



Course Outline

BABS2011

Current Trends in Biotechnology

School of Biotechnology and Biomolecular
Sciences

Faculty of Science

Term 1, 2021

1. Staff

Position	Name	Email	Locations	Consultation Times
Course Convenor	A/Prof Kyle Hoehn	k.hoehn@unsw.edu.au	Room 420A, Biological Sciences Building North (D26). West wing	By appointment
Course Co-convenor	Dr Frances Byrne	frances.byrne@unsw.edu.au	Room 420B, Biological Sciences Building North (D26). West wing	By appointment
Course Co-convenor	Dr Lindsay Wu	lindsay.wu@unsw.edu.au	SoMS	By appointment

2. Course Information

Units of credit: 6

Pre-requisite(s): Level 1 Science

Teaching times and locations: <http://timetable.unsw.edu.au/2021/BABS2011.html>

Due to COVID-19 this course has been made fully online. Lectures will be provided in an asynchronous format as soon as they become available. This format is what previous students prefer, rather than attending live sessions at defined times. However, quizzes will be held online at defined times that cannot be changed and attendance is required for quizzes and presentations (see course calendar).

2.1 Course Summary (Handbook entry)

Through lecture and case study presentations, students will be introduced to how biotechnology advances are impacting on society by solving problems in medicine (drugs), environment (biodegradable plastics), and agriculture (drought-resistance). Lectures discuss current analytical technologies that are enabling the performance of scientific fundamental and applied research. Through assignments, students will be provided with the opportunities to develop scientific expertise in a biotechnology targeted area of their interest and to develop the skills required to interpret scientific findings and report them to key technical and non-technical stakeholders involved in biotechnology commercialisation.

2.2 Course Aims

The course aims to provide students with:

1. Expertise to interpret and report scientific literature to both lay audiences (friends, high school classes, general public) and scientific audiences (investors, peers).
2. Knowledge of advanced technologies that enable biotechnology research
3. Skills in biotechnology commercialisation

2.3 Course learning outcomes (CLO)

At the completion of this course, students should be able to:

1. Define biotechnology in the context of its breadth and scope of diverse applications
2. Translate complex scientific reports into language comprehensible by key stakeholders involved in technology commercialisation.
3. Comprehensively analyse the literature to review biotechnology strategies for addressing market opportunities.
4. Identify and explain appropriate analytical technologies to be used in biotechnology-based research.
5. Develop insight into strategies for commercialising biotechnology-based opportunities.

2.4 Relationship between course and program learning outcomes and assessments

BABS2011 is a stage 2 course that follows from the Stage 1 course, BABS1202 Applied Biomolecular Sciences, though BABS1202 is not a prerequisite.

BABS2011 is a required core course for students undertaking the 3053 program and biotechnology BSc Major.

BABS2011 serves as an introduction to the stage 3 course BABS3071 Commercial Biotechnology.

BABS2011 is a suitable elective for students wishing to understand more about innovation in the biosciences and the pathways to commercialisation.

Course Learning Outcome (CLO)	LO Statement	Related Tasks & Assessment
CLO 1	Understand the diverse range of biotechnology applications in society.	Quiz 1
CLO 2	Translate complex scientific reports into language comprehensible by key stakeholders involved in technology commercialisation	Assignments and Projects

CLO 3	Comprehensively analyse the literature to review biotechnology strategies for addressing market opportunities.	Assignments
CLO 4	Identify and explain appropriate analytical technologies to be used in biotechnology-based research.	Quiz 2
CLO 5	Develop insight into strategies for commercialising biotechnology-based opportunities.	Projects

3. Strategies and approaches to learning

3.1 Learning and teaching activities

Throughout the course, students are encouraged to develop problem-solving skills and to critically evaluate concepts, ideas and research results by participating in all activities including the lectures and tutorials. Online learning materials will be made available via Moodle.

