1. Course Information

Course
BIOL 535

Course title
Drug development and careers in biotechnology

Course Description
Over the last century biotechnology has had a profound impact on health care by enabling novel innovative approaches to pharmaceutical development. Early contributions included the isolation of antibiotics from bacteria, but leaps in molecular biology in the 1970s and 1980s opened up entire new avenues for modeling and treating disease. These advances enabled development of many new effective treatments and helped establish the biopharma industry. New exciting breakthroughs and life-saving treatments emerge every year. Your degree in Biology is a potential launchpad into more than 100 distinct career opportunities in biotech. This course will be grounded on drug development and various areas of agricultural biotech, focusing on the challenges that leaders in these industries face and how their background and career trajectory prepared them to face those challenges. Beyond R&D, there is a wealth of career paths tied to clinical development, business development, executive management, marketing, regulatory affairs, law, sales, IT, and many other areas. You will have the chance to meet established leaders in these areas and ask questions like: what do I need to do to get this job? What are the expectations, rewards, and downsides of a career in this area? What does the future look like for this area and what other roles does it prepare me for? How do I keep my options open? Through a mix of lectures, student-guided discussions, and direct conversations with key opinion leaders, you will be exposed to the breadth of possibilities that your Biology degree sets up for you.

Semester and Year
Fall 2023

Pre-requisites
Level 4 and registration in a Biology Honours Plan (BIOL-M-BSH, BIMA-P-BSH, BIPS-P-BSH, BTEC-P-BSH, EBIO-P-BSH) and a minimum GPA of 2.0 in the Biological Foundations List and (BIOL 330/3.0 or BIOL 334/3.0 or BIOL 341/3.0 or BIOL 430/3.0) or permission of the Department.

Number of credits
3.0

Learning hours
120

Format
3 hour weekly sessions (evening, in-person), 1 hour weekly virtual student hours with the instructor (optional), and independent learning. Approximately a third of the weekly sessions will consist of lectures by the instructors, while the rest will be used for student-led seminars.

Required textbook
Career Opportunities in Biotechnology and Drug Development (Toby Freedman)

Topics
This course will touch upon some of all of the following topics:
1. Discovery Research: The Idea Makers.
2. Preclinical Research: The Bridge between Discovery Research and Clinical Development.
3. Project Management: The Product Development "Orchestra Conductors".
4. Clinical Development: Developing New Products to Benefit Human Health.
5. Medical Affairs: Working in the Post–Approval World.
6. Bio/Pharmaceutical Product Development: The Chemistry Has to Be Good.
7. Life Science Information Management: The Melding of Computer and Biological Sciences.
8. Business and Corporate Development: Why Big Deals Really Are a Big Deal.
9. Marketing: Communicating a Message to Customers.
10. Sales: Generating Revenue and Educating Customers.
11. Technical Applications and Support: Getting Paid to Be the Expert.
12. Corporate Communications: Communication between External and Internal Worlds.
13. Executive Leadership and Entrepreneurship: The Business Builders.
14. Law: Providing Legal Advice and Protecting Property.
15. Health Care Finance: Venture Capital, Institutional Investing, Investment Banking, and Equity Research.
16. Management Consulting: The Strategy Advisors.
17. Recruiting: The Business of Matchmaking.

Course Learning Outcomes
On successful completion of this course, students will be able to:
1. Be familiar with the history of drug development and how it has changed over time.
2. Understand the overall process and challenges of drug development.
3. Describe different career paths available to university graduate with a degree in biology.
4. Describe the functions of various job positions in the greater scope of drug development.
5. Understand the main challenges that leaders in this area need to overcome.
6. Know how one lands different careers in biotechnology and the required qualifications.

Important University Dates
Please visit the [Faculty of Arts and Sciences Sessional Dates website](#) for all academic deadlines.

2. Inclusion

Land Acknowledgement
Queen's University is situated on traditional Anishinaabe and Haudenosaunee Territory. To acknowledge this traditional territory is to recognize its longer history, one predating the establishment of the earliest European colonies. It is also to acknowledge this territory's significance for the Indigenous peoples who lived, and continue to live, upon it – people whose practices and spiritualities were tied to the land and continue to develop in relationship to the territory and its other inhabitants today. The Kingston Indigenous community continues to reflect the area's Anishinaabek

and Haudenosaunee roots. There is also a significant Métis community and there are First Peoples from other Nations across Turtle Island present here today. We encourage you to learn about the history of these lands.

https://www.queensu.ca/encyclopedia/t/traditional-territories
https://www.queensu.ca/indigenous/ways-knowing/land-acknowledgement

Equity, Diversity, and Inclusivity Statement

Queen's University recognizes that the values of equity and diversity are vital to and in harmony with its educational mission and standards of excellence. It acknowledges that direct, indirect and systemic discrimination exists within our institutional structures, policies and practices and in our community. These take many forms and work to differentially advantage and disadvantage persons across social identities such as race, ethnicity, disability, gender identity, sexual orientation, faith and socioeconomic status, among other examples.

