Course Description

An in-depth study of advanced pollution prevention practices with the preparation of a pollution prevention management plan. Emphasizes methodologies that achieve environmental compliance through less expensive pollution control methods.

Course Textbook


Course Learning Outcomes

Upon completion of this course, students should be able to:

1. Describe federal laws related to pollution prevention.
2. Conduct life cycle analyses.
3. Explain pollution prevention audits.
4. Evaluate economics of pollution prevention strategies.
5. Examine impact of corporate philosophy on pollution prevention.
6. Describe pollution prevention strategies for various industries.
7. Identify best available technologies for various industries.
8. Evaluate the impact of pollution prevention on ecosystems and biological communities.

Credits

Upon completion of this course, the students will earn three (3) hours of college credit.

Course Structure

1. **Study Guide**: Each unit contains a Study Guide that provides students with the learning outcomes, unit lesson, required reading assignments, and supplemental resources.
2. **Learning Outcomes**: Each unit contains Learning Outcomes that specify the measurable skills and knowledge students should gain upon completion of the unit.
3. **Unit Lesson**: Each unit contains a Unit Lesson, which discusses lesson material.
4. **Reading Assignments**: Each unit contains Reading Assignments from one or more chapters from the textbook.
5. **Suggested Reading**: Suggested Readings are listed in Units I-VI and Unit VIII study guides. Students are encouraged to read the resources listed if the opportunity arises, but they will not be tested on their knowledge of the Suggested Readings.
6. **Discussion Boards**: Discussion Boards are part of all CSU term courses. More information and specifications can be found in the Student Resources link listed in the Course Menu bar.
7. **Unit Assignments**: Students are required to submit for grading Unit Assignments in Units I-VIII. Specific information and instructions regarding these assignments are provided below. Grading rubrics are included with each assignment. Specific information about accessing these rubrics is provided below.
8. **Ask the Professor:** This communication forum provides you with an opportunity to ask your professor general or course content related questions.

9. **Student Break Room:** This communication forum allows for casual conversation with your classmates.

---

**CSU Online Library**

The CSU Online Library is available to support your courses and programs. The online library includes databases, journals, e-books, and research guides. These resources are always accessible and can be reached through the library webpage. To access the library, log into the myCSU Student Portal, and click on “CSU Online Library.” You can also access the CSU Online Library from the “My Library” button on the course menu for each course in Blackboard.

The CSU Online Library offers several reference services. E-mail (library@columbiasouthern.edu) and telephone (1.877.268.8046) assistance is available Monday – Thursday from 8 am to 5 pm and Friday from 8 am to 3 pm. The library’s chat reference service, *Ask a Librarian*, is available 24/7; look for the chat box on the online library page.

Librarians can help you develop your research plan or assist you in finding relevant, appropriate, and timely information. Reference requests can include customized keyword search strategies, links to articles, database help, and other services.

---

**Unit Assignments**

**Unit I Scholarly Activity**

Select two out of the three writing prompts listed below. Your responses to your two chosen prompts should be at least 500 words each. No title page is needed, but be sure to indicate which writing prompts you are addressing at the top of each response. Each response needs its own reference page.

Writing Prompts (respond to two only):

1. Explain the origin of the federal Pollution Prevention Act, including the year it was passed, events leading to its passage, by how wide of a vote it was passed, and which president signed it. Please use the CSU Online Library, the Internet, the textbook, and/or other resources to respond. Please cite and reference all sources used.

2. In Chapters 1 and 2 of the course textbook, Ashby (2013) discusses materials and energy. After studying the chapters, select four items total (materials and/or energy) where minimal cost pollution prevention efforts can provide the most gain in environmental benefit. Also, discuss which of the laws listed in the Unit I Lesson apply to your selections.

3. Address one of the five principles described on page 102 of the textbook. In your essay, include the date that the principle was initiated, events that led to the creation of the principle, the purpose of the principle, your thoughts about the usefulness of the principle, and any recent developments that occurred as a result of the principle.