Lectures serve to emphasize principles, provide an overview and connect the individual components of the course. They may also cover current ideas and research. The lectures provide a guide to the material needed to cover for the course. Students are encouraged to extend their knowledge by reading from a variety of sources. Lecture notes and recordings are also available on the course Moodle website.

Tutorials/reviews are designed to help students to revise the lecture materials, so that they can keep up to date with the content.

More details on learning activities and how they are going to assist students to achieve the intended learning outcomes will be provided during the course (the course manual and Moodle).

3.2 Expectations of students

Students must attend the Thursday and Friday classes in weeks 5 and 10 where presentations and quizzes are held.

All other classes are recorded will be uploaded for access in an asynchronous manner as soon as they become available.

If students have course-related questions, then they are encouraged to use discussion forums on the course's Moodle website where the entire class has access to the answered question. If more help is needed, students may send enquiries or requests for appointments from their UNSW email. When sending an email to the course coordinator, a student must state their name, student number and the course they are enrolled in.

4. Course schedule

*Additional non-class contact hours will be required to complete assessments, readings and exam preparation.

Week	Lectures - 3 hr sessions 3pm – 6pm (15:00 - 18:00) Thursdays Weeks 1-5,7-10			Case studies - 2 hr sessions 11am – 1pm (11:00 – 13:00) Fridays Weeks 1-5,7-10	
Wk 1 18/2	Kyle Hoehn Course overview	Qiao Qiao Commercial vs non-commercial biotech	Lindsay Wu & Kyle Hoehn Medical drug development pipeline	19/2 11-12 12-1p	Alison Todd, <u>SpeeDx</u>. Diagnostics Kyle Hoehn Assessment 1 instructions
Wk 2 25/2	Jeff Holst Natural products drug discovery	Megan Lenardon Vaccines (incl COVID-19) and antibodies	Lindsay Wu Commercial strategies for drug development	26/2 11-12 12-1p	Dr Philip Bell, Microbiogen Dr Rich Edwards, BABS Kyle Hoehn- Assignment 1 due by midnight tonight Assessment 2 instructions
Wk 3 4/3	Dominik Froehlich & Jeremy Pinyon Gene Therapy (viral: Dominik) (non-viral: Jeremy)	Kyle Hoehn RNA therapy	Lindsay Wu Due diligence checklist	5/3 11-12 12-1p	Lindsay Wu Due diligence case study Kyle Hoehn- Feedback on Assessment 1 and Assessment 3/4 instructions
Wk 4 11/3	Brendan Burns Environmental Biotech: Biofuels, foods, toxins, antibiotics	Jesse Goyette CAR-T cells	Kyle Hoehn Pre-clinical safety studies	12/3 11-12 12-1p	Tony Smithyman, <u>Cellabs</u> Phage Therapy LIVE REVIEW SESSION 1
Wk 5 18/3	Project 1 due before 10 AM today MUST ATTEND ONLINE: LIVE BROCHURE REVIEWS			19/3 11-1p	Quiz 1. Covers weeks 1-4 content Kevin Healey, International Animal Health Products P/L
Wk 6	No class this week				No class this week
Wk 7 1/4	Marc Wilkins Systems Biology	Russell Pickford Mass Spectrometry	Juanfang Ruan Cryo-EM Assignment 2 due by midnight tonight	2/4	No class today
Wk 8 8/4	Valerie Wasinger Proteomics	Russell Pickford Lipidomics & Metabolomics	Dr Emma Johansson-Beve Flow Cytometry	9/4 11-12 12-1p	Caroline Rae Magnetic Res Spec Kate Michie X-ray crystallography
Wk 9 15/4	Don Thomas NMR	Helena Mangs DNA sequencing	Dom Glover Synthetic Biology	16/4 11-12 12-1p	Brad Walsh, Minomic Ltd. LIVE REVIEW SESSION 2 Project 2: due by midnight
Wk 10 22/4	MUST ATTEND ONLINE: LIVE PRESENTATION VIDEOS			23/4	Quiz 2. Covers weeks 5-9 Feedback on presentations

