

ESC370
Industry Monitoring & Protection
3 Credits

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ESC370 Version: 11



Industry Monitoring & Protection

Calendar Description

This course examines the industrial processes, pollution control technologies and environmental impacts of major industrial activities found in Western Canada. Emphasis is placed on the physical, chemical and biological processes used to manage industrial processes and waste streams. Typical industries that may be examined include pulp production, petroleum extraction, oil refining and upgrading, petrochemicals, oilsands, mining, water treatment, intensive agricultural operations, and power production.

Rationale

This course is a core requirement for students in the Bachelor of Applied Science: Environmental Management degree. Most students focusing on a career in the monitoring and compliance sector are employed by government as a compliance inspector, or work with a consulting company or industry directly to monitor waste streams from the industrial facility. It is imperative the graduate from this degree stream have an understanding of the industrial processes and wastes produced in order to confidently carry out the tasks required in the field.

Prerequisites

None

Co-Requisites

None

Course Learning Outcomes

Upon successful completion of this course, student will be able to

1. explain and differentiate the importance of best management practice and the use of best available technology in industrial process and waste treatment technology.
2. explain and differentiate hazardous waste management practices required by any facility producing such wastes within the province of Alberta.
3. diagram and outline the main physical/chemical processes used to convert raw materials to useful end products for common industrial activities on the prairies

4. diagram and outline the main physical/chemical processes used to treat potable water and the regulatory standards for adequate treatment.
5. diagram and outline the processes producing waste streams (air, liquid, solid) within an industrial facility by reviewing government operating approvals.
6. explain and differentiate the pollution control technologies used by each industry to comply with emission/discharge standards and the requirements specified in their approval to address these emission/discharge standards for various waste media (air, wastewater, solid wastes).

Essential Employability Skills

Essential employability skills are critical for workplace success and lifelong learning. Lakeland College prepares its graduates for the workplace and lifelong learning by integrating and promoting essential employability skills development in its curricula. Each credit course offered at Lakeland College emphasizes one or more of the following five essential employability skills:

- A. **Communication Skills** that enable individuals to listen, interpret, express, and convey knowledge and ideas so that they are received and understood.
- B. **Teamwork Skills** that enable individuals to respect the thoughts and opinions of others as they work together to plan activities, meet deadlines, complete projects, and contribute to an organization's goals.
- C. **Critical Thinking Skills** that enable individuals to conceptualize and analyze issues from various perspectives while rationally evaluating the strengths and limitations of each perspective and deciding what action to take.
- D. **Adaptability Skills** that enable individuals to respond quickly, willingly, and positively to new conditions and changing times.
- E. **Positive Attitude and Behavioural Skills** that enable individuals to be confident about themselves and to deal with people, problems, and situations with honesty, integrity, and personal ethics.

Please refer to the Knowledge/Skills Matrix of this course outline to review the essential employability skills emphasized in this course.

Resource Materials

Required Text:

There is no required textbook for this course.

Reference Texts:

Guyer, Howard H. 1998. Industrial processes and waste stream management. Wiley & Sons, Inc., New York.

Metcalf and Eddy. 1991. Wastewater Engineering. 3rd ed.). McGraw–Hill, Inc., New York, N.Y.

Heumann, W.L. 1997. Industrial air pollution control systems. McGraw–Hill, Inc.,
New York, N.Y.

Shah, K.L. 2000. Basics of solid and hazardous waste management technology. Prentice
Hall, Columbus, Ohio.

Alberta Environment. 2001. Alberta users guide for waste managers. Publication No. T/611.

Conduct of Course

Lectures are supplemented by laboratory sessions consisting of field trips to various industrial facilities. Due to the traveling times involved, some trips may take more than the four hours allotted. Other activities may be conducted when possible and appropriate.

Evaluation Procedures

There are three to four non-cumulative exams. Lab reports and research papers may be assigned during the semester. Unless stated otherwise by the instructor, all lab assignments are due at the beginning of the class one week after they have been assigned. Late reports will be given a mark of zero.

