

**STATE UNIVERSITY OF NEW YORK !  
COLLEGE OF TECHNOLOGY !  
CANTON, NEW YORK !**



**MASTER SYLLABUS**

**COURSE NUMBER – COURSE NAME  
AREA 310 - BIOFUELS**

**Created by: Michael J. Newtown, P.E.**

**Updated by: Kibria Roman, Ph.D, P.E.**

**Canino School of Engineering Technology !**

**Department: Mechanical & Energy Technology !**

**Semester/Year: Fall/2018 !**

- A. **TITLE:** Biofuels
- B. **COURSE NUMBER:** AREA 310
- C. **CREDIT HOURS:** (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity)

# Credit Hours: 3  
# Lecture Hours: 3 per week  
# Lab Hours:        per week  
  Other:            per week

Course Length: 15 Weeks

- D. **WRITING INTENSIVE COURSE:** Yes  No

- E. **GER CATEGORY:** None:  Yes: GER !  
*If course satisfies more than one:* GER !

- F. **SEMESTER(S) OFFERED:** Fall  Spring  Fall & Spring

- G. **COURSE DESCRIPTION:**

This course covers alternative, renewable fuels derived from biological sources and their applications as an energy source for homes, industry and transportation. Wood, urban, and agricultural solid waste are discussed as potential sources of energy conversion. In addition, the production of methane and alcohol based fuels and their roles as a transportation fuel will lead to a re-discovery of opportunities to replace fossil-based fuels. Bio-diesel and vegetable oil topics are necessary to show a true alternate energy source for internal combustion engines. Throughout this course, students will examine both advantages and disadvantages of Biofuels as an energy source.

- H. **PRE-REQUISITES:** None  Yes  If yes, list below:

CHEM 101, Intro to Chemistry, Junior Status or permission of instructor

**CO-REQUISITES:** None  Yes  If yes, list below:

**I. STUDENT LEARNING OUTCOMES: (see key below)**

By the end of this course, the student will be able to:

<u>Course Student Learning Outcome</u> <i>[SLO]</i>	<u>Program Student Learning Outcome</u> <i>[PSLO]</i>	<u>GER</u> <i>[If Applicable]</i>	<u>ISLO &amp; SUBSETS</u>	
Describe the theory of operation of the different types of bio-fuels energy sources and how they produce energy.	SO #1 An appropriate mastery of the knowledge, techniques, and skills, and modern tools of their disciplines utilizing renewable energy systems and design parameters		2-Crit Think 5-Ind, Prof, Disc, Know Skills ISLO	CA Subsets Subsets Subsets
Analyze the positive and negative aspects of the various bio-fuels energy technologies	SO # 6 An ability to identify, analyze and solve technical problems.		2-Crit Think 5-Ind, Prof, Disc, Know Skills ISLO	CA Subsets Subsets Subsets
Explain the effects of Biofuels on the current world energy situation.	SO #10: A knowledge of the impact of engineering technology solutions in a societal and global context.		5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
Acquire specific bio-fuels energy information and conduct original research.	SO # 7 An ability to communicate effectively through written, oral, and graphic methods related to renewable energy systems.		1-Comm Skills 2-Crit Think ISLO	W IA Subsets Subsets
Demonstrate recommended applications of various commercially available bio-fuels energy technologies	SO # 6 An ability to identify, analyze and solve technical problems.		2-Crit Think ISLO ISLO	CA Subsets Subsets Subsets

<b>KEY</b>	<b><u>Institutional Student Learning Outcomes [ISLO 1 – 5]</u></b>
<b>ISLO #</b>	<b>ISLO &amp; Subsets</b>
<b>1</b>	<b>Communication Skills</b> Oral [O], Written [W]
<b>2</b>	<b>Critical Thinking</b> <i>Critical Analysis [CA], Inquiry &amp; Analysis [IA], Problem Solving [PS]</i>
<b>3</b>	<b>Foundational Skills</b> <i>Information Management [IM], Quantitative Lit./Reasoning [QTR]</i>
<b>4</b>	<b>Social Responsibility</b> <i>Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]</i>
<b>5</b>	<b>Industry, Professional, Discipline Specific Knowledge and Skills</b>

\*Include program objectives if applicable. Please consult with Program Coordinator !

J. **APPLIED LEARNING COMPONENT:** Yes  No

If YES, select one or more of the following categories:

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Classroom/Lab | <input type="checkbox"/> Civic Engagement              |
| <input type="checkbox"/> Internship               | <input type="checkbox"/> Creative Works/Senior Project |
| <input type="checkbox"/> Clinical Placement       | <input type="checkbox"/> Research                      |
| <input type="checkbox"/> Practicum                | <input type="checkbox"/> Entrepreneurship              |
| <input type="checkbox"/> Service Learning         | (program, class, project)                              |
| <input type="checkbox"/> Community Service        |  |

K. **TEXTS:**

21st Century Complete Guide to Biofuels and Bioenergy: Department of Energy Alternative Fuel Research, Agriculture Department Biofuel Research, Biomass, Biopower, Biodiesel, Ethanol, Methanol, Plant Material Products, Landfill Methane, Crop Residues (CDROM)

L. **REFERENCES:**

M. **EQUIPMENT:** None  Needed:

N. **GRADING METHOD:** A-F

O. **SUGGESTED MEASUREMENT CRITERIA/METHODS:**

Tests, Quizzes and Homework, Alternative Fuel Project, Oral Presentation/  
Demonstration

P. **DETAILED COURSE OUTLINE:**

**1. Wood**

- a. As heat sources
- b. In production of other energy types
- c. Regional Advantages/Disadvantages

**2. Urban, Agricultural and Industrial Wastes (solids)**

- a. Biomass and Energy Farms
- b. Farm Waste as an Energy Source
- c. Urban Waste as an Energy Source

**3. Methane, Ethane (gases)**

- a. Production of Methane
- b. Capture and recovery of methane and ethane
- c. Conversion to a useable energy source

**4. Alcohol Fuels (liquids)**

- a. Alcohol production methods

- b. Gasahol as a Motor Fuel
- c. MTBE and Ethanol's role in Reformulated Gasoline

**5. Bio-diesel/Vegetable Oil**

- a. Algae in Oil Production
- b. Crop maximization
- c. Other uses for waste products of Bio-diesel Production
- d. Bio-diesel Blending

**6. Biofuels Testing Methods**

- a. Compare/contrast to diesel fuel test methods

**7. Biofuels Marketing**

- a. Petroleum Industry Perspective on Biofuels
- b. Current Trends in Biofuels Use
- c. Development: government and industrial

**8. Brief Survey of Conventional Fuels**

- a. Oil, Natural Gas, Electric and Nuclear
- b. Sources
- c. Production
- d. Use Advantages and Disadvantages

Q. LABORATORY OUTLINE: None  Yes