

**I. CATALOG INFORMATION**

- A. Discipline: ENGINEERING
- B. Subject Code and Number: ENGR M33
- C. Course Title: Introduction to Environmental Engineering

## D. Credit Course units:

Units: 3

Lecture Hours per week: 3

Lab Hours per week : 0

Variable Units : No

## E. Student Learning Hours:

Lecture Hours:

Classroom hours: 52.5 - 52.5

Laboratory/Activity Hours:

Laboratory/Activity Hours 0 - 0**Total Combined Hours** in a 17.5 week term: 52.5 - 52.5

F. Non-Credit Course hours per week \_\_\_\_\_

G. May be taken a total of:  1  2  3  4 time(s) for credit

H. Is the course co-designated (same as) another course: No  Yes

If YES, designate course Subject Code & Number: \_\_\_\_\_

## I. Course Description:

Introduces local and global environmental pollution issues. Focuses on air, water, and soil pollution by identifying the various sources of contamination, examining the processes responsible for contaminant transformation and transportation, investigating the various methods of contaminant removal, and considering the effects of these contaminants on the health of humans and the ecosystems. Discusses and analyzes the relevant physical, chemical and biological principles responsible for all the aforementioned processes. Identifies and explains the applicable federal, state and local regulatory practices.

## J. Entrance Skills

\*Prerequisite: No  Yes  Course(s)  
\_\_\_\_\_

\*Corequisite: No  Yes  Course(s)  
\_\_\_\_\_

Limitation on Enrollment: No  Yes   
\_\_\_\_\_

Recommended Preparation: No  Yes  Course(s)  
CHEM M12 and MATH M03 or MATH M03B

Other: No  Yes

K. Other Catalog Information:

## II. COURSE OBJECTIVES

Upon successful completion of the course, a student will be able to:

		<b>Methods of evaluation will be consistent with, but not limited by, the following types or examples.</b>
1	demonstrate an understanding of local and global environmental management issues and applicable federal, state, and local laws and standards.	Homework Quizzes Exams Projects
2	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.	Homework Quizzes Exams Projects
3	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.	Homework Quizzes Exams Projects
4	describe the main components of Environmental Impact Assessment (EIA).	Homework Quizzes Exams Projects
5	develop practical skills for sampling and characterization of soil, water, and air samples.	Homework Quizzes Exams Projects

## III. COURSE CONTENT

Estimated %	Topic	Learning Outcomes
<b>Lecture</b> (must total 100%)		
5.00%	Overview of environmental engineering: - Objectives and principles - Evolution from a historical perspective - Introduction to main environmental legislation	1, 3

10.00%	Fundamentals of mass and energy: <ul style="list-style-type: none"> <li>- Law of Conservation of Mass</li> <li>- First Law of Thermodynamics (Law of Conservation of Energy)</li> <li>- Second Law of Thermodynamics (Entropy)</li> <li>- Implications of these laws on the principles of environmental engineering, waste and pollution control and clean-up</li> </ul>	2, 3
10.00%	Fundamentals of hydraulic engineering: <ul style="list-style-type: none"> <li>- Historical perspective</li> <li>- Hydrology: Groundwater, surface water, reservoirs</li> <li>- Open channel flow</li> <li>- Closed conduit flow</li> <li>- Hydraulic machinery: Pumps and turbines</li> </ul>	2, 3
10.00%	Water pollution: <ul style="list-style-type: none"> <li>- Classification of pollutants such as oxygen-demanding wastes, pathogens, nutrients, salts, heavy metals, pesticides, volatile organic compounds</li> <li>- Thermal pollution</li> <li>- Pollution of streams, lakes, and groundwater</li> </ul>	1, 2, 3, 5
10.00%	Water treatment processes: <ul style="list-style-type: none"> <li>- Coagulation and flocculation</li> <li>- Sedimentation and filtration</li> <li>- Disinfection</li> <li>- Controlling hardness and alkalinity</li> <li>- Softening</li> <li>- Understanding drinking water quality standards</li> </ul>	1, 2, 3, 5
10.00%	Wastewater treatment and disposal: <ul style="list-style-type: none"> <li>- Legislation and standards</li> <li>- Preliminary and primary treatment</li> <li>- Secondary (biological) treatment</li> <li>- Tertiary (advanced) treatment</li> <li>- Sludge management</li> </ul>	1, 2, 3, 5
5.00%	Introduction to municipal solid waste and hazardous waste characteristics and management practices	1, 2, 3
15.00%	Air pollution: <ul style="list-style-type: none"> <li>- Clean Air Act</li> <li>- Air quality and emission standards</li> <li>- Pollution sources</li> <li>- Main pollutants: Carbon monoxide, nitrogen oxides, sulfur oxides, photochemical smog, ozone, particulate matter</li> <li>- Atmospheric factors affecting air pollution</li> <li>- Indoor air pollution</li> </ul>	1, 2, 3, 5
10.00%	Environmental Impact Assessment studies and audits	1, 3, 4, 5
15.00%	Soil pollution: <ul style="list-style-type: none"> <li>- Sources of soil pollution</li> <li>- Classification of soil pollutants such as heavy metals and their salts, acid rain, and radionuclides</li> <li>- Transformation of soil pollutants</li> <li>- Remediation technologies: Physical, chemical, biological, thermal</li> </ul>	1, 2, 3, 5

