Faculty of Medicine

School of Medical Sciences

DEPARTMENT OF PHARMACOLOGY

PHAR 3101
Drug Discovery, Design and Development

COURSE OUTLINE

Term 3, 2019

CRICOS Provider Code: 00098G

CONTENTS

Please read this outline in conjunction with the following pages on the School of Medical Sciences website:

- Advice for Students
- Learning Resources

(or see "STUDENTS" tab at medicalsciences.med.unsw.edu.au)

PHAR3101 Course Information

Drug Discovery, Design and Development (PHAR3101) is a 3rd year Science course worth six units of credit (6 UOC). The course is usually undertaken as part of a major in Pharmacology for the Bachelor of Science (Adv.) or Bachelor of Medical Sciences or as part of the Bachelor of Medicinal Chemistry. The course builds on the knowledge you have gained in Pharmacology (PHAR2011).

OBJECTIVES OF THE COURSE

This course will explore the process of drug development, from target identification to final drug registration. It will present drug development as a process involving target selection, hit discovery using computer-based methods, combinatorial chemistry/high-throughput screening. Lead identification and optimisation via the use of structure activity series and computational methods will be covered. Safety evaluation, bioavailability, clinical trials, and the essentials of intellectual property, regulatory affairs and commercialisation will also be discussed. Along the way, you will learn about screening assays, computer-aided drug design, and toxicology as applied to the development of new medicines.

COURSE CONVENER and LECTURERS:

Course Convener:

Dr. Angela Finch

a.finch@unsw.edu.au

Wallace Wurth Building, level 3E, ph: 9385 1325

Co-Convener:

Dr Nicole Jones

n.jones@unsw.edu.au

Wallace Wurth Building, level 3E,

Students wishing to see the course staff should make an appointment via email as our offices are not readily accessible. We will organize to meet you in a convenient location elsewhere in the building.

Lecturers in this course:

Dr Trudie Binder	w.binder@unsw.edu.au
Dr Orin Chisholm	o.chisholm@unsw.edu.au
Ms Teresa Domagala	Teresa.Domagala@tevapharm.com
Prof Peter Gunning	p.gunning@unsw.edu.au
Dr Nicola Smith	nicola.smith@unsw.edu.au
Dr Alastair Stewart	a.stewart@victorchang.edu.au

COURSE STRUCTURE and TEACHING STRATEGIES

Learning activities occur on the following days and times:

- Lectures: Wednesday 1-2 pm and Friday 12-1pm
- Tutorials: Friday 3-4 pm or 4-5 pm
- Practicals: Wednesday 3-6 pm

Students are expected to attend all scheduled activities for their full duration (2 hours of lectures per week and 4 hours of practical and tutorial sessions per week, plus complete any online activities provided. Students are reminded that UNSW recommends that a 6 units-of-credit course should involve about 125-150 hours of study and learning activities. The formal learning activities are approximately 70 hours throughout the semester and students are expected (and strongly recommended) to do at least the same number of hours of additional study.

Lectures will provide you with the concepts and theory essential for understanding the processes involved in drug development. To assist in the development of research and analytical skills practical classes and tutorials will be held. These classes and tutorials allow students to engage in a more interactive form of learning than is possible in the lectures. The skills you will learn in practical classes are relevant to your professional development.

APPROACH TO LEARNING AND TEACHING

The learning and teaching philosophy underpinning this course is centred on student learning and aims to create an environment which interests and challenges students. The teaching is designed to be relevant and engaging in order to prepare students for future careers.

Although the primary source of information for this course is the material covered in lectures, tutorials, and practical classes, effective learning can be enhanced through self-directed use of other resources such as textbooks and Web based sources. Your practical classes will be directly related to the lectures and it is essential and required to prepare for practical classes before attendance *via* the pre-lab modules. It is up to you to ensure you perform well in each part of the course: preparing for classes; completing assignments; studying for exams and seeking assistance to clarify your understanding.