5. Assessment

5.1 Assessment tasks

Assessment task and methods	Weighting (%)	Submission methods	Mark and feedback style	Week due
Assignment 1: SWOT and TPP analysis Due midnight Feb 26 th	10	Submit via Moodle/Turnitin	General feedback via class discussion	2
Project 1: Technical Brochure Due by 10AM March 18 th	15	Submit via Moodle/Turnitin	Feedback via class and Moodle with rubric comments	5
Assignment 2: Investment thesis Due midnight April 1 st	20	Submit via Moodle/Turnitin	General feedback via class discussion	7
Project 2: Pitch presentation Due midnight April 16 th	15	Submit recorded presentation to location to be determined	Feedback via class and Moodle with rubric comments	9
Quizzes: 2 quizzes worth 20 marks each 11AM March 19 th 11AM April 23 rd	40	Via moodle - 1 hr duration. Comprises multiple choice, True/False, and Short answer questions	Feedback on quizzes are discussed as indicated in calendar	5 and 10

Further information

UNSW grading system: <https://student.unsw.edu.au/grades>

UNSW assessment policy: <https://student.unsw.edu.au/assessment>

5.2 Assessment criteria and standards

The major components of this course are the content which is delivered through lectures and tutorials. This will be assessed by written or oral assignments and quizzes. More details on the assessment tasks and how they will be graded will be provided during the course (in the course manual or online via Moodle).

5.3 Submission of assessment tasks

Assignment submission

Refer to the tables provided in section 4 and 5.1 for due dates and routes for submission.

Late submissions occurring in the first 24 hours post-deadline will incur a 20% deduction in potential marks. Submissions 24-48 hours late will incur a 40% deduction in possible marks with an additional 20% deduction for each day late thereafter.

Special consideration (see section 11 below)

5.4. Feedback on assessment

Students will receive constructive feedback on their assignments in a timely manner (within 2 weeks after submissions). The delivery method of feedback may vary depending on the assessment type. Brief outline of assessment feedback is presented in the table provided in section 5.1. Full details will be provided in the course manual and on the course Moodle site.

6. Academic integrity, referencing and plagiarism

Referencing is a way of acknowledging the sources of information that you use to research your assignments. You need to provide a reference whenever you draw on someone else's words, ideas or research. Not referencing other people's work can constitute plagiarism.

Further information about referencing styles can be located at <https://student.unsw.edu.au/referencing>

Academic integrity is fundamental to success at university. Academic integrity can be defined as a commitment to six fundamental values in academic pursuits: honesty, trust, fairness, respect, responsibility and courage.¹ At UNSW, this means that your work must be your own, and others' ideas should be appropriately acknowledged. If you don't follow these rules, plagiarism may be detected in your work.

Further information about academic integrity and **plagiarism** can be located at:

- The *Current Students* site <https://student.unsw.edu.au/plagiarism>, and
- The *ELISE* training site <http://subjectguides.library.unsw.edu.au/elise/presenting>

The *Conduct and Integrity Unit* provides further resources to assist you to understand your conduct obligations as a student: <https://student.unsw.edu.au/conduct>.

7. Readings and resources

Course Manual

This course manual is available through download via Moodle. Any additional resources will be provided online via Moodle.

Course Website

All students enrolled in courses offered at BABS automatically have access to the course Moodle site <https://moodle.telt.unsw.edu.au>. This site will be used to distribute course notes and information and should be checked at regular intervals. This includes:

- Lecture handouts
- Tutorial notes
- Assessments - detailed information
 - marks
 - further information resulting from special consideration
- Information about examination arrangements
- Self-management resources

¹ International Center for Academic Integrity, 'The Fundamental Values of Academic Integrity', T. Fishman (ed), Clemson University, 2013.