Building a Classroom Community

University is a place to share, question, and challenge ideas. Each student brings a different set of lived experiences. You can help to create a safer, more respectful classroom community for learners by following these guidelines:

- Make a personal commitment to learn about, understand, and support your peers.
- Assume the best of others and expect the best of them.
- Recognize and value the experiences, abilities, and knowledge each person brings to the course.
- Acknowledge the impact of oppression on other people's lives and make sure your words and tone are respectful and inclusive.
- Encourage others to develop and share their ideas.
- Pay close attention to what your peers say/write before you respond. Think through and re-read what you have written before you post online or send your comments to others.
- Be open to having your ideas challenged and challenge others with the intent of facilitating growth.
- Look for opportunities to agree with one another, building on and intentionally referencing peers' thoughts and ideas; disagree with ideas without making personal attacks, demeaning, or embarrassing others.

Fostering Accessibility

All of us have a shared responsibility for fostering accessibility and promoting meaningful inclusion of those with disabilities. The Accessibility Hub at Queen's University's Human Rights & Equity Office offer a host of tutorials that provide us all with practical tips for:

- creating accessible documents, e.g., to submit to your teaching team or share with peers in peer feedback activities/in a presentation,
- emails, e.g., while communicating with group members or your teaching team, and
- meeting practices (e.g., in tutorials/labs/seminars or virtual meetings.

Name/Pronoun

If, for whatever reason, you wish to change how your name appears in onQ and/or on class lists, please follow these steps. You may also use this process to add your pronouns to the appearance of your name.

1. Log into SOLUS.

2. Click on Personal Information tab.
3. Click on the Names tab
4. Click on the Add New Name tab
5. Choose Preferred from the Name Type drop down menu
6. Enter the name you would like to appear in onQ and/or on class lists.
7. Click Save.

Please allow 24 to 48 hours for your name to be registered within the system. If you have further questions or concerns, please contact ITS at Queen's University.

3. Course Materials & Technologies

Required Course Textbooks
The following textbooks is required for this course: Career Opportunities in Biotechnology and Drug Development (1st Edition), by Toby Freedman. At the time of writing this syllabus, this book is available from Amazon.ca for approximately CA$43, Amazon.com for approximately US$57, and Cold Spring Harbor Laboratory Press for approximately US$37 (print) or US$29 (eText).

Notice of Recording
Synchronous (live) classes will involve components delivered through Zoom and/or Teams, video conferencing platforms supported by the University. Steps have been taken by the University to configure these platforms in a secure manner. Classes may be recorded with video and audio (and, in some cases, transcription) and may be made available to students in the course for the duration of the term. The recordings may capture your name, image or voice through the video and audio recordings. By attending these live classes, you are consenting to the collection of this information for the purposes of administering the class and associated coursework. If you are concerned about the collection of your name and other personal information in the class, please contact the course instructor to identify possible alternatives.

To learn more about how your personal information is collected, used and disclosed by Queen's University, please see the Notice of Collection, Use and Disclosure of Personal Information.

Copyright of Course Material
Course materials created by the course instructor, including all slides, presentations, handouts, tests, exams, and other similar course materials, are the intellectual property of the instructor. It is a departure from academic integrity to distribute, publicly post, sell or otherwise disseminate an instructor's course materials or to provide an instructor's course materials to anyone else for distribution, posting, sale or other means of dissemination, without the instructor's express consent. A student who engages in such conduct may be subject to penalty for a departure from academic integrity and may also face adverse legal consequences for infringement of intellectual property rights.

4. Communication

Questions about the Course and Contacting the Teaching Team
Questions should be directed to either course instructor either in person during or after lecture, during the optional weekly student hours, or via email using the contact information provided on onQ.

Queen's Email
The university communicates with students via Queen's email. Please check your email regularly to ensure you do not miss important information related to your course.

Course Feedback
At various points during the course, you may be asked to take part in a variety of feedback activities, such as surveys and questionnaires. This feedback enables the teaching team to improve the course. All surveys are anonymous and are directly related to activities, assessments, and other course material.

5. Assessments

Weighting of Assessments

Assessment	Weighting
Facilitating KOL interview	30%
Participation in class discussions	30%
In-class presentation	15%
Quizzes	15%
Assignment	10%

Academic Accommodations and Academic Considerations will be implemented in a manner consistent with university policy (see: 6. Policy) and we be determined on an individual basis for each student.