The final mark consists of:

| Course Activity | Portion of Final Mark |
|-----------------|-----------------------|
| Lecture Exams | 70% |
| Lab Assignments | 30% |

Note that these weights may change slightly depending upon circumstances.

Attendance for laboratories is mandatory. To obtain credit for this course, all labs must be **attended** and all lab assignments must be **completed and handed in**. If you cannot make it to your respective lab session, please discuss it with the instructor beforehand to see if alternate arrangements can be made. If the absence is excused, the instructor may assign an alternative assignment.

Knowledge/Skills Matrix

Students apply and demonstrate their knowledge and skills to use

A. Communication Skills

| |
|---|
| A1. by listening, reading, interpreting information, and communicating effectively |
|---|

| |
|--|
| Evaluation(s)/Goal(s): Exams / Goals 1-6, Lab Assignments/Goals 1-6 |
|--|

A2. by using written, spoken, and/or visual formats and media to communicate and meet needs of each particular audience

Evaluation(s)/Goal(s): Exams / Goals 1-6, Lab Assignments/Goals 1-6

A3. by using libraries, Internet, technical publications, journals and other sources to find pertinent information

Evaluation(s)/Goal(s): Lab Assignments/Goals 1-6

B. Teamwork Skills

B1. by using interpersonal skills to create an atmosphere that maximizes the strengths of group members to accomplish tasks

Evaluation(s)/Goal(s): Lab Assignments/Goals 1-6

B2. by using interpersonal skills to resolve conflict, relate to others, and assist others

Evaluation(s)/Goal(s): Lab Assignments/Goals 1-6

B3. by contributing and listening to others as group determines realistic objectives, prioritizes tasks, and identifies resources and timelines

Evaluation(s)/Goal(s): Lab Assignments/Goals 1-6

B4. by treating other members of the group open-mindedly and fairly

Evaluation(s)/Goal(s): Lab Assignments/Goals 1-6

B5. by developing tactics/strategies to accomplish tasks

Evaluation(s)/Goal(s): Lab Assignments/Goals 1-6

C. Critical Thinking Skills

C1. by seeing critical thinking as a lifelong process of self-assessment

Evaluation(s)/Goal(s): Exams / Goals 1-6; Lab Assignments/Goals 1-6

C2. by examining problems closely

Evaluation(s)/Goal(s): Exams / Goals 1-6; Lab Assignments/Goals 1-6

C3. by examining beliefs, assumptions, and opinions, and weigh them against the facts

Evaluation(s)/Goal(s): Exams / Goals 1-6; Lab Assignments/Goals 1-6

C4. by seeking out the truth

Evaluation(s)/Goal(s): Exams / Goals 1-6; Lab Assignments/Goals 1-6

C5. by finding solutions; make decisions

Evaluation(s)/Goal(s): Exams / Goals 1-6; Lab Assignments/Goals 1-6

C6. by incorporating new ideas that may not necessarily agree with previous thought on the topic

Evaluation(s)/Goal(s): Exams / Goals 1-6; Lab Assignments/Goals 1-6

C7. by seeing connections between topics and use knowledge from other disciplines to enhance reading and learning experiences

Evaluation(s)/Goal(s): Exams / Goals 1-6; Lab Assignments/Goals 1-6

D. Adaptability Skills

D1. by working independently or as part of team

Evaluation(s)/Goal(s): Exams / Goals 1-6; Lab Assignments/Goals 1-6

D2. by carrying out multiple tasks or projects

Evaluation(s)/Goal(s): Exams / Goals 1-6; Lab Assignments/Goals 1-6

| |
|---|
| D3. by being innovative and resourceful: identify and suggest alternative ways to get the job done |
| Evaluation(s)/Goal(s): Exams / Goals 1-6; Lab Assignments/Goals 1-6 |
| D4. by being open and respond constructively to change and uncertainty |
| Evaluation(s)/Goal(s): Exams / Goals 1-6; Lab Assignments/Goals 1-6 |
| E. Positive Attitude and Behavioural Skills |
| E1. by dealing with people, problems, and situations with honesty, integrity, and personal ethics |
| Evaluation(s)/Goal(s): Exams / Goals 1-6; Lab Assignments/Goals 1-6 |
| E2. by showing interest, initiative, and effort |
| Evaluation(s)/Goal(s): Exams / Goals 1-6; Lab Assignments/Goals 1-6 |
| E3. by affirming the need for positive solutions and encourage positive interaction and feedback |
| Evaluation(s)/Goal(s): Exams / Goals 1-6; Lab Assignments/Goals 1-6 |
| E4. by balancing personal and family activities with job-related activities |
| Evaluation(s)/Goal(s): Lab Assignments/Goals 1-6 |