You are required to use at least your textbook as source material for both of your responses. All sources used, including the textbook, must be referenced; paraphrased and quoted material must have accompanying citations.

Information about accessing the Blackboard Grading Rubric for this assignment is provided below.

**Unit II Scholarly Activity**

Select two out of the three writing prompts listed below. Your responses to your two chosen prompts should be at least 500 words each. No title page is needed, but be sure to indicate which writing prompts you are addressing at the top of each response. Each response needs its own reference page.

Writing Prompts (respond to two only):

1. Using the life cycle concepts discussed in Chapter 3, select a product, and describe its life cycle.
2. Imagine that you broke a compact disk (CD) that had music on it. Please respond to the following questions in paragraph form:

- How do you typically dispose of a broken CD?
- Does your community have a means of recycling CDs?
- Considering Figure 4.2 in the textbook, what infrastructure would be needed in your community in order to have the best end of life option, which is reuse? If reuse is not possible, discuss re-engineering, recycling, or combustion as options instead of disposal in a landfill.
- Research the materials that are in a CD. Considering Table 4.1, is recycling a possibility?

3. Imagine that you have a smart phone that has been crushed and is no longer usable. Please respond to the following questions in paragraph form:

- How would you typically dispose of a broken smart phone?
- Does your community have a means of recycling smart phones?
- Considering Figure 4.2 in the textbook, what infrastructure would be needed in your community in order to have the best end of life option, which is reuse? If reuse is not possible, discuss re-engineering, recycling, combustion as options instead of disposal in a landfill.
- Research the materials that are in a smart phone. Considering Table 4.1, is recycling a possibility?

You are required to use at least your textbook as source material for both of your responses. All sources used, including the textbook, must be referenced; paraphrased and quoted material must have accompanying citations.

Information about accessing the Blackboard Grading Rubric for this assignment is provided below.

Unit III Case Study

Select one of the products described in the eco-audit case study in Chapter 8 of your textbook (e.g., cups, grocery bags, electric kettle). Using the data in the textbook from the eco-audit, additional data from Chapter 15 (as necessary), and any additional resources that you find helpful, prepare a pollution prevention audit for the product that you have selected. Base your P2 audit on the steps shown in the Unit III Lesson.

You do not need to use all of the P2 audit steps shown in the Unit III Lesson, but use at least three major steps from each phase (a major step being Step 5 rather than Step 5.1). Since you will not be using all of the steps shown in the Unit Lesson, you may re-number them if you wish so that your audit proceeds sequentially without skipping numbers. Your audit should include an introductory paragraph explaining both the purpose of a P2 audit and the reasons for including the steps that you have selected.

Your case study must be at least two full pages in length. All sources used, including the textbook, must be referenced; paraphrased and quoted material must have accompanying citations. All references and citations used must be in APA style. The introduction should be formatted in paragraph form, and the steps can be formatted as a list.

Information about accessing the Blackboard Grading Rubric for this assignment is provided below.

Unit IV Scholarly Activity

Address all three of the following writing prompts. Your responses to your three chosen prompts should be at least 350 words each. No title page is needed, but be sure to indicate which writing prompts you are addressing at the top of each response. Each response needs its own reference page.

Writing Prompts (respond to all three):

1. Review the Reading Assignment titled as "Pollution Prevention Practices in Oregon's Electronics Industry" by Harding and Jones. In your review, include:
   - an overview of the article,
   - benefits of using pollution prevention in the electronics industry,
   - specific process modifications discussed in the article,
• chemical substitutions mentioned in the article,
• economics of making the suggested changes, and
• reasons companies might not embrace pollution prevention.

2. Review the Reading Assignment titled as "Optimal Deployment of Emissions Reduction Technologies for Construction Equipment" by Barl, Zietsman, Quadrifoglio, and Farzaneh. In your review:

• Write an overview of the article.
• Describe hydrogen enrichment (HE), selective catalytic reduction (SCR), and fuel additive (FA) technologies.
• Describe the advantages and disadvantages of HE, SCR, and FA, including a discussion of costs.
• Does the computer model do a satisfactory job of determining the best technology? Explain.
• What would be your recommendations as far as which technology (HE, SCR, and/or FA) should be used, or should none be used?