#### IV. TYPICAL ASSIGNMENTS

##### A. Writing assignments

Writing assignments are required. Possible assignments may include, but are not limited to:

1 answer concept questions from lectures. A few examples would be: Why is groundwater contamination a particularly difficult problem to solve? What does the "10"

	in PM10 mean? Why are coagulants added during the advanced phase of water treatment?
2	write short essays for homework or on exams. An example would be: Summarize the main points of the Clean Air Act including its history, objectives, enforcement and compliance laws and regulations.
3	write a technical report on an environmental engineering issue. An example would be: Using the data management system GeoTracker, find a local gas station that has a leaking underground storage tank and write a technical report discussing the main pollutants released into the environment, their environmental hazards, and typical monitoring and remediation strategies that could be used to address the problem.

## B. Appropriate outside assignments

Appropriate outside assignments are required. Possible assignments may include, but are not limited to:	
1	conduct library and/or Internet research to gather information and prepare a group presentation on a topic related to environmental engineering. An example would be: In groups of 2 or 3 conduct a library or Internet search to investigate EPA's Superfund program. In your search investigate the program's history and objectives explaining the hazard ranking system and the national priority list. Additionally, utilize the data management system EnviroStor to investigate the three Superfund sites in California, describe the pollutants and the polluted media, pollutant sources, and the remedial action plans. Prepare a 10-15 min PowerPoint presentation of your findings to be presented in class.
2	participate in a field trip relevant to environmental engineering. An example would be: Visit a drinking water treatment or a municipal or industrial wastewater treatment facility and prepare a field trip report. Include in your report the name and address of the facility, the name and job title of the tour guide, a visual reference or a layout map of the facility, a list of pollutants present in the influent that need to be treated, and a description of the treatment methodology.
3	program a spreadsheet using Microsoft Excel to analyze an environmental pollution problem. An example would be: Use the Point-Source Gaussian Plume Model with Microsoft Excel to predict the concentration of pollutants at ground level at varying downwind distances from a smokestack that is releasing sulfur oxides into the atmosphere.

## C. Critical thinking assignments

Critical thinking assignments are required. Possible assignments may include, but are not limited to:	
1	evaluate environmental impacts of a proposed project or development: An example would be: List, analyze and discuss potential environmental impacts of the construction and operation of a new seawater desalination facility in Ventura County, taking into account inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse.
2	discuss, analyze, and select the proper treatment technology for a given environmental problem. An example would be: Compare and contrast the water treatment options to treat a municipal wastewater versus the ones required for wastewater in the oil industry. Consider in your analysis the differences in the physicochemical and biological characteristics of the pollutants for each wastewater type.
3	use engineering concepts and principles to answer mathematical problem-solving questions in homework or during exams. An example would be: Consider a lake with a volume of 10 million cubic meters of water that is fed by a stream with a flow rate of 5 cubic meters per second which has a pollution concentration equal to 10 mg/L. There is also a sewage outfall that discharges 0.5 cubic meters per second of sewage into the same lake. The sewage has a pollution concentration of 100 mg/L and a reaction rate

coefficient of 0.2/day. Assuming the pollution is completely mixed in the lake, and assuming no evaporation or other water losses or gains, find the steady-state concentration of the pollution in the lake.

