MINNESOTA WEST COMMUNITY & TECHNICAL COLLEGE
COURSE OUTLINE

Faculty is required to have the outline submitted to the Academic Affairs Office. The course outline is the form used for approval of new courses by the Academic Affairs and Standards Council.

DEPT.  RNEW                        COURSE NUMBER:  2120

NUMBER OF CREDITS:  2

COURSE TITLE:  Ethanol Separation Technology

CATALOG DESCRIPTION :
This course will cover the basic principles of ethanol distillation, evaporation and dehydration. Included will be an understanding of the operating components in a distillation system; demonstrable familiarity with startup, cleaning, operating, and shutdown procedures; and, the ability to interpret both normal and abnormal operating conditions. The evaporative process and its role in processing plants will also be covered as well as the theory of molecular sieve dehydration and how it is used in the ethanol process.

AUDIENCE  : Students seeking an A.A.S. degree or Certificate for ethanol production, incumbent workforce

FULFILLS MN TRANSFER CURRICULUM AREA(S) *(Leave blank if not applicable)*
Area: by meeting the following competencies:
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Area: by meeting the following competencies:

PREREQUISITES OR NECESSARY ENTRY SKILLS/KNOWLEDGE: RNEW 1101, Ethanol Process Fundamentals

LENGTH OF COURSE : 1 Semester

THIS COURSE IS USUALLY OFFERED:
Every other year □    fall □    spring X    summer □    undetermined □

Four goals are emphasized in course at Minnesota West Community & Technical College:

1) ACADEMIC CONTENT: The academic objectives of this course are:
   a. Understand the fundamental principles of batch and continuous distillation as it relates to ethanol processing
   b. Understand the fundamental principles of evaporation as it relates to ethanol processing
   c. Understand the fundamental principles of dehydration as it relates to ethanol processing
2) THINKING SKILLS: This course will help students improve the effectiveness of their thinking skills through:
   a. Identifying proper parameters for the distillation, dehydration, and evaporation of ethanol
   b. Become familiar with trouble shooting options for each step relating to ethanol separation
   c. Understand the difference between batch and continuous distillation principles
   d. Understand the process flow of an ethanol separation system

3) COMMUNICATIONS SKILLS: This course will help students improve their oral and written communication skills through:
   a. Completing section self assessments for each of the focus areas in the course
   b. Drawing the distillation, evaporation, and dehydration processes in a process flow diagram and explaining the processing steps that accompany the diagram

4) HUMAN DIVERSITY: This course will help students recognize, understand, and appreciate human diversity through:
   a. Working with a partner in an on-line format to evaluate drawings and descriptions of processing
   b. Participate in class discussion in an on-line format

TOPICS TO BE COVERED:
1. Chemical and physical characteristics of ethanol
2. Ethanol and water mixtures
3. Alcohol/Water vapor diagrams
4. True percent proof tables
5. Batch distillation
6. Continuous distillation
7. Beer column
8. Side stripper
9. Rectifier column
10. Fusel oils
11. Reflux condenser
12. Reflux ratio
13. Azeotropic distillation
14. Molecular sieve dehydration
15. Three-bed molecular sieve operation and troubleshooting
16. Evaporation principles
17. Falling film evaporators
18. Multiple effect evaporation
19. Centrifuge basics and operation

LIST OF EXPECTED COURSE OUTCOMES:
1. Students will become familiar with the terminology as it relates to ethanol separation technologies
2. Students will be able to identify proper parameters for the distillation, dehydration, and evaporation of ethanol
3. Students will become familiar with trouble shooting options for each step relating to ethanol separation
4. Students will understand the difference between batch and continuous distillation principles
5. Students will understand the process flow of an ethanol separation system

LEARNING/TEACHING TECHNIQUES used in the course are:
X Collaborative Learning   X Problem Solving
☐ Student Presentations   ☐ Interactive Lectures
☐ Creative Projects   ☐ Individual Coaching
X Lecture   ☐ Films/Videos/Slides
☐ Demonstrations   X Other (describe below)
☐ Lab   Participation in on-line discussions relating to ethanol separation

ASSIGNMENTS AND ASSESSMENTS FOR THIS CLASS INCLUDE:
X Reading   X Tests   X Individual Projects
☐ Oral Presentations   ☐ Worksheets   X Collaborative Projects
X Textbook Problems   ☐ Papers   ☐ Portfolio
X Group Problems   ☐ Term Paper
X Other (describe below)
  Reviewing on-line videos

EXPECTED STUDENT LEARNING OUTCOMES:
1. Students will become familiar with the terminology as it relates to ethanol separation technologies
2. Students will be able to identify proper parameters for the distillation, dehydration, and evaporation of ethanol
3. Students will become familiar with trouble shooting options for each step relating to ethanol separation
4. Students will understand the difference between batch and continuous distillation principles
5. Students will understand the process flow of an ethanol separation system

The information in this course outline is subject to revision

Veteran Services: Minnesota West is dedicated to assisting veterans and eligible family members in achieving their educational goals efficiently. Active duty and reserve/guard military members should advise their instructor of all regularly scheduled military appointments and duties that conflict with scheduled course requirements. Instructors will make every effort to work with the student to identify adjusted timelines. If you are a veteran, please contact the Minnesota West Veterans Service Office.

To receive reasonable accommodations for a documented disability, please contact the campus Student Services Advisor or campus Disability Coordinator as arrangements must be made in advance. In addition, students are encouraged to notify their instructor.

This document is available in alternative formats to individuals with disabilities by contacting the Student Services Advisor or by calling 800-658-2330 or Minnesota Relay Service at 800-627-3529 or by using your preferred relay service.

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