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# Genetically Engineered Machines (BCHEM1850)

Dual Credit Program through the University of Lethbridge

September - Dec, 2020

## Program Description

This 3 credit university course will enhance students' understanding of Unit C (Cell Division, Genetics and Molecular Biology) in the Biology 30 curriculum and prepare them for participation in the iGEM competition and future university lab courses. Students will develop advanced lab skills and good lab safety habits, as well as gain experience in data interpretation and experimental troubleshooting. The course is designed to increase students' interest in science and nurture a positive relationship with synthetic biology. Students will learn the implications that genetic engineering has for society, what further advancements will mean for everyday life, and how to communicate their ideas to a wider audience. The course will encompass both lectures and laboratory work, complementing each other to help students increase their understanding of the material. Topics will include: the cellular basis of life, macromolecules, biology's central dogma, scientific ethics, research and communication.

## Student Eligibility

**This program is available to all Palliser students:**

1. Who are excited about learning and sharing their ideas
2. Who are in grades 11 or 12 and who have an interest in the biological sciences.
3. Who are able to commit to the duration of the program, attend classes on campus and complete their assignments on time throughout the semester.

## Important Dates

- **Applications due:** May 22, 2020


**Course begins:** September, 2020

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## **Program benefits**

1. Earn 30-level high school options credits
2. Earn post-secondary credit without paying post-secondary tuition.
3. Reduce stress associated with the transition from high school to post-secondary
4. Experience a post-secondary learning environment
5. Explore potential post-secondary and career options

## **Pre-requisites**

1. HCS3000 Workplace Safety
  2. Completed Grade 10 - English 10, Social 10, Math 10C, Science 10.
  3. Enrolled in Biology 20. (co-requisite)
  4. Students must have access to a computer and reliable internet access.
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<b>Course Topics Session</b>	<b>Topic(s)</b>	<b>Description</b>
Week 1	Bioengineering Basics	<ul style="list-style-type: none"> <li>• What is a cell?</li> <li>• How can we engineer cells?</li> <li>• How to read scientific literature</li> </ul>
Week 2	Lab Safety, Equipment & Etiquette	<ul style="list-style-type: none"> <li>• How to behave safely in a lab environment, work as a team, and keep good records.</li> <li>• What is a pipette and how to use it?</li> <li>• How to follow and write lab protocols</li> </ul>
Week 3	DNA Analysis	<ul style="list-style-type: none"> <li>• PCR and gel electrophoresis</li> </ul>
Week 4	Science Literacy	<ul style="list-style-type: none"> <li>• How can we tell good science from bad science?</li> </ul>
Week 5	Transformations & Competent Cells	<ul style="list-style-type: none"> <li>• Preparation of competent cells</li> <li>• Transformations with prepared DNA</li> </ul>
Week 6	Science Communication	<ul style="list-style-type: none"> <li>• How is science portrayed in the media?</li> <li>• Learn how to share your ideas in an effective and honest way!</li> </ul>
Week 7	DNA Isolation & Restriction	<ul style="list-style-type: none"> <li>• What are plasmids?</li> <li>• Isolating DNA via alkaline lysis</li> <li>• How can we use restriction enzymes to interpret DNA?</li> </ul>
Week 8	Transcription & Translation	<ul style="list-style-type: none"> <li>• How can we monitor gene transcription?</li> <li>• How will we measure protein production?</li> </ul>

<b>Week 9</b>	<b>Scientific careers and the future</b>	<ul style="list-style-type: none"><li>• What can you do with a science degree?</li><li>• What careers will be available in the future?</li></ul>
<b>Week 10</b>	<b>Protein Analysis</b>	<ul style="list-style-type: none"><li>• How can we identify the protein we made?</li><li>• SDS-PAGE</li></ul>
<b>Week 11</b>	<b>Enzyme Activity</b>	<ul style="list-style-type: none"><li>• How can we measure protein function?</li><li>• Using 3D models to understand how proteins work</li></ul>
<b>Week 12</b>	<b>What did you learn?</b>	<ul style="list-style-type: none"><li>• Final class presentations and wrap-up</li></ul>