ENGR M33L: ENVIRONMENTAL ENGINEERING LAB

Originator
srelle

College
Moorpark College

Discipline (CB01A)
ENGR - Engineering

Course Number (CB01B)
M33L

Course Title (CB02)
Environmental Engineering Lab

Banner/Short Title
Environmental Engineering Lab

Credit Type
Credit

Start Term
Spring 2020

Catalog Course Description
Provides students with working knowledge of physical, chemical, and biological processes that control environmental pollution transport, transformation, and remediation. Explores various laboratory techniques in analytical chemistry and microbial biology related to identification and quantification of inorganic and organic contaminants present in soil, water, wastewater, and air samples.

Taxonomy of Programs (TOP) Code (CB03)
0924.00 - *Engineering Technology, General (requires Trigonometry)

Course Credit Status (CB04)
D (Credit - Degree Applicable)

Course Transfer Status (CB05) (select one only)
A (Transferable to both UC and CSU)

Course Basic Skills Status (CB08)
N - The Course is Not a Basic Skills Course

SAM Priority Code (CB09)
C - Clearly Occupational

Course Cooperative Work Experience Education Status (CB10)
N - Is Not Part of a Cooperative Work Experience Education Program

Course Classification Status (CB11)
Y - Credit Course

Educational Assistance Class Instruction (Approved Special Class) (CB13)
N - The Course is Not an Approved Special Class

Course Prior to Transfer Level (CB21)
Y - Not Applicable

Course Noncredit Category (CB22)
Y - Credit Course

Funding Agency Category (CB23)
Y - Not Applicable (Funding Not Used)

Course Program Status (CB24)
1 - Program Applicable

General Education Status (CB25)
Y - Not Applicable

Support Course Status (CB26)
N - Course is not a support course

Field trips
May be required

Faculty notes on field trips; include possible destinations or other pertinent information
Destinations may include water and wastewater treatment facilities, recycling plants, and government or private laboratories where environmental testing or air, water, and soil may take place.

Grading method
Letter Graded

Alternate grading methods
Student Option- Letter/Pass
Pass/No Pass Grading

Does this course require an instructional materials fee?
No

Repeatable for Credit
No

Units and Hours

Carnegie Unit Override
No

In-Class

Lecture

Activity

Laboratory
Minimum Contact/In-Class Laboratory Hours
52.5
Maximum Contact/In-Class Laboratory Hours
52.5

Total in-Class

Total in-Class
Total Minimum Contact/In-Class Hours
52.5
Total Maximum Contact/In-Class Hours
52.5

Outside-of-Class

Internship/Cooperative Work Experience

Paid

Unpaid

Total Outside-of-Class

Total Outside-of-Class

Total Student Learning

Total Student Learning

Total Minimum Student Learning Hours

52.5

Total Maximum Student Learning Hours

52.5

Minimum Units (CB07)

1

Maximum Units (CB06)

1

Prerequisites

ENGR M33 or Concurrent Enrollment

Entrance Skills

Prerequisite Course Objectives

ENGR M33-demonstrate an understanding of local and global environmental management issues and applicable federal, state, and local laws and standards.
ENGR M33-discuss and apply the relevant physical, chemical, and biological principles fundamental to the practice of environmental engineering as they relate to the management of soil, water, and air quality and solid and hazardous waste.
ENGR M33-discuss, analyze, and select a proper soil, water, and air pollution control method or waste management practice while considering impacts on human health and the environment.
ENGR M33-describe the main components of Environmental Impact Assessment (EIA).
ENGR M33-develop practical skills for sampling and characterization of soil, water, and air samples.

Requisite Justification

Requisite Type

Prerequisite

Requisite

ENGR M33

Requisite Description

Course in a sequence

Level of Scrutiny/Justification

Closely related lecture/laboratory course

Student Learning Outcomes (CSLOs)

	Upon satisfactory completion of the course, students will be able to:
1	demonstrate an understanding of the chemical reactions, and physical and microbial processes that govern soil, aquatic, and atmospheric environmental systems.
2	identify main inorganic and organic pollutants that affect water, soil, and air systems and their impacts on human health and ecological communities.
3	use standard testing methods and instruments to analyse and remediate polluted soil, water, and air.