3. Review the Reading Assignment titled as "Flue Gas Desulfurization: The State of the Art" by Srivastava and Jozewicz. In your review:

• Write an overview of the article.
• Describe flue gas desulfurization (FGD) at coal-fired power plants and why it is used.
• Explain the details of one once-through process and one regenerable process.
• Summarize the section titled "The MEL [magnesium enhanced slurry] Cost Model."
• Discuss how the article is useful to a pollution prevention manager.
• Conduct an Internet search to explain the concept of Best Available Technology (BAT) and whether any of the FGD processes described in the article are considered BATs.

You are required to use at least your textbook as source material for all of your responses. All sources used, including the textbook, must be referenced; paraphrased and quoted material must have accompanying citations.

Information about accessing the Blackboard Grading Rubric for this assignment is provided below.

Unit V Essay

Please write an essay about pollution prevention in the dry cleaning and hydraulic fracturing industries. Include the following items:

1. one-paragraph introduction;
2. five-paragraph review of the Sinshelmer, Grout, Namkoong, Gottlieb, and Latif (2007) dry cleaning article, including an explanation of the common dry cleaning process using perchloroethylene (PCE), problems with PCE, and a review of options to PCE presented in the paper;
3. five-paragraph review (total—not five paragraphs for each article) of the Heywood (2012) article and the Chen, Al-Wadei, Kennedy, and Terry (2014) article on hydraulic fracturing, including environmental issues with hydraulic fracturing and the P2 solutions presented in each of the two articles (include the use of liquid carbon dioxide);
4. five-paragraph review of the Taylor, Carbonell, and Desimone (2010) article on using liquid carbon dioxide for P2, focusing on how liquid carbon dioxide can be used as a substitute in the dry cleaning industry and in the hydraulic fracturing industry; and a
5. two-paragraph summary to include your overall thoughts about P2 in the dry cleaning and hydraulic fracturing industries, and specifically whether liquid carbon dioxide is a reasonable, cost-effective, and environmentally-friendly alternative to traditional methods.

In order to access the resources below, you must first log into the myCSU Student Portal and access the Academic Search Complete database within the CSU Online Library.

Use at least the following references:


Your paper must be at least three full pages in length, not including the title page and reference page. All sources used, including the textbook, must be referenced; paraphrased and quoted material must have accompanying citations. All references and citations used must be in APA style.

Information about accessing the Blackboard Grading Rubric for this assignment is provided below.

**Unit VI Scholarly Activity**

Address both of the following writing prompts. Your responses to both of your chosen prompts should be at least 500 words each. No title page is needed, but be sure to indicate which writing prompts you are addressing at the top of each response. Each response needs its own reference page.

**Writing Prompts (respond to both):**

1. Review the Reading Assignment titled as "The Greening of a Pulp and Paper Mill" by Hill, Saviello, and Groves. In your review, describe:
   - the history of the Androscoggin Mill, including when it was built, the strike, number of employees, and amount of paper produced,
   - the kraft pulping process,
   - pollution problems prior to 1990,
   - P2 methods implemented after 1990, best available technologies, and economics, and
   - key actions by the 1990s management team that changed the mill from an environmental problem to an environmental success.

2. Review the Reading Assignment titled as "Greenhouse Gas Emissions Reduction Opportunities for Concrete Pavements" by Santero, Loojos, and Ochsendorf. In your review, describe:
   - greenhouse gas production from construction and operation of pavements,
   - how each of the following reduces greenhouse emissions: embodied emissions, albedo, carbonation, and vehicle fuel consumption,
   - the five greenhouse gas emissions strategies starting on page 861,
   - best available technologies related to concrete paving, and
   - the Life Cycle Cost Analysis (LCCA) presented in the article.