## V. METHODS OF INSTRUCTION

Methods of instruction may include, but are not limited to:

- Distance Education – When any portion of class contact hours is replaced by distance education delivery mode (Complete DE Addendum, Section XV)
- Lecture/Discussion
- Laboratory/Activity
- Other (Specify)  
 Guest speakers from industry and academia will present on topics relevant to environmental engineering  
 Postings and discussions on the class website  
 Reading and analyzing research articles relevant to new pollution prevention and treatment technologies
- 
- Optional Field Trips
- Required Field Trips

## VI. METHODS OF EVALUATION

Methods of evaluation may include, but are not limited to:

- |  |   |   |
|--|---|---|
| <input checked="" type="checkbox"/> Essay Exam           | <input checked="" type="checkbox"/> Classroom Discussion    | <input type="checkbox"/> Skill Demonstration        |
| <input checked="" type="checkbox"/> Problem Solving Exam | <input checked="" type="checkbox"/> Reports/Papers/Journals | <input checked="" type="checkbox"/> Participation   |
| <input checked="" type="checkbox"/> Objective Exams      | <input checked="" type="checkbox"/> Projects                | <input checked="" type="checkbox"/> Other (specify) |

Oral presentations

Excel spreadsheet programming to analyze an environmental pollution problem and/or to synthesize a solution

## VII. REPRESENTATIVE TEXTS AND OTHER COURSE MATERIALS

Masters, Gilbert M., and Wendell P. Ela. Introduction to Environmental Engineering and Science. 3rd ed. Pearson, 2007.

Davis, Mackenzie L., and David Cornwell. Introduction to Environmental Engineering. 5th ed. McGraw-Hill, 2012.

Cooper, C. David. Introduction to Environmental Engineering. Waveland, 2014.

Masters, Gilbert M., and Wendell P. Ela . Introduction to Environmental Engineering and Science. 3rd ed. Pearson India, 2015.

Mihelcic, James R., and Julie Zimmerman. Environmental Engineering: Fundamentals, Sustainability, Design. 2nd ed. Wiley, 2014.

### VIII. STUDENT MATERIALS FEES

No  Yes

### IX. PARALLEL COURSES

College	Course Number	Course Title	Units
CSU Chico	CIVL 231	Introduction to Environmental Engineering	3
CSU LA	CE 2840	Environmental Engineering I	1

### X. MINIMUM QUALIFICATIONS

#### Courses Requiring a Masters Degree:

Master's degree in any field of engineering technology or engineering OR bachelor's degree in either of the above AND master's degree in physics, mathematics, computer science, biological science, or chemistry, OR bachelor's degree in industrial technology, engineering technology or engineering AND a professional engineer's license OR the equivalent (NOTE: A bachelor's degree in any field of engineering with a professional engineer's license is an alternative qualification for this discipline.)

### XI. ARTICULATION INFORMATION

#### A. Title V Course Classification:

1. This course is designed to be taken either:

- Pass/No Pass only (no letter grade possible); or  
 Letter grade (P/NP possible at student option)

2. Degree status:

Either  Associate Degree Applicable; or  Non-associate Degree Applicable

#### B. Moorpark College General Education:

1. Do you recommend this course for inclusion on the Associate Degree General Education list?

Yes:  No:  If YES, what section(s)?

- A1 - Natural Sciences - Biological Science  
 A2 - Natural Sciences - Physical Science  
 B1 - Social and Behavioral Sciences - American History/Institutions  
 B2 - Social and Behavioral Sciences - Other Social Behavioral Science  
 C1 - Humanities - Fine or Performing Arts  
 C2 - Humanities - Other Humanities  
 D1 - Language and Rationality - English Composition  
 D2 - Language and Rationality - Communication and Analytical Thinking  
 E1 - Health/Physical Education  
 E2 - PE or Dance  
 F - Ethnic/Gender Studies

#### C. California State University(CSU) Articulation:

1. Do you recommend this course for transfer credit to CSU? Yes:  No:

2. If YES do you recommend this course for inclusion on the CSU General Education list?

Yes:  No:  If YES, which area(s)?