Resources

Literature Searching: <http://www.ncbi.nlm.nih.gov/pubmed>

UNSW Library: <http://www.library.unsw.edu.au>

8. Administrative matters

Biosciences Student Office

Student Advisor (BABS) Email: BABStudent@unsw.edu.au

Tel: +61 (2) 9385 8047

Student Grievance Officer

Megan Lenardon (BABS) Email: m.lenardon@unsw.edu.au

School Contact (set up in progress)

Director of Teaching Email: BABSteaching@unsw.edu.au

Faculty Contact

Dr Gavin Edwards

Associate Dean (Academic Programs)

Email: g.edwards@unsw.edu.au

Tel: +61 (2) 9385 4652

Additional Websites

- Biosciences Student Office: <https://www.babs.unsw.edu.au/contact/biosciences-student-office>
- School of Biotechnology and Biomolecular Sciences website for current students:
<https://www.babs.unsw.edu.au/current-students/undergraduate-programs>
- MyUNSW: <https://my.unsw.edu.au/>

9. Additional support for students

- The Current Students Gateway: <https://student.unsw.edu.au/>
- Academic Skills and Support: <https://student.unsw.edu.au/academic-skills>
- Student Wellbeing, Health and Safety: <https://student.unsw.edu.au/wellbeing>
- Disability Support Services: <https://student.unsw.edu.au/disability-services>
- UNSW IT Service Centre: <https://www.it.unsw.edu.au/students/index.html>
- UNSW Academic Calendar Key Dates: <https://student.unsw.edu.au/dates>
- UNSW Handbook: <https://www.handbook.unsw.edu.au/>

- UNSW Learning Centre: <http://www.lc.unsw.edu.au/>
- UNSW Student Equity and Disabilities Unit: <https://student.unsw.edu.au/disability>
- Counselling and Support: <https://www.counselling.unsw.edu.au/>
- University Health Service: <http://www.healthservices.unsw.edu.au/>
- The Nucleus: <https://nucleus.unsw.edu.au>
- UNSW Careers and Employment Service: <http://www.careers.unsw.edu.au/>
- ARC- Student Life: <https://www.arc.unsw.edu.au/>
- UNSW Student Life: <https://www.unsw.edu.au/life>

10. Assessment guidelines

Assignment 1. SWOT and TPP Analysis. Individual assessment. – 10% of overall marks for course

SWOT Analysis:

A SWOT (strengths, weaknesses, opportunities, and threats) analysis is a tool used to critically evaluate a biotechnology product in development. In this exercise you will create a SWOT analysis for a biotechnology product in current development for the treatment of COVID-19 (can be a vaccine, antibody, natural compound, etc).

Strengths section: Must have 3 or more bullet points and must include published evidence on the biotechnology from clinical trials, conference posters, or company pages (you'll have to do some literature searching).

Weaknesses section: Must have 3 or more bullet points and must include information on the company developing the molecule.

Opportunities: Must have 3 or more bullet points and be specific to the biotechnology.

Threats: Must have 3 or more bullet points and name the top two leading competitors.

You must include a literature citation reference for each bullet point that includes a fact that can be referenced.

Therapeutic Product Profile (TPP):

Develop a therapeutic product profile for the same biotechnology product that you performed the SWOT analysis on. Instructions and examples will be provided.

Project 1. Technology brochure. Individual assessment. (15% final grade)

Objective Students will prepare a report suitable for a lay audience that covers a scientifically published scientific discovery that underpins a technology under development.

Introduction. The traditional means for communicating scientific discovery is through publishing in peer review journals. These reports are replete with highly technical information and jargon, meaning that only those with scientific expertise in the particular discipline will be in a position to read the reports and understand the content. Even those who are science educated are likely to have difficulty

understanding the content if they are unfamiliar with the field of study and its experimental design and language.

In the commercialisation of scientific discovery, a broad range of stakeholders need to be engaged in the process and to fulfil their roles they all need to understand the underlying concepts of the science and the problems it can solve i.e. the technology the science enables. Business people, managers, marketers, investors, etc. will not be able to gain this insight into the science by reading the scientific reports.