Course Objectives

	Upon satisfactory completion of the course, students will be able to:
1	develop working knowledge of the various chemical reaction types such as acid-base, precipitation-dissolution, complexation, and redox reactions that govern the transformation of various contaminants in the environmental systems.
2	develop working knowledge and skills related to the analytical methods and instruments used for the identification and quantification of typical inorganic and organic pollutants present in soil, water, wastewater, and air samples.
3	develop working knowledge of the various microbiological tests that are used to enumerate total coliform, fecal coliform, and fecal streptococcus in water and wastewater.
4	conduct various qualitative and quantitative experiments while adhering to safety protocols; record observations, analyze data using graphical analysis and/or mathematical computations; and present results in informal and formal reports and presentations.

Course Content

Lecture/Course Content

Does not apply.

Laboratory or Activity Content

5% - Laboratory safety

50% - Laboratory techniques in analyzing contaminants present in soil, water, wastewater and air

- Selected experiments related to:
  - - pH and alkalinity
  - - Electrical conductivity and total dissolved solids
  - - Turbidity
  - - Hardness
  - - Specific ions and heavy metals such as nitrate, phosphate, chloride, lead, mercury, etc.
  - - Total fecal coliforms and Escherichia coli
  - - Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD), Dissolved Oxygen (DO)
  - - Soil sorption
  - - Optimum coagulant and flocculant dose
  - - Octanol water partition coefficient

10% - Introduction to chromatography and mass spectrometry

10% - Fundamentals of gravimetric, volumetric, spectrophotometric and electrochemical methods

10% - Introduction to basic instrumentation in the environmental engineering laboratory

15% - Data analysis and statistical evaluation of results

Methods of Evaluation

Which of these methods will students use to demonstrate proficiency in the subject matter of this course? (Check all that apply):

Problem solving exercises
Skills demonstrations
Written expression

Methods of Evaluation may include, but are not limited to, the following typical classroom assessment techniques/required assignments (check as many as are deemed appropriate):

Classroom Discussion
Group projects
Individual projects
Laboratory activities
Laboratory reports
Projects
Participation
Reports/Papers/Journals
Skills demonstrations

Instructional Methodology

Specify the methods of instruction that may be employed in this course

Class activities

Class discussions
Demonstrations
Field trips
Group discussions
Guest speakers
Instructor-guided interpretation and analysis
Instructor-guided use of technology
Laboratory activities

Describe specific examples of the methods the instructor will use:

For each lab activity the instructor will:

- explain the applicable theory and background information
- explain the use of technology and instrumentation as appropriate
- demonstrate the data collection and analysis techniques as appropriate

Representative Course Assignments

Writing Assignments

- Answer concept questions from the laboratory activity. An example would be: Define the terms pH, total dissolved solids, hardness and alkalinity and then explain how each of these parameters is measured analytically. Additionally, comment on their required or recommended limits as prescribed by primary and secondary drinking water standards.
- Prepare formal laboratory reports which conform to the requirements specified by the instructor using an appropriate technical writing style. An example would be: For the "Total Fecal Coliform Lab" include sample collection information (sample origin, sample amount, collection date, analysis date, and name of the person collecting the sample and analyzing the sample), a list of instruments used for sample collection and analysis, a description of standard operating procedures for sample collection and analysis, results, and a description of results.

Critical Thinking Assignments

- Analyze the data collected from a laboratory experiment, evaluate the experimental results, and determine whether or not the objectives of the experiment were met. An example would be: Perform an acid titration of acetic acid and plot the titration curve. From the titration curve obtain the dissociation constant of the acid. Determine whether or not the dissociation constant matches the value tabulated in the textbook. If not, provide some possible sources of error.
- Solve chemical equilibrium problems relevant to environmental engineering. An example would be: Calculate the maximum concentration of fluoride that a water treatment plant operator can add to a water containing 150 mg/L of calcium before precipitation of calcium fluoride occurs.