You are required to use at least your textbook as source material for both of your responses. All sources used, including the textbook, must be referenced; paraphrased and quoted material must have accompanying citations.

Information about accessing the Blackboard Grading Rubric for this assignment is provided below.

**Unit VII Scholarly Activity**

Address both of the following writing prompts. Your responses to both of your chosen prompts should be at least 500 words each. No title page is needed, but be sure to indicate which writing prompts you are addressing at the top of each response. Each response needs its own reference page.

**Writing Prompts (respond to both):**

1. Review the Reading Assignment titled as "Designing a Low-Cost Pollution Prevention Plan to Pay Off at the University of Houston" by Bialowas, Sullivan, and Schneller. In your review, describe:
   - why the university developed a P2 plan,
   - the process of bulking hazardous wastes, fume hood modifications, and cost savings,
silver recovery and cost savings, oil reclamation plan and cost savings, and your overall thoughts about the university's P2 program.

2. Review the Reading Assignment titled as "Effectiveness of State Pollution Prevention Programs and Policies" by Donna Harrington. In your review, describe:

- the three objectives of the study,
- the Toxic Releases Inventory (TRI) and its impact on P2,
- the empirical model (framework) used in the study,
- costs of P2 programs, and
- the article's conclusions and your thoughts about the conclusions.

You are required to use at least your textbook as source material for both of your responses. All sources used, including the textbook, must be referenced; paraphrased and quoted material must have accompanying citations.

Information about accessing the Blackboard Grading Rubric for this assignment is provided below.

Unit VIII Research Paper

Please write a research paper addressing the following:

How important is corporate philosophy to a company's pollution prevention efforts? Please use an example of one or more companies to support your position.

The completed assignment must be a minimum of 4-5 pages in length, not including the title page and reference page. The paper should have a minimum of three sections: an introduction, a body, and a conclusion. A minimum of three references should be used, and at least one of these must be from a scholarly, peer-reviewed journal. All sources used, including the textbook, must be referenced; paraphrased and quoted material must have accompanying citations. You may use articles cited in previous portions of the course but you must write new, unique content that was not in any of your previous submissions in this (or any other) course.

Information about accessing the Blackboard Grading Rubric for this assignment is provided below.

APA Guidelines

The application of the APA writing style shall be practical, functional, and appropriate to each academic level, with the primary purpose being the documentation (citation) of sources. CSU requires that students use APA style for certain papers and projects. Students should always carefully read and follow assignment directions and review the associated grading rubric when available. Students can find CSU’s Citation Guide by clicking here. This document includes examples and sample papers and provides information on how to contact the CSU Success Center.

Grading Rubrics

This course utilizes analytic grading rubrics as tools for your professor in assigning grades for all learning activities. Each rubric serves as a guide that communicates the expectations of the learning activity and describes the criteria for each level of achievement. In addition, a rubric is a reference tool that lists evaluation criteria and can help you organize your efforts to meet the requirements of that learning activity. It is imperative for you to familiarize yourself with these rubrics because these are the primary tools your professor uses for assessing learning activities.

Rubric categories include: (1) Discussion Board, (2) Assessment (Written Response), and (3) Assignment. However, it is possible that not all of the listed rubric types will be used in a single course (e.g., some courses may not have Assessments).

The Discussion Board rubric can be found within Unit I’s Discussion Board submission instructions.

The Assessment (Written Response) rubric can be found embedded in a link within the directions for each Unit Assessment. However, these rubrics will only be used when written-response questions appear within the Assessment.
Each Assignment type (e.g., article critique, case study, research paper) will have its own rubric. The Assignment rubrics are built into Blackboard, allowing students to review them prior to beginning the Assignment and again once the Assignment has been scored. This rubric can be accessed via the Assignment link located within the unit where it is to be submitted. Students may also access the rubric through the course menu by selecting “Tools” and then “My Grades.”