- A1  A2  A3  B1  B2  B3  B4   
 C1  C2  D1  D2  D3  D4  D5   
 D6  D7  D8  D9  D10  E

D. University of California (UC) Articulation:

1. Do you recommend this course for transfer to the UC? Yes:  No:   
 2. If YES do you recommend this course for the Intersegmental General Education Transfer Curriculum (IGETC)? Yes:  No:

IGETC Area 1: English Communication

- English Composition  
 Critical Thinking-English Composition  
 Oral Communication

IGETC Area 2: Mathematical Concepts and Quantitative Reasoning

- Mathematical Concepts

IGETC Area 3: Arts and Humanities

- Arts  
 Humanities

IGETC Area 4: Social and Behavioral Sciences

- Anthropology and Archaeology  
 Economics  
 Ethnic Studies  
 Gender Studies  
 Geography  
 History  
 Interdisciplinary, Social & Behavioral Sciences  
 Political Science, Government & Legal Institutions  
 Psychology  
 Sociology & Criminology

IGETC Area 5: Physical and Biological Sciences (mark all that apply)

- Physical Science Lab or Physical Science Lab only (non-sequence)  
 Physical Science Lecture only (non-sequence)

- Biological Science
- Physical Science Courses
- Physical Science Lab or Biological Science Lab Only (non-sequence)
- Biological Science Courses
- Biological Science Lab course
- First Science course in a Special sequence
- Second Science course in a Special Sequence
- Laboratory Activity
- Physical Sciences

IGETC Area 6: Language other than English

- Languages other than English (UC Requirement Only)
- U.S. History, Constitution, and American Ideals (CSU Requirement ONLY)
- U.S. History, Constitution, and American Ideals (CSU Requirement ONLY)

**XII. REVIEW OF LIBRARY RESOURCES**

- A. What planned assignment(s) will require library resources and use?

The following assignments require 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.

- B. Are the currently held library resources sufficient to support the course assignment?

YES:  NO:

If NO, please list additional library resources needed to support this course.

**XIII. PREREQUISITE AND/OR COREQUISITE JUSTIFICATION**

ENGR M33: Not Applicable

**XIV. WORKPLACE PREPARATION**

Required for career technical courses only. A career technical course/program is one with the primary goal to prepare students for employment immediately upon course/program completion, and/or upgrading employment skills.

Detail how the course meets the Secretary of Labors Commission on the Achievement of Necessary Skills (SCANS) areas. (For a description of the competencies and skills with a listing of what students should be able to do, go to:

<http://www.ncrel.org/sdrs/areas/issues/methods/assment/as7scans.htm>)

The course will address the SCANS competency areas:

1. Resources: the students will learn to use, in an effective and efficient manner, the



various resources at their disposal to perform chemical analysis of certain contaminants of concern in our environment. Resources include, but are not limited to, technological resources, facilities resources, economic resources, and human resources.

2. **Interpersonal:** the students will work in groups of 2 or 3 to complete a variety of classroom, online, and as appropriate field activities while developing the necessary interpersonal skills to work professionally with engineers, clients, and government agencies.
3. **Information:** the students will use information gained from lectures, readings, and field activities to analyze chemical properties of certain environmental contaminants, and critically evaluate the results as they pertain to human health and ecological communities.
4. **Systems:** the students will understand their role as an environmental engineering technician, working with an environmental engineer, to chemically analyze environmental pollutants and maintain technical documents to ensure compliance with state and federal environmental regulations.
5. **Technology:** the students will use online resources to search and learn about the various contaminants in the environment and familiarize themselves with or review the various regulations that exist at the local, state, and federal levels regarding their effects on human health and the ecological communities.

