

**Alternative Energy Technology Credential:
Associate in Applied Science in Biofuels
Technology
A20130**

This curriculum is designed to provide students with the educational foundation and technical skills necessary to obtain employment in the biofuels industry, or ability to create a new business dealing with biofuels.

Course work includes general education, alternative energy resource management, chemistry, industrial safety, and an array of coursework specific to all sectors of the biofuels industry.

Graduates should qualify for numerous positions within the industry. Employment opportunities include, but are not limited to, plant technician, plant manager, lab technician, sales manager, process coordinator, fuel purchaser, or business owner.

Course Requirements for Biofuels Technician Degree

A. General Education Courses		C-L-SHC
ENG 111	Expository Writing	3-0-3
ENG 111A	Expository Writing Lab	0-2-1
ENG 114	Professional Research & Reporting	3-0-3
MAT 140	Survey of Mathematics	3-0-3
	Humanities Elective	3-0-3
	Social Science Elective	<u>3-0-3</u>
(15hrs Required)	Total Gen Ed Hours	15-2-16

B. Required Major Core Courses

ALT 110	Biofuels I	3-0-3
ALT 120	Renewable Energy Technology	2-2-3
ALT 210	Biofuels II	3-2-4
ALT 211	Biofuels Analytics	2-4-4
ALT 230	Biofuels Waste Management	2-0-2

C. Other Required Hours

AGR 139	Intro to Sustainable Agriculture	3-0-3
CIS 110	Introduction to Computers	2-2-3
ELC 112	AC/DC Electronics	3-6-5
ISC 121	Environmental Health and Safety	3-0-3
MEC 130	Mechanisms	2-2-3
MNT 230	Pumps and Piping Systems	1-3-2
BUS 280	REAL Small Business	4-0-4
CHM 131	Intro to Chemistry	3-0-3
CHM 131A	Intro to Chemistry Lab	0-2-1
BPM 110	Bioprocessing Practices	3-4-5
CHM 132	Organic Chemistry	3-3-4
COE 111	Co-op Work Experience I	0-10-1
	or	
ALT 281	Biofuels Project Experience	0-6-2

(49hrs Required) Total Major/Core Hours 53-54

Total Required Credit Hours for Graduation: 69-70

Semester Curriculum for Biofuels Technology Degree

1st Semester (Fall)

ALT 110	Biofuels I	3-0-3
CIS 110	Introduction to Computers	2-2-3
ALT 120	Renewable Energy Technology	2-2-3
CHM 131	Intro to Chemistry	3-0-3
CHM 131A	Intro to Chemistry Lab	0-2-1
MAT 140	Survey of Mathematics	<u>3-0-3</u>
		13-6-16

2nd Semester (Spring)

ENG 111	Expository Writing	3-0-3
ENG 111A	Expository Writing Lab	0-2-1
CHM 132	Organic Chemistry	3-3-4
ALT 210	Biofuels II	3-2-4
BPM 110	Bioprocessing Practices	<u>3-4-5</u>
		12-11-17

3rd Semester (Summer)

COE 111	Co-op Work Experience I	0-10-1
	or	
ALT 281	Biofuels Project Experience	0- 6- 2

4th Semester (Fall)

ELC 112	AC/DC Electricity	3-6-5
ALT 211	Biofuels Analytics	2-4-4
AGR 139	Intro to Sustainable Agriculture	3-0-3
ISC 121	Environmental Health and Safety	3-0-3
----?-----	Humanities Elective	<u>3-0-3</u>
		14-10-18

5th Semester (Spring)

MEC 130	Mechanisms	2-2-3
MNT 230	Pumps and Piping Systems	1-3-2
ALT 230	Biofuels Waste Management	2-0-2
BUS 280	REAL Small Business	4-0-4
----?-----	Social Science Elective	3-0-3
ENG 114	Research and Reporting	<u>3-0-3</u>
		15-5-17

Total Semester Hours Credit: 69-70

Course Descriptions:

ALT 110 Biofuels I 3-0-3

Prerequisites: None

Corequisites: None

This course is designed to provide an introduction to the fundamentals of biobased fuels. Emphasis is placed on proper handling and use guidelines, basic chemistry of biofuels, production methods, and the social, environmental, and economic impacts of biofuels. Upon completion students should be able to demonstrate a general understanding of biofuels.

