

# Course Outline

**Course Code: BIO201.1**

**Course Name: Introduction to Biochemistry & Biotechnology**

## **Instructor**

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Lecturer

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## **Brief Description**

The course aims to give the students an understanding of the fundamentals of chemistry of living organisms and application of the biochemical knowledge in biotechnology. The principal aim of the course is to equip students with a basic knowledge of biochemical reactions and the chemical nature of biological macromolecules that can be applied in biotechnological inventions. The course also gives an introduction of molecular biology to achieve basic knowledge about nucleic acids.

## **Course Objective**

Upon successful completion of this course the student should be able to: (i) Define and explain the basic concepts in biochemistry; (ii) Discuss biochemical pathways; (iii) Define biological macromolecules; (iv) Discuss functions of DNA and RNA in the information pathways of cells; (v) Discuss the application of biochemical knowledge in biotechnological inventions; (vi) Explain the underlying concepts in biotechnology.

## **Text Books**

1. **Lehninger Principles of Biochemistry**, 4<sup>th</sup> or 5<sup>th</sup> Edition. David L. Nelson & Michael M. Cox. WH Freeman & Company, New York, USA.
2. **Biotechnology**, 5<sup>th</sup> Edition, 2009. John E. Smith. Cambridge University Press, New York, USA.

## **Lecture Contents**

1. Overview of Biochemistry & Biotechnology
2. Foundations of Biochemistry
3. Chemistry of Water
4. Introduction to Biological Macromolecules
5. Biological Membranes
6. Bio-signaling
7. Bioenergetics
8. Overview of Metabolic Pathways
9. Introduction to Biotechnology
10. Biochemical applications in Biotechnology

## **Rationale for Content**

This course is designed as an essential building block for students with a desire to have a solid understanding of the basis of biochemical reactions and their application in biotechnological innovations. The topics covered will be suitable for someone who is considering a career in biochemistry, microbiology, biotechnology, molecular biology. Having knowledge on this course is an important component of any program in which students are expecting to gain employment in the fields of medical and biotechnological research.

## Lecture materials

All the lectures will be sent to students as Microsoft Powerpoint files via email.

## Discussion sections

Discussion or debate on the concepts will take place throughout the course. While text books/powerpoint files provide good overview of the lecture topics, discussions tend to go slightly beyond the scope of the books/powerpoint files.

## Organization of Lectures

There will be 24 lecture periods of 1.5 hours each at the rate of two per week unless there are interruptions due to unavoidable circumstances.

## Evaluation

Performance of a student will be evaluated according to the following criteria:

<b>Examination</b>	<b>Marks</b>	<b>Remarks</b>
<b>Class Attendance</b>	5%	100% attendance is required, and there will be no make-up lecture for those absent. I shall render some help to students who miss a lecture for a serious reason.
<b>Quizzes</b> (10 min each) (Best 2 out of 5)	20%	Quizzes will be objective type in format that will include fill in the blanks, true/false, and MCQ.
<b>Mid-Term Examinations</b>	35%	Mid-Term Exams will be based on both objective-type questions and questions with short answers.
<b>Final Examination</b> (1hr 10 min )	40%)	Final Exam will be based on both objective-type questions and questions with short answers.
<i>Project ( Bonus)</i>	<i>5%</i>	<i>Lecture 11</i>

## Grading scheme

NSU grading policy will be followed.

## Policies

1. Be happy inside and outside of the classroom. Being happy keeps human body healthy.
2. Questions during the lectures are always welcome.
3. Attend classes on time and regularly. Do not attend classes late regularly.
4. There will be no make-up quiz. Make-up for mid-term exams will be considered only under special circumstances. Any make-up of mid-term exam will be based primarily on questions with answers on essay-format.
5. If an exam is not held due to unavoidable circumstances, it will be held on the following class day.
6. Mobile phones are allowed in the classroom only for video and/or audio recordings of all the lectures inside the classroom.
7. Switch your mobile phones to vibration mode inside the classroom. Do not receive or make calls inside the class. Do not exchange messages using your phone inside the classroom.
8. Students should be aware of the policy about probation in NSU.
9. To make an appointment to discuss about the course, come to my office room (SAC812) or call me or send me an e-mail.
10. Avoid going to the washroom during the lectures. Go to the washroom before the lectures, if required. No visit to the washroom is allowed in the middle of an exam.

### Class & Exam Schedule for BIO201

(Dates and Times are subject to change and any such change will be notified to the students by emails or messages)

Lecture	Lecture Topic	Reading
1	Overview of Biochemistry & Biotechnology	None
2	Foundations of Biochemistry	Lehninger Chapter 1
3	Water	Lehninger Chapter 2
4	Amino Acids	Lehninger Chapter 3
5	<b>(Quiz 1)</b> Proteins	Lehninger Chapter 4, 5, 6 (Chapters' key points will be summarized in lecture)
6	Carbohydrates	Lehninger Chapter 7
7	Lipids	Lehninger Chapter 10
8	<b>(Quiz 2)</b> Nucleotides & Nucleic Acids	Lehninger Chapter 8
<b>Midterm 1</b>		
9	DNA-based Information Technologies	Lehninger Chapter 9
10	Biological Membranes	Lehninger Chapter 11
11	<i>Bio-signaling-I (project)</i>	<i>Lehninger Chapter 12</i>
12	<b>(Quiz 3)</b> Bio-signaling-II, Bioenergetics	Lehninger Chapter 12, 13
13	Overview of Metabolic Pathways-I	Lehninger Chapter 14-23 (Chapters' key points will be summarized in lecture)
14	Overview of Metabolic Pathways-II	Lehninger Chapter 14-23 (Chapters' key points will be summarized in lecture)
15	<b>(Quiz 4)</b> Overview of Metabolic Pathways-III	Lehninger Chapter 14-23 (Chapters' key points will be summarized in lecture)
16	Overview of Metabolic Pathways-IV	Lehninger Chapter 14-23 (Chapters' key points will be summarized in lecture)
<b>Midterm 2</b>		
17	Overview of Metabolic Pathways-V	Lehninger Chapter 14-23 (Chapters' key points will be summarized in lecture)
18	<i>Overview of Metabolic Pathways-VI (Presentation)</i>	<i>Lehninger Chapter 14-23 (Chapters' key points will be summarized in lecture)</i>
19	Overview of Metabolic Pathways-VII	Lehninger Chapter 14-23 (Chapters' key points will be summarized in lecture)
20	<b>(Quiz 5)</b> Overview of Metabolic Pathways-VIII	Lehninger Chapter 14-23 (Chapters' key points will be summarized in lecture)
21	Introduction to Biotechnology; Genetics & Biotechnology	Smith Chapter 1, 2, 3 (Chapters' key points will be summarized in lecture)
22	Fermentation & Enzyme technologies; Biofuel technology	Smith Chapter 4, 5, 6 (Chapters' key points will be summarized in lecture)
23	Environmental-, Plant-, Animal- Biotechnology	Smith Chapter 7, 8, 9 (Chapters' key points will be summarized in lecture)
24	<b>(Quiz 6)</b> Food-, Medicine-, Stem Cell- Biotechnology; Safety & Ethics in Biotechnology	Smith Chapter 10-16 (Chapters' key points will be summarized in lecture)
<b>Final Exam</b>		