

Department of Chemistry and Biochemistry Syllabus

1. CHMI 3236 EL – Enzymology (Fall 2020) 3 cr

2. Instructor:

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Office Hours: There are no designated office hours this term. For questions regarding the course, please email me, and we can set up a Zoom meeting.

3. Course description (from Calendar), including prerequisites.

This course covers the principles of biochemical catalysis including the structure, function, mechanism and regulation of enzymes. The topics include: structure-function relationships, models of enzyme catalysis, enzyme kinetics, methods to isolate and study enzymes, coenzymes, and clinical aspects of enzyme function. Pre/Co-req: CHMI 3226 EL. (lec 3) 3 cr

4. Learning objectives

The students will learn:

- *Common methods utilized to isolate, purify and study enzymes*
- *The underlying principles behind the rate enhancement of enzyme-catalysed reactions*
- *How to use kinetic equations in the delineation of enzyme mechanisms and inhibition*
- *How to classify enzymes based on their function and mechanism*
- *How enzymes are involved in the manifestation of diseases*
- *How auxiliary factors (e.g., coenzymes, metals) influence biochemical reactivity*

5. Outline of Topics:

Week 1: General aspects of enzymology

Week 2: Determination and viewing of 3-dim protein structures;
Isolation/purification of enzymes

Weeks 3 & 4: Thermodynamic aspects of enzyme function; Mechanisms of catalysis

Week 5: Enzyme kinetics and inhibition

Weeks 6 & 7: Coenzymes & metalloenzymes

Week 8: Enzymes in organized systems
Week 9: Isozymes, catalytic antibodies, ribozymes
Weeks 10 & 11: Applications and industrial uses of enzymes
Week 12: Clinical enzymology; review

6. Methods of Evaluation:

Assignments: 30%

Midterm: 20%

Oral presentation: 10%

Final exam: 40%

7. Methods of Delivery or method of teaching

- *Via Zoom*

8. Learning outcomes

At the end of the course, students will be able to:

- *Propose efficient strategies to isolate and purify a variety of enzymes*
- *Analyse kinetic data to assess enzyme mechanisms and inhibition*
- *Predict the effects of pH, isotope replacement, temperature, and other environmental factors on enzymatic reactions*
- *Differentiate fundamental enzyme mechanisms*
- *Identify the role of cofactors (including metals) in the function of enzymes*
- *Describe the function and importance of enzymes in medicine and industry*

9. Readings/Textbooks

- **Enzymology** by T. Devasena, Oxford University Press (2010) ISBN-10: 0198064438; ISBN-13: 978-0198064435
- **Fundamentals of Enzymology: Cell and Molecular Biology of Catalytic Proteins** (3rd Ed.) by N. Price & L. Stevens, Oxford University Press (1999) ISBN-10: 019850229X
- **Essentials of Enzymology** by R. Okotore, Xlibris (2015) ISBN-10: 1503527239; ISBN-13: 978-1503527232
- **Practical Enzymology** (3rd Ed.) by H. Bisswanger, Wiley-VCH (2019) ISBN-10: 352734604X; ISBN-13: 978-3527346042
- **Fundamentals of Enzyme Kinetics** (4th Ed.) by A. Cornish-Bowden, Wiley-Blackwell (2012) ISBN-10: 3527330747
- General Biochemistry textbooks (e.g., Voet & Voet, Stryer, Lehninger)
- Scientific articles (accessible in electronic or hardcopy form)

10. Policies

- *Students must be familiar with the University Policies, including*
 - *Policy on Student Academic Integrity:*
<https://intranet.laurentian.ca/policies/2017.09.19%20-%20Policy%20and%20Procedures%20on%20Academic%20Integrity%20-%20EN.pdf>
 - *Grade Appeal Policy:*
<https://intranet.laurentian.ca/policies/2017.09.19%20Grade%20Appeal%20Policy%20-%20EN.pdf>

11. Other

- **Important dates:**
 - *September 10* *First class*
 - *October 12 – 16* *Study Week – No classes!*
 - *October 29* *Midterm*
 - *December 07* *Last class*
- **Oral presentation:** Students will give a brief Powerpoint presentation on an enzyme to be chosen from a list. The presentation should be 7-8 minutes in length, and will be followed by a ca. 2 minute question period.
Dates of the presentations: September 28, October 01 and October 05.
- **Additional material** regarding the assignments, oral presentations, lecture material, etc. will be made available on the class website at www.bioinorganic.ca/teaching/chmi3236.html.