



Course Specification

DIPLOMA

Course Title: **Biofuel**

Course Code: **APRT2207**

Program: **Renewable energie technology**

Department: **Diploma Department**

College: **Applied Science**

Institution: **Umm Al-Qura University**

Version: **1**

Last Revision Date: **13-2-2025**



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A. General information about the course:

1. Course Identification

1. Credit hours: (3)

2. Course type

A. ☐ University ☐ College ☒ Department ☐ Track ☐ Others
B. ☐ Required ☒ Elective

3. Level/year at which this course is offered: (4th Level / 2nd Year)

4. Course General Description:

We are currently facing both energy and environmental challenges. In this course, we will explore how biofuels offer potential solutions to these issues. Biofuels is an interdisciplinary topic, so we will investigate the science and engineering, economics, societal impacts and the political aspects of biofuels including both ethanol and biodiesel. The course will provide a broad understanding of the impacts and implications of biofuels use through an investigation of: (1) The viability of various biofuels for transportation; (2) The engineering and science of fuel production and use; (3) The economics of biofuels production and use; (4) The environmental impacts of both ethanol and biodiesel; and (5) The policies and environmental issues driving the use of biofuels as well as the societal impacts.

5. Pre-requirements for this course (if any):

6. Co-requisites for this course (if any):

7. Course Main Objective(s):

This course introduces an introductory course focusing on the scope of valorization of waste made from nonpetroleum sources (biomass). The source, processing, and social impacts of biofuel utilization will be covered.

2. Teaching mode (mark all that apply)





No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	5	100%
2	E-learning		
3	Hybrid <ul style="list-style-type: none"> Traditional classroom E-learning 		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	45
3.	Field	
4.	Tutorial	
5.	Others (specify)	
Total		75

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Figure out a comprehensive knowledge and critical understanding of the main subjects of the Biofuel or specialization, including the main concepts, principles, theories and their current applications in the field of academic research specializing in Biofuel .	K1	Lectures, tutorials and independent study assignments	Homework, Quizzes, Midterm and Exam
1.2	Understand deeply one or more areas of specific specialization in relation to the latest theories,	K2	Lectures, tutorials and independent study assignments	Homework, Quizzes, Midterm and Exam



Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	research and professional practice in Biofuel .			
1.4	Describe the most current advancements in one or more mechanical engineering sectors, professional specialties, or professions with sufficient level of competence and comprehension.	K3	Lectures, tutorials and independent study assignments	Homework, Quizzes, Midterm and Exam
1.5	Demonstrate knowledge and awareness of a number of well-known and specialized research and/or inquiry methodologies, as well as experience in the Biofuel of mechanical engineering.	K4	Lectures, tutorials and independent study assignments	Homework, Quizzes, Midterm and Exam
2.0	Skills			
2.1	Apply continuously theoretical and practical knowledge in dealing with a variety of contexts, new and unexpected scientific, and provide authentic and innovative responses to problems and issues. Make convincing and informed judgments in situations where complete or consistent information is not available.	S1	Lectures, tutorials and independent study assignments	Homework, Quizzes, Midterm and Exam
2.2	Extracts from published research or professional reports in Biofuel . and can apply them, develops	S2	Lectures, tutorials and independent study assignments	Homework, Quizzes, Midterm and Exam





Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	important new ideas and integrates them into their knowledge or experiences. Applies specialized and general research methods in the creative analysis of complex issues and in the development of results and proposals related to its academic field.			
2.3	Plan and execute large projects or part of scientific research independently, applying his theoretical and practical knowledge and using research methods to arrive at valuable conclusions that lead to important additions to current knowledge or professional practices in certain field of Biofuel .	S4	Lectures, tutorials and independent study assignments	Homework, Quizzes, Midterm and Exam
3.0	Values, autonomy, and responsibility			
3.1	Contribute to improving the quality of life in the community.	V4	Study presentation and report preparation	Oral presentation and minor projects.
3.2	Ability to self-learning about engineering problems in Biofuel	V3	Study presentation and report preparation	Oral presentation and minor projects.

C. Course Content

No	List of Topics	Contact Hours
1.	Carbon in our environment-Introduction to Biofuels-	3
2.	Combustion Engines Part 1. Parts and Function- Combustion Engines Part 2. Turbines and Fuel Ratings	3



3.	Alcohol Fuels Part 1. Attributes and History- Alcohol Fuels Part 2. Characteristics- Alcohol Fuels Part 3. Ethanol Production- Alcohol Fuels Part 4. Cellulosic Ethanol and Methanol- Alcohol Fuels Part 5. Butanol	6
4.	Biodiesel Part 1. Petrodiesel - Biodiesel Part 2. Terms and Properties- Biodiesel Part 3. Making Biodiesel- Biodiesel Part 4. Oil Sources- Biodiesel Part 5. Straight Vegetable Oil- Biodiesel Part 6. Co-uses for Oilseed	3
5.	Gasification Part 1. Biomass - Gasification Part 2. Producer Gas	3
6.	Biogas Part 1. Biology- Biogas Part 2. Feed Selection- Biogas Part 3. Fuel Value and Properties- Biogas Part 4 Uses	6
7.	Fuel Conversion and Future Technology	3
8.	Team-work Projects	3
9.	Lab work	45
Total		75

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quiz	3,5,11,13	%20
2.	Midterm exam	8	20 %
3.	Minor Project	15	20 %
4.	Final exam	16/17	40 %

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Pandey, Larroche, Ricke, Dussap, Gnansounou. Biofuels, 1st Edition Alternative Feedstocks and Conversion Processes, 2011.
Supportive References	Rattan Lal, B.A. Stewart. Soil Quality and Biofuel Production, CRC Press Reference -222 Pages -37 B/W Illustrations, 2009.
Electronic Materials	All the lecture notes
Other Learning Materials	

2. Required Facilities and equipment



Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms
Technology equipment (projector, smart board, software)	Data show
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Faculty	Direct (project, HW, Quiz, midterm and final exam)
Effectiveness of Students assessment	Students	Indirect (Student Survey)
Quality of learning resources	Program Coordinator	Direct analysis
The extent to which CLOs have been achieved	Course Learning Outcomes (CLOs), Target Specification Criterion (TSC); 70% students score 70% or better.	Direct analysis
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Umm Al-Qura University Council
REFERENCE NO.	851141114462/190394
DATE	22/11/1446