Grade Equivalents and Course Pass Requirements

A minimum grade of D (50%) (1.00) is required to pass this course.

| Letter | F | D | D+ | C- | C | C+ | B- | B | B+ | A- | A | A+ |
|---------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|
| Percent Range | 0-49 | 50-52 | 53-56 | 57-59 | 60-64 | 65-69 | 70-74 | 75-79 | 80-84 | 85-89 | 90-94 | 95-100 |
| Points | 0.00 | 1.00 | 1.30 | 1.70 | 2.00 | 2.30 | 2.70 | 3.00 | 3.30 | 3.70 | 4.00 | 4.00 |

Students must maintain a cumulative grade of C (GPA - Grade Point Average of 2.00) in order to qualify to graduate.

Attendance

Classroom and laboratory attendance is considered vital to the learning process and as significant to the students' evaluation as examinations and reports, therefore absenteeism is recorded.

- a. Students having a combination of excused and/or unexcused absence of 20 percent or higher for the scheduled course hours can be required to withdraw and would then automatically receive a "RW" (required withdrawal) for the course, regardless of any other evaluation results. (RW is a failing grade).
- b. An excused absence is one that is verified with your instructor. Verification should be prior to the absence or the next class day following the absence. Verification of the absence may take the form of a note from your doctor/College nurse regarding illness, or a note from another instructor regarding a field trip or other activity, or authorization by your instructor following an in-person meeting. Be sure to contact your instructor and ask what they will require from you as verification of each absence. An unexcused absence is anything NOT verified by the instructor prior to the absence or the next class day following the absence.

NOTE: Any exceptions to the above attendance policy (e.g. timetable conflicts, work-related issues) must be approved in writing by the Department Chair prior to the beginning of the course.

It is the students' responsibility to know their own absentee record.

Normal hours are 8:30 a.m. to 6:30 p.m., with potential for evening courses, exams or extended field trips. Students are expected to be available for classes during these times.

Course Units/Topics

Course and laboratory units are given below. The topics under each unit title are examples of what may be discussed during each unit. All attempts will be given for lecture materials to coincide with laboratory field trips. Considering this, the orders given for each topic and laboratory below is tentative; depending on availability facility tours for laboratory field trips.

Lecture Schedule

- 1. Introduction to Industrial Processes**
 - Generalized industrial processes
 - Environmental considerations
 - Best management practices
 - Risk considerations in process/product decision making
 - Government perspective - approvals, codes of practice and compliance tools

- 2. Hazardous Waste Management**
 - Define and characterize hazardous wastes
 - Hazardous waste classification
 - Overview of government regulatory responsibilities
 - Responsibilities of waste managers

- 3. Pulp and Paper**
 - Nature and components of wood and raw materials
 - Physical and chemical pulping processes
 - Environmental concerns

- 4. Upstream and Midstream Petroleum**
 - Rotary drilling systems and operations
 - Oil production and surface treatment
 - Upstream oil and gas surface facilities
 - Environmental concerns

5. Downstream Petroleum

- Composition, chemistry and quality of crude oil
- Refining processes - distillation, cracking, treatment, blending
- Environmental concerns

6. Petrochemicals production

- Ethylene glycol production
- Vinyl chloride production
- Styrene production
- Environmental concerns

7. Power Production

- Facility types
- General processes
- Environmental concerns

Laboratory Schedule:

Some laboratories encompass site visits to various industrial facilities within Alberta and Saskatchewan. Assignments include investigating regulations and approvals associated with industrial operations.



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