Your objective in this assignment is to develop the communication skills required by biotechnologists to translate scientific reports to something digestible by the educated lay community. These capabilities are not only required for industry-based scientists but also those in government funded research agencies that are seeking government funding (grants).

These skills will also become invaluable should you wish to become a science communicator (e.g. journalist), a school teacher, or a marketing copywriter for science-based products.

Source of journal articles

1. Pick your favourite specific unmet need (pancreatic cancer, Parkinson's disease, antibiotic resistance, bioplastics, improving crop tolerance, or something else that excites you about biotechnology – i.e. why are you in this class?)
2. Search for a paper with impact factor greater than 5 that is addressing this need.
 - a. For example, a lentiviral gene therapy to treat Parkinson's disease is described here: Dopamine gene therapy for Parkinson's disease in a nonhuman primate without associated dyskinesia. Jarraya et al. Science Translational Medicine. 2009 Oct 14;1(2):2ra4. doi: 10.1126/scitranslmed.3000130. You can search pubmed, google scholar, or biotech company websites.
3. Read it – can you understand it?
 - a. No – try reading whilst searching (e.g. Wikipedia) for explanations of technical/scientific terms. If this proves too difficult look for something that better suits your current scientific understanding.
 - b. Yes – is it interesting to you, do the findings excite you to want to find out more? If so, then perhaps you have found the paper for your assignment. If not, continue searching.
4. *Prepare a technology brochure*

The technical brochure is intended to introduce the technology to a lay audience that is interested in how it works and why it is important.

 - a. Strictly limited to two-pages (A4) and must be in colour and look professional
 - b. Must have a background, introduction to the unmet need, proposed solution, and one data panel to demonstrate proof-of-concept. The data shown must be a figure from a publication with impact factor greater than 5.

Examples of previous student efforts will be uploaded on Moodle.

Assignment 2. Investment thesis. Individual. (20% final grade).

Submitted on-line through Turnitin.

Write a four-page report for a scientific audience that describes your investment thesis for a company that will be chosen during the course.

Submission structure

Fully referenced 4-page (not including bibliography) investment thesis written for a scientifically-trained audience, that should include a 1 page executive summary of the company and technology with key financial information, an investment thesis, upcoming catalysts and milestones, base case assumptions with upside and downside scenarios, a detailed scientific description of the technology, your estimated chances of FDA approval, and your estimated valuation for the company after the FDA decision with rationale for the price you chose.

Examples will be provided.

Project 2. Recorded pitch presentation. Teams of 4-5. (15% final grade)

This is an exercise designed to help you learn biotech commercialisation. Prepare a video presentation designed to request \$10 million from investors to progress a COVID-19 pre-clinical technology into phase 1 clinical trials (you can choose any other unmet need if you don't want to use COVID-19). Key things you should clearly explain in the pitch include:

- Introduction to unmet need
- Your product
- Your team (make up fictitious roles for each person on team)
- Market size
- Competitors (and how you differentiate)
- Opportunity and value proposition (what size of the market can you capture and when will you be profitable)
- Intellectual property (this can be fictitious but should be realistic, e.g. do you have patents?).
- Therapeutic product profile
- Business model
- Request - Explain at the end of the pitch the future goals and what you are hoping to achieve with the \$10M.

Each team will submit an (5 min max) video .mp4 file prepared in PowerPoint (or similar) with voiceover and video of the presenter. Each team member must present at least one slide. The presentations will be uploaded on Moodle in Week 10.

Note: The assignment requirements and the grading rubrics will be discussed in further detail during the tutorial sessions.

Examples of previous high-quality efforts will be uploaded on Moodle

Quizzes

Two quizzes will be worth 20% each.

Quiz format may include multiple choice, true/false, and/or short answer questions.