The course also addresses the SCANS skills and personal qualities:

1. **Basic Skills:** the students will use reading, writing, listening, and speaking skills to complete the course assignments. Emphasis will be placed upon proper technical writing skills which will include filling out various regulatory forms and applications, proper usage of the technical vocabulary words relevant to contaminant identification and analysis, and proper usage of regulatory terms and acronyms.
2. **Thinking Skills:** the students will think creatively and critically to analyze physical, chemical, and biological properties of the environmental contaminants and synthesize reasonable and appropriate solutions for their identification and quantification taking into account laws and regulations in addition to acceptable chemical analysis techniques.
3. **Personal Qualities:** the students will follow the engineering code of ethics in completing all their assignments and in all their interactions with their peers, professors, industry guest speakers, and other individuals with whom they will interact on a professional basis during their field trips or site visits. This includes conducting themselves in a professional, responsible manner while exhibiting a strong work ethic and the highest standards of honesty and integrity.

## **XV. DISTANCE LEARNING COURSE OUTLINE ADDENDUM**

### 1. Mode of Delivery

- Online (course will be delivered 100% online)
- Online with onsite examinations (100% of the instruction will occur online, but examinations and an orientation will be scheduled onsite)
- Online/Hybrid (a percentage of instruction will be held online and the remaining percentage of instruction will be held onsite)

Lab activities will be conducted onsite

Televideo (Examinations and an orientation will be held onsite)

Teleconference

Other Live online discussions and chats to permit real time interaction with students (i.e. question and answer sessions). Students may be assigned to post answers and critiques of answers to case studies and discussion questions. Posting of group based assignments: Homework in quiz format and other electronically based assignments (lab simulations, interactive websites) in addition to any typical assignments an instructor may choose to require.

2. Need/Justification

Improve general student access.

3. Describe how instructors teaching this course will ensure regular, effective contact with and among students.

Students may participate in interactive online activities such as live online lectures (which allows sharing of powerpoint, desktops, free hand drawing, audio/video and chat) and/or live online chats (either as a class or as work groups).

Students may also engage in asynchronous communications such as discussion groups, posting written questions/assignments to message boards as well as direct communication with the instructor or fellow students via email.

4. Describe how instructors teaching this course will involve students in active learning.

Live online discussions and chats to permit real time interaction with students (i.e. question and answer sessions).

Students may be assigned to post answers and critiques of answers to case studies/discussion questions. Posting of group based assignments. Homework in quiz format and other electronically based assignments (lab simulations, interactive websites) in addition to any typical assignments an instructor may choose to require.

5. Explain how instructors teaching this course will provide multiple methods of content representation.

Live online lectures, recorded lectures, podcasts, posting of information (text, images, videos, music, textbook based assignments), links to relevant websites.

6. Describe how instructors teaching this course will evaluate student performance.

Onsite/online testing, exams, quizzes, posting of answers to case studies, discussion boards, homework assignments, research papers, course related projects, peer based grading of posted assignments.

**XVI. GENERAL EDUCATION COURSE OUTLINE ADDENDUM**

ENGR M33: Not Applicable

**XVII. STUDENT MATERIALS FEE ADDENDUM**

ENGR M33: Not Applicable

**XVIII. REPEATABILITY JUSTIFICATION TITLE 5, SECTION 55041**

ENGR M33: Not Applicable

**XIX. CURRICULUM APPROVAL**

Course Information:

Discipline: ENGINEERING

Discipline Code and Number: ENGR M33

Course Revision Category: New Course

Course Proposed By:

Originating Faculty Scarlet Relle 03/08/2018

Faculty Peer: Scarlet Relle 03/09/2018

Curriculum Rep: Scarlet Relle 03/09/2018

Department Chair: Erik Reese 03/12/2018

Division Dean: Mary Rees 04/04/2018

Approved By:

Curriculum Chair: Jerry Mansfield 09/26/2018

Executive Vice President: \_\_\_\_\_

Articulation Officer: Letrisha Mai 09/17/2018

Librarian: Mary LaBarge 09/15/2018

Implementation Term and Year: Fall 2019

Approval Dates:

Approved by Moorpark College Curriculum Committee: 10/02/2018

Approved by Board of Trustees (if applicable): 11/13/2018

Approved by State (if applicable): 11/29/2018