Again, it is vitally important for you to become familiar with these rubrics because their application to your Discussion Boards, Assessments, and Assignments is the method by which your instructor assigns all grades.

Communication Forums

These are non-graded discussion forums that allow you to communicate with your professor and other students. Participation in these discussion forums is encouraged, but not required. You can access these forums with the buttons in the Course Menu. Instructions for subscribing/unsubscribing to these forums are provided below.

Click here for instructions on how to subscribe/unsubscribe and post to the Communication Forums.

Ask the Professor

This communication forum provides you with an opportunity to ask your professor general or course content questions. Questions may focus on Blackboard locations of online course components, textbook or course content elaboration, additional guidance on assessment requirements, or general advice from other students.

Questions that are specific in nature, such as inquiries regarding assessment/assignment grades or personal accommodation requests, are NOT to be posted on this forum. If you have questions, comments, or concerns of a non-public nature, please feel free to email your professor. Responses to your post will be addressed or emailed by the professor within 48 hours.

Before posting, please ensure that you have read all relevant course documentation, including the syllabus, assessment/assignment instructions, faculty feedback, and other important information.

Student Break Room

This communication forum allows for casual conversation with your classmates. Communication on this forum should always maintain a standard of appropriateness and respect for your fellow classmates. This forum should NOT be used to share assessment answers.

Grading

<table>
<thead>
<tr>
<th>Assignment Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discussion Boards (8 @ 2%)</td>
<td>= 16%</td>
</tr>
<tr>
<td>Scholarly Activities (5 @ 9%)</td>
<td>= 45%</td>
</tr>
<tr>
<td>Unit III Case Study</td>
<td>= 12%</td>
</tr>
<tr>
<td>Unit V Essay</td>
<td>= 12%</td>
</tr>
<tr>
<td>Unit VIII Research Paper</td>
<td>= 15%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>= 100%</td>
</tr>
</tbody>
</table>

Course Schedule/Checklist (PLEASE PRINT)

The following pages contain a printable Course Schedule to assist you through this course. By following this schedule, you will be assured that you will complete the course within the time allotted.
### MEE 6201, Advanced Pollution Prevention

Course Schedule

By following this schedule, you will be assured that you will complete the course within the time allotted. Please keep this schedule for reference as you progress through your course.

<table>
<thead>
<tr>
<th>Unit I</th>
<th>Introduction to Pollution Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Review:</strong></td>
<td>Unit Study Guide</td>
</tr>
</tbody>
</table>
| **Read:** | Chapter 1: Introduction: material dependence  
| | Chapter 2: Resource consumption and its drivers  
| | Chapter 5: The long reach of legislation  
| | Additional Reading Assignment(s): See Study Guide  
| | Suggested Reading: See Study Guide |
| **Discuss:** | Discussion Board Response: Submit your response to the Discussion Board question by Saturday, 11:59 p.m (Central Time)  
| | Discussion Board Comment: Comment on another student’s Discussion Board response by Tuesday, 11:59 p.m (Central Time) |
| **Submit:** | Scholarly Activity by Tuesday, 11:59 p.m (Central Time) |

| Notes/Goals: |

<table>
<thead>
<tr>
<th>Unit II</th>
<th>Life Cycle Assessment as it Relates to Pollution Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Review:</strong></td>
<td>Unit Study Guide</td>
</tr>
</tbody>
</table>
| **Read:** | Chapter 3: The material life cycle  
| | Chapter 4: End of first life: a problem or a resource?  
| | Additional Reading Assignment(s): See Study Guide  
| | Suggested Reading: See Study Guide |
| **Discuss:** | Discussion Board Response: Submit your response to the Discussion Board question by Saturday, 11:59 p.m (Central Time)  
| | Discussion Board Comment: Comment on another student’s Discussion Board response by Tuesday, 11:59 p.m (Central Time) |
| **Submit:** | Scholarly Activity by Tuesday, 11:59 p.m (Central Time) |