11. Special consideration/further assessment - Term 1 2021

Students who believe that their performance, either during the session or in the end of session exams, may have been affected by illness or other circumstances may apply for special consideration. Applications can be made for compulsory class absences such as (laboratories and tutorials), in-session assessments tasks, and final examinations. **Students must make a formal application for Special Consideration** for the course/s affected as soon as practicable after the problem occurs and **within three working days of the assessment to which it refers**. Students should consult the A-Z section of the student guide, www.student.unsw.edu.au, particularly the

section on “Special Consideration”, for further information about general rules covering examinations, assessment, special consideration and other related matters. This information is published free in your UNSW Student Diary and is also available on the web at:

<https://student.unsw.edu.au/special-consideration>

HOW TO APPLY FOR SPECIAL CONSIDERATION

Applications must be made via Online Services in myUNSW. **You must obtain and attach Third Party documentation before submitting the application. Failure to do so will result in the application being rejected.** Log into myUNSW and go to **My Student Profile tab > My Student Services channel > Online Services > Special Consideration**. After applying online, students must also verify supporting their documentation by submitting to Student Central at

<https://nucleus.unsw.edu.au/>

- Originals or certified copies of your supporting documentation. Visit <https://nucleus.unsw.edu.au/Studentadmin/special-consideration>. Student Central can certify your original documents), and/or
- A completed Professional Authority form which can be downloaded at <https://student.unsw.edu.au/sites/all/files/uploads/group47/forms/ProfessionalAuthority.pdf>

The supporting documentation must be submitted to Student Central for verification **within three working days** of the assessment or the period covered by the supporting documentation. Applications which are not verified will be rejected.

Students will be contacted via the online special consideration system as to the outcome of their application. Students will be notified via *their official university email once an outcome has been recorded.*

SUPPLEMENTARY EXAMINATIONS:

The University does not give deferred examinations. However, further assessment exams may be given to those students who were absent from the final exams through illness or misadventure. Special Consideration applications for final examinations and in-session tests will only be considered after the final examination period when lists of students sitting supplementary exams/tests for each course are determined at School Assessment Review Group Meetings. Students will be notified via the online special consideration system as to the outcome of their application. **It is the responsibility of all students to regularly consult their official student email accounts and myUNSW in order to ascertain whether or not they have been granted further assessment.**

For Term 1 2021, Supplementary Exams will be scheduled on:

► 24-28 May 2021

Further assessment exams will be offered on this day ONLY and failure to sit for the appropriate exam may result in an overall failure for the course. Further assessment will NOT be offered on any alternative dates.

12. UNSW Academic Honesty and Plagiarism

The University regards plagiarism as a form of academic misconduct and has very strict rules regarding plagiarism. For UNSW policies, penalties, and information to help you avoid plagiarism see: <https://student.unsw.edu.au/plagiarism>

What is Plagiarism?

Plagiarism is the presentation of the thoughts or work of another as one's own. *Examples include:

- direct duplication of the thoughts or work of another, including by copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, web site, Internet, other electronic resource, or another person's assignment without appropriate acknowledgement;
- paraphrasing another person's work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
- piecing together sections of the work of others into a new whole;
- presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and
- claiming credit for a proportion a work contributed to a group assessment item that is greater than that actually contributed.†

For the purposes of this policy, submitting an assessment item that has already been submitted for academic credit elsewhere may be considered plagiarism.

Knowingly permitting your work to be copied by another student may also be considered to be plagiarism.

Note that an assessment item produced in oral, not written, form, or involving live presentation, may similarly contain plagiarised material.

The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does *not* amount to plagiarism.

The Learning Centre website is main repository for resources for staff and students on plagiarism and academic honesty. These resources can be located via:

<http://www.lc.unsw.edu.au/academic-integrity-plagiarism>

The Learning Centre also provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:

- correct referencing practices;
- paraphrasing, summarising, essay writing, and time management;
- appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.

Individual assistance is available on request from The Learning Centre.

Students are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting, and the proper referencing of sources in preparing all assessment items.

* Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle

† Adapted with kind permission from the University of Melbourne.