ALT 120 Renewable Energy Technology 2-2-3

Prerequisites: *None*

Corequisites: *None*

This course provides an introduction to multiple technologies that allow for the production and or conservation of energy from renewable sources. Topics will include hydro-electric, wind power, passive and active solar energy, tidal energy, appropriate building techniques, and energy conservation methods. Upon completion, students should be able to demonstrate an understanding of renewable energy production and its impact of humans and their environment.

ALT 210 Biofuels II 3-0-3

Prerequisites: *ALT 110*

Corequisites: *None*

This course provides an in-depth study of commercial biofuels production and various methods for manufacturing biofuels at a large scale. Topics include advanced production technologies, feedstock selection and pretreatment, quality control, energy balance, and biofuels business models. Upon completion students should possess a practical knowledge of commercial biofuels production and facility operation.

ALT 211 Biofuels Analytics 3-2-4

Prerequisites: *ALT 110*

Corequisites: *None*

This course is designed to address quality control management during all phases of the biofuels production process. Topics include feedstock analysis, in-process quality monitoring, and standards compliance with national and international biofuels specifications. Upon completion, students should be able to demonstrate safe and accurate laboratory practices as well as an understanding of various quality control techniques.

ALT 230 Biofuels Waste Management 2-0-2

Prerequisites: *ALT 110*

Corequisites: *None*

This course is designed to address the issues of sustainability and environmental stewardship involved with the production and use of biofuels. Topics include the sustainable production of feedstocks, efficient and low energy methods of fuel production, and management of biofuels sidestreams. Upon completion, students should be able to identify and mediate environmental impacts of biofuels and understand the importance of producing biofuels using sustainable practices.

ALT 281 Biofuels Project Experience 0-6-2

Prerequisites: *ALT 110, ALT 120, and ALT 210*

Corequisites: *None*

This course provides an opportunity to pursue an individual project in biofuels. Emphasis is placed on developing, performing, and maintaining records of a project in a specific area of interest. Upon completion, students should be able to complete the project with accurate records and demonstrate an understanding of the process.

AGR 139 Intro to Sustainable Ag 3-0-3

Prerequisites: *None*

Corequisites: *None*

This course will provide students with a clear perspective on the principles, history and practices of sustainable agriculture in our local and global communities. Students will be introduced to the economic, environmental and social impacts of agriculture. Upon completion, students should be able to identify the principles of sustainable agriculture as they relate to basic production practices.

BPM 110 Bioprocess Practices 3-4-5

Prerequisites: *None*

Corequisites: *None*

This course provides a study of plant operations including various plant utility systems and detailed study of the varied plant environments in a bioprocessing facility. Emphasis is placed on quality mindset and principles of validation through applications of monitoring procedures. Upon completion, students should be able to demonstrate the rigors of industry regulation and its necessity.

BUS 280 REAL Small Business 4-0-4

Prerequisites: *None*

Corequisites: *None*

This course introduces hands-on techniques and procedures for planning and opening a small business, including the personal qualities needed for entrepreneurship. Emphasis is placed on market research, finance, time management, and day-to-day activities of owning/operating a small business. Upon completion, students should be able to write and implement a viable business plan and seek funding.

CHM 131 Introduction to Chemistry 3-0-3

Prerequisites: *None*

Corequisites: *None*

This course introduces the fundamental concepts of inorganic chemistry. Topics include measurement, matter and energy, atomic and molecular structure, nuclear chemistry, stoichiometry, chemical formulas and reactions, chemical bonding, gas laws, solutions, and acids and bases. Upon completion, students should be able to demonstrate a basic understanding of chemistry as it applies to other fields.

CHM 131A Introduction to Chemistry Lab 0-2-1

Prerequisites: *None*

Corequisites: *CHM 131*

This course is a laboratory to accompany CHM 131. Emphasis is placed on laboratory experiences that enhance materials presented in CHM 131. Upon completion, students should be able to utilize basic laboratory procedures and apply them to chemical principles presented in CHM 131.