<p>| Notes/Goals: |</p>
<table>
<thead>
<tr>
<th>Unit III</th>
<th>Pollution Prevention Audits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review:</td>
<td>□ Unit Study Guide</td>
</tr>
</tbody>
</table>
| Read:    | □ Chapter 7: Eco-audits and eco-audit tools  
           □ Chapter 8: Case studies: eco-audits  
           □ Additional Reading Assignment(s): See Study Guide  
           □ Suggested Reading: See Study Guide |
| Discuss: | □ Discussion Board Response: Submit your response to the Discussion Board question by Saturday, 11:59 p.m (Central Time)  
           □ Discussion Board Comment: Comment on another student’s Discussion Board response by Tuesday, 11:59 p.m (Central Time) |
| Submit:  | □ Case Study by Tuesday, 11:59 p.m (Central Time) |

| Notes/Goals: |

<table>
<thead>
<tr>
<th>Unit IV</th>
<th>Pollution Prevention in Specific Industries – Construction, Electronics, and Coal-Fired Power Plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review:</td>
<td>□ Unit Study Guide</td>
</tr>
</tbody>
</table>
| Read:   | □ Reading Assignment: See Study Guide  
           □ Suggested Reading: See Study Guide |
| Discuss:| □ Discussion Board Response: Submit your response to the Discussion Board question by Saturday, 11:59 p.m (Central Time)  
           □ Discussion Board Comment: Comment on another student’s Discussion Board response by Tuesday, 11:59 p.m (Central Time) |
| Submit: | □ Scholarly Activity by Tuesday, 11:59 p.m (Central Time)                                           |

| Notes/Goals: |

<table>
<thead>
<tr>
<th>Unit V</th>
<th>Pollution Prevention in Specific Industries – Dry Cleaning and Hydraulic Fracturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review:</td>
<td>□ Unit Study Guide</td>
</tr>
</tbody>
</table>
| Read:  | □ Reading Assignment: See Study Guide  
           □ Suggested Reading: See Study Guide |
| Discuss:| □ Discussion Board Response: Submit your response to the Discussion Board question by Saturday, 11:59 p.m (Central Time)  
           □ Discussion Board Comment: Comment on another student’s Discussion Board response by Tuesday, 11:59 p.m (Central Time) |
| Submit:| □ Essay by Tuesday, 11:59 p.m (Central Time)                                           |

| Notes/Goals: |
### Unit VI: Pollution Prevention in Specific Industries – Pulp and Paper Milling and Concrete Paving

- **Review:** Unit Study Guide
- **Read:**
  - Reading Assignment: See Study Guide
  - Suggested Reading: See Study Guide
- **Discuss:**
  - Discussion Board Response: Submit your response to the Discussion Board question by Saturday, 11:59 p.m. (Central Time)
  - Discussion Board Comment: Comment on another student’s Discussion Board response by Tuesday, 11:59 p.m. (Central Time)
- **Submit:** Scholarly Activity by Tuesday, 11:59 p.m. (Central Time)

### Unit VII: Pollution Prevention Economics

- **Review:** Unit Study Guide
- **Read:**
  - Reading Assignment: See Study Guide
- **Discuss:**
  - Discussion Board Response: Submit your response to the Discussion Board question by Saturday, 11:59 p.m. (Central Time)
  - Discussion Board Comment: Comment on another student’s Discussion Board response by Tuesday, 11:59 p.m. (Central Time)
- **Submit:** Scholarly Activity by Tuesday, 11:59 p.m. (Central Time)

### Unit VIII: Corporate Philosophy

- **Review:** Unit Study Guide
- **Read:**
  - Reading Assignment: See Study Guide
  - Suggested Reading: See Study Guide
- **Discuss:**
  - Discussion Board Response: Submit your response to the Discussion Board question by Saturday, 11:59 p.m. (Central Time)
  - Discussion Board Comment: Comment on another student’s Discussion Board response by Tuesday, 11:59 p.m. (Central Time)
- **Submit:** Research Paper by Tuesday, 11:59 p.m. (Central Time)