



TAN TAO UNIVERSITY
FROM KNOWLEDGE TO THE STARS



TAN TAO UNIVERSITY
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COURSE SYLLABUS: BIOENERGY (NĂNG LƯỢNG SINH HỌC)

TTU Student Honor Code

“Student members of the Tan Tao University community pledge not to cheat, plagiarize, steal, or lie in matters related to academic work.”

1. **Course name:** Bioenergy (Năng Lượng Sinh Học)
2. **Course code:** BT20-404
3. **Credits:** 2.0 theory + 1 practice
4. **Knowledge:** Core course for Biotechnology major
5. **Term:** Spring_2023
6. **Lecturer:** Dr. Nguyen Thanh Dien
7. **E-mail:** dien.nguyenthanh@ttu.edu.vn
8. **Address:** School of Biotechnology, Tan Tao University
9. **Office hours:** Friday 8:50-11:40

10. Time distribution

- 10.1. Class: 60 periods
- 10.2. Theory periods: 45
- 10.3. Practice: 15
- 10.4. Assessment periods: 4
- 10.5. Self-study: 120 hours

11. Prerequisites: BT20-404

12. Expected learning outcomes (ELOs)

- 12.1. Knowledge
 - 12.1.1. Being able to analyze and apply this knowledge to tackle current problems in the various fields of study as well as to explain related phenomena in real life
 - 12.1.2. Being able to plan, operate, and assess task completion for individuals and teams when participating in the experiments or projects in bioenergy

12.2. Skills

12.2.1. Being able to describe, illustrate, explain and present scientific information in English

12.2.2. Being able to operate technical skills in bioenergy that are performed in the laboratory or research institute setting

12.3. Autonomy and responsibility level

12.3.1. Being able to work independently, self-study, self-develop, be a lifelong learner, be responsible for the community and society; Being able to apply the scientific knowledge to solve practical problems

Objectives	Outcomes expected from the Course	Outcome Descriptions	Outcome (Bloom)	Outcomes from Training Program
G1	G1.1	Being able to analyze and apply this knowledge to tackle current problems in the various fields of study as well as to explain related phenomena in real life	- Application	ELO04
	G1.2	Being able to plan, operate, and assess task completion for individuals and teams when participating in the experiments or projects in bioenergy	- Application	ELO03
G2	G2.1	Being able to describe, illustrate, explain and present scientific information in English	- Analysis - Evaluation	ELO08
	G2.2	Being able to operate technical skills in bioenergy that are performed in the laboratory or research institute setting	- Application	ELO07
G3	G3.1	Being able to work independently, self-study, self-develop, be a lifelong learner, be responsible for the community and society; Being able to apply the scientific knowledge to solve practical problems	- Application	ELO14

13. Course description: This course will provide an overview of the fundamentals of bioenergy production, from biological processes to conversion technologies. The course will examine the

various types of bioenergy sources, including biomass, biofuels, and biogas, and their respective production and conversion processes. Students will learn about the potential of bioenergy to reduce greenhouse gas emissions and promote sustainable energy practices.

14. Student tasks: Students are expected to attend class regularly, take notes, do presentations, and participate in class discussion. Outside of class, students are expected to review notes and prepare for designed tasks.

15. Learning materials

15.1. Required Textbooks

15.1.1. *BioEnergy: Principles and Application*, by Yebo Li and Samir Kumar Khanal.
 Publisher: Wiley Blackwell; 1st edition (2017); ISBN: 978-1-118-56831-6

15.2. Supplementary references

15.2.1. *Biorenewable Resources: Engineering New Products from Agriculture*, by Robert C. Brown and Tristan R. Brown. Publisher: Wiley Blackwell; 2nd edition (2014);
 ISBN-13: 978-1-1185-2495-4/2014

15.2.2. *Articles from PubMed*

15.2.3. *Videos from YouTube*

15.2.4. <https://www.iea.org/fuels-and-technologies/bioenergy>

15.2.5. <https://www.irena.org/Publications/2022/Jun/Renewable-energy-for-agriculture-Insights-from-Southeast-Asia>

15.2.6. *Other Database resources*

16. Assessments

16.1. Evaluation criteria

Assessments		
1	Attendance	10%
2	Presentation	20%
3	Mid-term exam	30%
4	Final exam	40%
TOTAL		100%

16.2. Grade calculation

16.2.1. **Assessment 1:** Students who attend greater than 95% of class sessions will get 10% of the total grade.

16.2.2. **Assessment 2:** Students are expected to use and improve presentation skills. Well-prepared and coherent presentation will get 20% of the total grade.

16.2.3. **Assessment 3:** The mid-term exam will cover knowledge from all the lessons that are taught before the date of the mid-term. This will account for 30% of the total grade.

16.2.4. **Assessment 4:** The final exam will cover knowledge from all the lessons that are taught in class. This will account for 40% of the total grade.