CHM 132 Organic and Biochemistry 3-3-4

Prerequisites: CHM 131 and CHM 131A or CHM 151

Corequisites: None

This course provides a survey of major functional classes of compounds in organic and biochemistry. Topics include structure, properties, and reactions of the major organic and biological molecules and basic principles of metabolism. Upon completion, students should be able to demonstrate an understanding of fundamental chemical concepts needed to pursue studies in related professional fields.

CIS 110 Introduction to Computers 2-2-3

Prerequisites: None

Corequisites: None

This course introduces computer concepts, including fundamental functions and operations of the computer. Topics include identification of hardware components, basic computer operations, security issues, and use of software applications. Upon completion, students should be able to demonstrate an understanding of the role and function of computers and use the computer to solve problems.

COE 111 Co-op Work Experience I 0-10-1

Prerequisites: None

Corequisites: None

This course provides work experience with a college-approved employer in an area related to the student's program of study. Emphasis is placed on integrating classroom learning with related work experience. Upon completion, students should be able to evaluate career selection, demonstrate employability skills, and satisfactorily perform work-related competencies.

ENG 111 Expository Writing 3-0-3

Prerequisites: None

Corequisites: None

This course is the required first course in a series of two designed to develop the ability to produce clear expository prose. Emphasis is placed on the writing process including audience analysis, topic selection, thesis support and development, editing, and revision. Upon completion, students should be able to produce unified, coherent, well-developed essays using standard written English.

ELC 112 DC/AC Electricity 3-6-5

Prerequisites: None

Corequisites: None

This course introduces the fundamental concepts of and computations related to DC/AC electricity. Emphasis is placed on DC/AC circuits, components, operation of test equipment; and other related topics. Upon completion, students should be able to construct, verify, troubleshoot, and repair DC/AC circuits.

ENG 111A Expository Writing Lab 0-2-1

Prerequisites: None

Corequisites: None

This writing laboratory is designed to apply the skills introduced in ENG 111. Emphasis is placed on the editing and revision components of the writing process. Upon

completion, students should be able to apply those skills in the production of final drafts in ENG 111.

ENG 114 Prof Research & Reporting 3-0-3

Prerequisites: ENG 111

Corequisites: None

This course, the second in a series of two, is designed to teach professional communication skills. Emphasis is placed on research, listening, critical reading and thinking, analysis, interpretation, and design used in oral and written presentations. Upon completion, students should be able to work individually and collaboratively to produce well-designed business and professional written and oral presentations

ISC 121 Envir Health & Safety 3-0-3

Prerequisites: None

Corequisites: None

This course covers workplace environmental health and safety concepts. Emphasis is placed on managing the implementation and enforcement of environmental health and safety regulations and on preventing accidents, injuries, and illnesses. Upon completion, students should be able to demonstrate an understanding of basic concepts of environmental health and safety.

MAT 140 Survey of Mathematics 3-0-3

Prerequisites: MAT 070, MAT 080, MAT 090, MAT 095, MAT 120, MAT 121, MAT 161, MAT 171, or MAT 175

Corequisites: None

This course provides an introduction in a non-technical setting to selected topics in mathematics. Topics may include, but are not limited to, sets, logic, probability, statistics, matrices, mathematical systems, geometry, topology, mathematics of finance, and modeling. Upon completion, students should be able to understand a variety of mathematical applications, think logically, and be able to work collaboratively and independently.

MEC 130 Mechanisms 2-2-3

Prerequisites: None

Corequisites: None

This course introduces the purpose and action of various mechanical devices. Topics include cams, cables, gear trains, differentials, screws, belts, pulleys, shafts, levers, lubricants, and other devices. Upon completion, students should be able to analyze, maintain, and troubleshoot the components of mechanical systems

MNT 230 Pumps & Piping Systems 1-3-2

Prerequisites: None

Corequisites: None

This course covers pump installation and maintenance and related valves and piping systems. Topics include various types of pump systems and their associated valves, piping requirements, and other related topics. Upon completion, students should be able to select and install pump and piping systems and demonstrate proper maintenance and troubleshooting procedures.