Reading Assignments

- Conduct library or Internet research to explore a different analytical method for identification and quantification of a particular environmental pollutant and write a summary of that new procedure. An example would be: Identify a new approach, other than the one used in the lab, for identifying the presence of lead ions in aquatic systems. Describe the experimental techniques and the instruments used for this analysis. Be sure to use American Chemical Society (ACS) citation style.
- Conduct library or Internet research to explore and analyze environmental pollution issues from an environmental engineering perspective. An example would be: It is well known that burning of fossil fuels to generate electricity accounts for the majority of atmospheric sulfur dioxide and nitrogen oxides which are the main causes of acid rain. Using your knowledge of gas-liquid equilibria and acid-base reactions, write chemical equations to describe the process of rain acidification. Additionally, elaborate on the effects of acid rain on the ecological communities of lakes and discuss the role of the lakes' alkalinity in this process.

Skills Demonstrations

- Demonstrate the use of chromatography to separate mixtures to remove the pollutant components using water remediation methods.
- Demonstrate the use of an spectrophotometry in analyzing bacterial contaminants in aquatic environments.

Outside Assignments

Articulation

Equivalent Courses at other CCCs

College	Course ID	Course Title	Units
No comparable courses			

District General Education

A. Natural Sciences

B. Social and Behavioral Sciences

C. Humanities

D. Language and Rationality

E. Health and Physical Education/Kinesiology

F. Ethnic Studies/Gender Studies

Course is CSU transferable
Yes

CSU Baccalaureate List effective term:
FALL 2020

CSU GE-Breadth

Area A: English Language Communication and Critical Thinking

Area B: Scientific Inquiry and Quantitative Reasoning

Area C: Arts and Humanities

Area D: Social Sciences

Area E: Lifelong Learning and Self-Development

CSU Graduation Requirement in U.S. History, Constitution and American Ideals:

UC TCA

UC TCA
Denied

Date Proposed:
10/7/2019

Date Denied:
7/5/2019

IGETC

Area 1: English Communication

Area 2A: Mathematical Concepts & Quantitative Reasoning

Area 3: Arts and Humanities

Area 4: Social and Behavioral Sciences

Area 5: Physical and Biological Sciences

Area 6: Languages Other than English (LOTE)

Textbooks and Lab Manuals

Resource Type
Manual

Description
Baranitharan, B. (2016). *Lab manual for environmental engineering ,volume 1,* (2nd ed.). CreateSpace.

Resource Type
Manual

Description
Rump, H. H. (2000). *Laboratory manual for the examination of water, waste water and soil*, (3rd ed.). Wiley-VCH.

Resource Type
Manual

Description
Balamurali, B. (2016). *Environmental engineering laboratory manual,* (2nd ed.). CreateSpace.

Library Resources

Assignments requiring library resources
Written and oral reports to accompany a laboratory activity or a laboratory project.

Sufficient Library Resources exist
Yes

Example of Assignments Requiring Library Resources
Research using the Library's print and online resources, to gather information and prepare a written and oral report on an environmental contaminant that threatens human health and ecological communities. Explore its origin, chemical properties, and the analytical methods used for its identification and quantification.

Primary Minimum Qualification
ENGINEERING

Review and Approval Dates

Department Chair
09/22/2019

Dean
09/26/2019

Technical Review
10/03/2019

Curriculum Committee
10/15/2019

DTRW-I
MM/DD/YYYY

Curriculum Committee
MM/DD/YYYY

Board
MM/DD/YYYY

CCCCO
MM/DD/YYYY

Control Number
CCC000598765

DOE/accreditation approval date
MM/DD/YYYY