Timing of Final Examinations
There will be no final exam in this course.

Assignment Submission Policy
Most assessments in this course are performed during scheduled class time and thus are unable to be submitted late. For assignments performed outside of the scheduled class time, the late policy will be detailed in the corresponding assignment instructions.

Policy Review of Graded Work
Requests for assessment regrading may be made to your instructor no more than one week after assignment grades are released. Requests for feedback must be made via email to the course instructors. To request that your assessment be reviewed, please include the following in your email:
- In the subject line of your email:

- o Indicate that you are making a regrade request and state the name of the assignment in the question (e.g., Regrade Request: Quiz 1).
- In the body of your email, include:
  - o A clear explanation of why the assessment deserves a different grade than assigned.
  - o The assignment as an attached document, along with all feedback you received on the assignment.

Please note that we may reassess the entire assessment (not just the portion specified in your request) and the new grade will stand, even if it is lower than the original.

6. Policies

Class Attendance
In-person class attendance is mandatory, except for students experiencing extenuating situtations (e.g., illness, a traumatic event, participation in a varsity athletic event as an athlete). Your presence and participation in class contributes to the knowledge and skills that you will develop throughout this course. We expect that you attend class regularly, participate in class conversations and learning activities. These types of activities provide active engagement, promote a deeper understanding of the course content, and contribute to your success in this course. Class attendance is necessary to complete the in-class assignments and receive a high score for participation in class discussions (see: 5. Assessements).

Academic Support
All undergraduate students face new learning and writing challenges as they progress through university: essays and reports become more complex; effectively incorporating research into writing becomes more important; the types of assignments become more diverse; managing your time and developing the skills you need to read and think critically gets more challenging. I encourage students to contact Student Academic Success Services (SASS). SASS offers many different ways to receive support:
- Free online or in-person appointments to get personalized support on writing and academic skills from expert staff and trained peers.
- Workshops and drop-in programs. SASS' Events Calendar lists events coming soon.
- Online resources that provide strategies for academic skills and writing development at university.
- If English is not your first language, SASS has specific resources for English as Additional Language students, including weekly programs and EAL academic skills appointments. You can meet on an ongoing basis with an EAL consultant to work on your academic writing, speaking, listening, and reading skills.

Accommodations for Disabilities
Queen's University is committed to working with students with disabilities to remove barriers to their academic goals. Queen's Student Accessibility Services (QSAS), students with disabilities, instructors, and faculty staff work together to provide and implement academic accommodations designed to allow students with disabilities equitable access to all course material (including in-class as well as exams). If you are a student currently experiencing barriers to your academics due to disability related reasons, and you would like to understand whether academic accommodations could support

the removal of those barriers, please visit the [QSAS website](#) to learn more about academic accommodations or start the registration process with QSAS by clicking **Access Ventus** button at **[Ventus | Accessibility Services | Queen's (queensu.ca)](#)**

VENTUS is an online portal that connects students, instructors, Queen's Student Accessibility Services, the Exam's Office and other support services in the process to request, assess, and implement academic accommodations.

To learn more go to: https://www.queensu.ca/ventus-support/students/visual-guide-ventus-students

Academic Consideration for Students in Extenuating Circumstances

Academic Consideration is a process for the University community to provide a compassionate response to assist students experiencing unforeseen, short-term extenuating circumstances that may impact or impede a their ability to complete their academics. This may include but is not limited to:

- Short term Physical or Mental Illness or Injury (stomach flu, anxiety/depression, mononucleosis, concussion, broken bones, surgery, medical treatments, etc.)
- Traumatic Event/Confidential (Bereavement, serious injury, illness or required treatment for a significant other/family member or a traumatic event such as divorce, sexual assault, social injustice, etc.)
- Requirements by Law or Public Health Authorities (court dates, jury duty, requirements to isolate, etc.)
- Significant Event (varsity athletic event, distinguished event, serving in the Reserve Forces, etc.)

Queen's University is committed to providing academic consideration to students experiencing extenuating circumstances. For more information, please see the [Senate Policy on Academic Consideration for Students in Extenuating Circumstances](#).

Each Faculty has developed a protocol to provide a consistent and equitable approach in dealing with requests for academic consideration for students facing extenuating circumstances. For more information, undergraduate students in the Faculty of Arts and Sciences should consult the Faculty's webpage on [Academic Consideration in Extenuating Circumstances](#) and submit a request via the [Academic Consideration Request Portal](#). Students in other Faculties and Schools who are enrolled in this course should refer to the protocol for their home Faculty.

Students are encouraged to submit requests as soon as the need becomes apparent and to contact their instructor and/or course coordinator as soon as possible once academic consideration has been granted. Any delay in contact may limit the options available for academic consideration.

