea sediments and the climate record, and contamination of water and soil.

**Prerequisites**

Co-req: ENVI.2030L Earth Systems: Geoscience Lab, and Kennedy College of Science majors only.

**ENVI.2030L Earth Systems: Geosphere Laboratory**

The Laboratory component Earth Systems: Geosphere requires the student to make measurements, analyze and plot data, draw conclusions from the data plots, characterize and identify earth materials, and interpret geospatial representations. These skills will follow lecture material and increase understanding through active learning.

**Prerequisites**

Co-req: ENVI.2010 Earth Systems: Geoscience, and Kennedy College of Science majors only.

**ENVI.2020 Earth Systems: Atmosphere and Oceans**

Earth Systems: Atmosphere and Oceans deals with the atmosphere, and oceans, as well as the important role they play within Earth's vital systems. These interactions will address atmospheric structure, processes, and pollution. It will also address ocean-atmosphere exchange, ocean structure, processes, pollution, and coastal and deep sea sedimentation processes.

**Prerequisites**

Co-req: ENVI.2040L Earth Systems Atmosphere and Oceans Lab, and Kennedy College of Science majors only.

**ENVI.2040L Earth Systems: Atmosphere and Oceans Laboratory**

Earth Systems: Atmosphere and Oceans Lab is designed to complement the lecture material from ENVI.2020 - Earth Systems Atmosphere and Oceans. This course, along with the other Earth Systems courses and corresponding labs use a systems-based approach for the topic of Earth and Environmental Science. This laboratory will concentrate on the Atmosphere and Oceanography.

**Prerequisites**

Co-req: ENVI.2020 Earth Systems: Atmosphere and Oceans, and Kennedy College of Science majors only.

**ENVI.2050 Earth Systems: Biosphere and Global Change**

Earth Systems: Biosphere and Global Change explores the origin and evolution of life on Earth, its history, and how life has interacted with Earth systems throughout its history. Students will become familiar with the biomes of the world, ecological processes within those biomes, the biological communities that inhabit them, and how ecological processes lead to evolution over time. Throughout the course, we will examine how human society interacts with the biosphere, including how global change is both generated by and responds to the interaction.

**Prerequisites**

Co-req: ENVI.2070L Earth Systems: Biosphere and Global Change Lab, and Kennedy College of Science majors only.

**ENVI.2070L Earth Systems: Biosphere and Global Change Lab**

This lab is designed to complement the lecture material from ENVI.2050 - Earth Systems: Biosphere and Global Change. This course, along with the other Earth Systems courses and corresponding labs use a systems-based approach for the topic of Earth and Environmental Science. This laboratory will concentrate of the Biosphere and Global Environmental Change.

**Prerequisites**

Co-req: ENVI.2050 Earth Systems: Biosphere and Global Change, and Kennedy College of Science majors only.

**GEOL.1010 General Geology**

Presents a study of the earth with emphasis on earth materials, earth structure (crustal and internal), earth history, and the development of life. Designed for the general student.

**Prerequisites**

Co-Req: 89.103 General Geology Lab.

**GEOL.1030L General Geology Laboratory**

Topics covered include rock and mineral identification; interpretation of topographic and geologic maps; earthquakes and rock deformation; ground water, streams, wind, and glaciers and the sculpting of the Earth's surface; and natural hazards and their impacts to humans.

**Prerequisites**

Co-Req: 89.101 General Geology.

**GEOL.1510 Earth and Life**

This course will trace the changes in both the Earth and a variety of organisms through an investigation of fossils, field sites, map interpretation, and basic earth science principles. The effects of physical change and geobiochemical processes on evolution will be stressed as will the effects of life on Earth. Students will gain an appreciation of the very special nature of the earth and its symbiont life forms when seen against the background of other planets.

**Prerequisites**

89.153 co-req

**GEOL.1530L Earth and Life Laboratory**

This laboratory will concentrate on the identification of fossils, discrimination of fossils from sedimentary structures, and interpretation of ancient environments from lithology, fossils, and maps. A field trip is required.

**Prerequisites**

89.151 co-req

**LELD Dual Enrollment Application**

Last Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ First Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date of Birth\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Current High School \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Grade Point Average (GPA)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (On a 4.0 scale)

Current Academic Year\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Desired Course and Major ­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Desired University \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Please attach a letter of recommendation from your principal, guidance counselor, or teacher.**