17. Grading guidelines

TTU percentages	Letter Grade	GPA
97-100	A+	4.0
93-96	A	4.0
90-92	A-	3.7
87-89	B+	3.3
83-86	B	3.0
80-82	B-	2.7
77-79	C+	2.3
73-76	C	2.0
70-72	C-	1.7
65-69	D	1.0
0-64	F	0.0

18. Scope and sequence

Week	Content	Teaching methods	Class activity		Learning material	Evaluation	Expected learning outcomes
			Lecturer	Student			
1	Introduction to Bioenergy	Slide presentation;	Show slides of lessons and explain the lesson content to students;	Listen & discuss with Instructor to obtain the knowledge	15.1.1; 15.2.1; 15.2.2; 15.2.3	In-class questions and answers	G1.1; G1.2; G3.1
2	Bioenergy Fundamentals: -Units & Conversions; Mass balance; Thermodynamics - Organic & Carbohydrate chemistry; plant structural chemistry	Slide presentation;	Show slides of lessons and explain the lesson content to students;	Listen & discuss with Instructor to obtain the knowledge	15.1.1; 15.2.1; 15.2.2; 15.2.3	In-class questions and answers	G1.1; G1.2; G3.1
3	Bioenergy Feedstocks: Starch-Oilseed-Lignocellulose Feedstocks	Slide presentation;	Show slides of lessons and explain the lesson content to students;	Listen & discuss with Instructor to obtain the knowledge	15.1.1; 15.2.1; 15.2.2; 15.2.3	In-class questions and answers	G1.1; G1.2; G3.1
4	Biological conversion technologies 1:	Slide presentation;	Show slides of lessons and explain the lesson content to students;	Listen & discuss with Instructor to obtain the knowledge	15.1.1; 15.2.1; 15.2.2; 15.2.3	In-class questions and answers	G1.1; G1.2; G3.1

	Pretreatment; Hydrolysis; Fermentation						
5	Biological conversion technologies 2: Anaerobic digestion; Biogas production; Composting	Slide presentation;	Show slides of lessons and explain the lesson content to students;	Listen & discuss with Instructor to obtain the knowledge	15.1.1; 15.2.1; 15.2.2; 15.2.3	In-class questions and answers	G1.1; G1.2; G3.1
6	Midterm Exam	Online exam	Supervise the exam	Carry out the exam	In-class-slides	Exam's grade	G1.1; G1.2; G3.1
7	Thermal conversion technologies 1: Combustion	Slide presentation;	Show slides of lessons and explain the lesson content to students;	Listen & discuss with Instructor to obtain the knowledge	15.1.1; 15.2.1; 15.2.2; 15.2.3	In-class questions and answers	G1.1; G1.2; G3.1
8	Thermal conversion technologies 2: Gasification; Pyrolysis	Slide presentation;	Show slides of lessons and explain the lesson content to students;	Listen & discuss with Instructor to obtain the knowledge	15.1.1; 15.2.1; 15.2.2; 15.2.3	In-class questions and answers	G1.1; G1.2; G3.1
9	Presentation	Slide presentation;	Lead the questions and answers	Prepare and present; explain and answer questions	N/A	Level of preparation and the coherence of the presentation; Ability to explain rising questions	G1.1; G1.2; G2.1; G2.2; G3.1
10	Biobased refinery 1: Sugar-Starch based biorefinery	Slide presentation;	Show slides of lessons and explain the lesson content to students;	Listen & discuss with Instructor to obtain the knowledge	15.2.2; 15.2.4; 15.2.5; 15.2.6	In-class questions and answers	G1.1; G1.2; G1.3; G2.1; G2.3; G3.1
11	Biobased refinery 2: Lignocellulose-Lipid based biorefinery	Slide presentation;	Show slides of lessons and explain the lesson content to students;	Listen & discuss with Instructor to obtain the knowledge	15.2.2; 15.2.4; 15.2.5; 15.2.6	In-class questions and answers	G1.1; G1.2; G1.3; G2.1; G2.3; G3.1
12	Bioenergy system analysis: Life cycle assessment; Government policy	Slide presentation;	Show slides of lessons and explain the lesson content to students;	Listen & discuss with Instructor to obtain the knowledge	15.2.2; 15.2.4; 15.2.5; 15.2.6	In-class questions and answers	G1.1; G1.2; G1.3; G2.1; G2.3; G3.1
13	Experiment 1: Biodiesel production from vegetable oil	Laboratory Training	- Guide Laboratory-based practical operations for students.	- Practice under the guidance of the Instructor; - Report the progress and result under the guidance of the Lecturer.	15.2.2; 15.2.4; 15.2.5; 15.2.6	- Level of students' understanding and implementation of the experiment	G1.1; G1.2; G1.3; G2.1; G2.3; G3.1
14	Experiment 2: Biodiesel production from animal fat	Laboratory Training	- Guide Laboratory-based practical operations for students.	- Practice under the guidance of the Instructor; - Report the progress and result under the guidance of the Lecturer.	15.2.2; 15.2.4; 15.2.5; 15.2.6	- Level of students' understanding and implementation of the experiment	G1.1; G1.2; G1.3; G2.1; G2.3; G3.1
15	Final Exam	Onsite exam	Supervise the exam	Carry out the exam	In-class-slides	Exam's grade	G1.1; G1.2; G3.1

Full Name of Course Lecturer:

Dr. Nguyen Thanh Dien



Signature:

Full Name of Department Head: Dr. Ta Van Quang



Signature:

Date: February 5, 2023