For more information on the Academic Consideration process, what is and is not an extenuating circumstance, and to submit an Academic Consideration request, please see the Faculty of Arts and Science's [Academic Consideration website](#). Please refer to onQ for contact information for your instructors, where relevant.

Queen's Policy Statement on Academic Integrity

Queen's University is dedicated to creating a scholarly community free to explore a range of ideas, to build and advance knowledge, and to share the ideas and knowledge that emerge from a range of intellectual pursuits. Queen's students, faculty, administrators and staff therefore all have

responsibilities for supporting and upholding the fundamental values of academic integrity. Academic integrity is constituted by the five core fundamental values of honesty, trust, fairness, respect and responsibility and by the quality of courage. These values and qualities are central to the building, nurturing and sustaining of an academic community in which all members of the community will thrive. Adherence to the values expressed through academic integrity forms a foundation for the "freedom of inquiry and exchange of ideas" essential to the intellectual life of the University.

The following statements from "The Fundamental Values of Academic Integrity" (2nd edition), developed by the International Center for Academic Integrity (ICAI), contextualize these values and qualities:
1. **Honesty**. Academic communities of integrity advance the quest for truth and knowledge through intellectual and personal honesty in learning, teaching, research, and service.
2. **Trust**. Academic communities of integrity both foster and rely upon climates of mutual trust. Climates of trust encourage and support the free exchange of ideas which in turn allows scholarly inquiry to reach its fullest potential.
3. **Fairness**. Academic communities of integrity establish clear and transparent expectations, standards, and practices to support fairness in the interactions of students, faculty, and administrators.
4. **Respect.** Academic communities of integrity value the interactive, cooperative, participatory nature of learning. They honor, value, and consider diverse opinions and ideas.
5. **Responsibility**. Academic communities of integrity rest upon foundations of personal accountability coupled with the willingness of individuals and groups to lead by example, uphold mutually agreed-upon standards, and take action when they encounter wrongdoing.
6. **Courage**. To develop and sustain communities of integrity, it takes more than simply believing in the fundamental values. Translating the values from talking points into action -- standing up for them in the face of pressure and adversity — requires determination, commitment, and courage.

Students are responsible for familiarizing themselves with and adhering to the Senate regulations concerning academic integrity, along with Faculty or School specific information. Departures from academic integrity include, but are not limited to, plagiarism, use of unauthorized materials, facilitation, forgery and falsification. Actions which contravene the regulation on academic integrity carry sanctions that can range from a warning, to loss of grades on an assignment, to failure of a course, to requirement to withdraw from the university.

Syllabus statements for Generative Artificial Intelligence (AI) Tools
Students must submit their own work and cite the work that is not theirs. The use of generative AI writing tools such as ChatGPT in your submitted work is not permitted in this class unless explicitly stated otherwise in an assignment's instructions. If a specific assignment allows the use of generative AI writing tools, student's must cite the material that they generate. Any other use constitutes a Departure from Academic Integrity.

Queen's Student Academic Success Services (SASS) offers a self-directed, online academic integrity module which we encourage all students to take which will help with:
• Understanding the nature of the academic integrity departure
• Understanding the expectations of and role of sources in scholarly writing
• Integrating sources into your writing (paraphrasing, quoting, summarizing)

- Understanding when and how to cite your sources
- Managing your time effectively to avoid the need for shortcuts
- Taking effective notes to ensure accuracy of source material and correct attribution

Turnitin Statement

This course may make use of Turnitin, a third-party application that helps maintain standards of excellence in academic integrity. If Turnitin is used for an assignment, normally students will be required to submit their course assignments through onQ to Turnitin. In doing so, students' work will be included as source documents in the Turnitin reference database, where they will be used solely for the purpose of detecting plagiarized text in this course. Data from submissions is also collected and analyzed by Turnitin for detecting Artificial Intelligence (AI)-generated text. These results are not reported to your instructor at this time but could be in the future.

Turnitin is a suite of tools that provide instructors with information about the authenticity of submitted work and facilitates the process of grading. The similarity report generated after an assignment file is submitted produces a similarity score for each assignment. A similarity score is the percentage of writing that is similar to content found on the internet or the Turnitin extensive database of content. Turnitin does not determine if an instance of plagiarism has occurred. Instead, it gives instructors the information they need to determine the authenticity of work as a part of a larger process.

Please read Turnitin's Privacy Policy, Acceptable Use Policy and End-User License Agreement, which govern users' relationship with Turnitin. Also, please note that Turnitin uses cookies and other tracking technologies; however, in its service contract with Queen's Turnitin has agreed that neither Turnitin nor its third-party partners will use data collected through cookies or other tracking technologies for marketing or advertising purposes.

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