TEXTBOOK AND READING LIST

Recommended Primary Texts:

- Drug Discovery and Development - Technology in Transition. Hill & Rang. Elsevier Ltd 2nd edition 2013.
- Pharmacology in Drug Discovery: understanding drug response T. P. Kenakin. Elsevier, 2nd Edition 2012.

These textbooks will be available at the UNSW bookshop. They are also available in print and online formats from the library.

Other Resources:

The following electronic journals are accessible *via* the UNSW library.

- Nature Reviews: Drug Discovery.
- Drug discovery today.
- Pharmacology & Pharmaceutical Medicine Study guide http://subjectguides.library.unsw.edu.au/medicine/pharmacology

Links to additional sources to supplement the material covered in the lectures will be placed on the lecture pages on Moodle.

STUDENT LEARNING OUTCOMES

PHAR3101 will develop those attributes that the Faculty of Science has identified as important for a Science Graduate to attain and the Learning Objectives of the Pharmacology Major.

A. Research, inquiry and analytical thinking abilities.
B. Capability and motivation for intellectual development.
C. Ethical, Social and Professional Understanding.
D. Communication.
E. Teamwork, collaborative and management skills.
F. Information literacy.

Pharmacology Major Learning Outcomes

i. Demonstrate an understanding of how drugs/therapeutics are developed, work and are used safely.
ii. Critically analyse, interpret and effectively communicate pharmacology data and literature.
iii. Design and/or execute experiments or other activities to address pharmacological scenarios.

On completion of this course students should be able to:

1. demonstrate an understanding of the steps involved in drug development from bench to bedside.
2. apply knowledge of the drug development process and identify challenges and benefits of different approaches to address novel scenarios.
3. critically analyse scientific literature and experimental data and communicate their findings.
4. show an understanding of teamwork and the contributions of different discipline areas to drug development

See also: UNSW Graduate Outcomes Science Graduate Attributes

ASSESSMENT PROCEDURES

- Progress exam (50 min duration): **10 %**
- Research Report **20 %**
- Stages of Drug Design and Development Process **15 %**
- End of session examination (2 hours duration) **55 %**
- Formative assessment

The *practicals and tutorials* are provided to support lecture material and practise analytical skills. The practical classes and tutorials help you to develop graduate attributes A, C, D & E.

You will submit a written report covering four of the practical sessions. The report should be in the form of a scientific communication comprising introduction, methods, results and discussion (see below for instructions). You will work in teams to research the drug discovery process of a given drug and the teamwork involved in that process. These assessment tasks will allow you to develop your research, information literacy, communication and time management skills, as well as allowing you to demonstrate your ability to work in a team and collaborate successfully (Graduate attributes A, B, C, D, E & F) and enable you to demonstrate your mastery of learning outcomes 1, 2, 3 & 4. The marking criteria and instructions are provided below.

A penalty will apply for late submissions of assessment tasks (10% per day).

The *progress examination* will be held during the Wednesday 1 pm lecture session in week 5, on the 16th of October. This exam will give you feedback on how you are succeeding in the course. The *progress examination* and *end of session examination* will test not only your knowledge of the process of drug design and development but also your ability to apply the knowledge you have acquired from multiple lectures, practicals and tutorials to drug development scenarios. The examination will be in the format of short and long answer questions. The questions will be based on the material covered in the lectures, practical classes and tutorials. Material covered prior to the progress exam may be examined again in the final exam. The examinations will address graduate attributes A and B and enable you to demonstrate your mastery of learning outcomes 1, 2 & 3. The end of session examination will be held during the official examination period.

The goal of *formative assessment* is to provide ongoing feedback that you can use to improve your learning. Formative assessment tasks help students identify their strengths and weaknesses and therefore the areas they should focus on. The formative assessment will take the form of tutorial questions. Tutorial questions will be posted on Moodle a week before scheduled tutorial sessions and feedback will be provide in the tutorial classes.

COURSE EVALUATION AND DEVELOPMENT

Each year feedback is sought from students about the courses offered in the Department of Pharmacology and continual improvements are made based on this feedback. The UNSW myExperience survey is the way in which student feedback is evaluated and significant changes to the course will be communicated to subsequent cohorts of students. Also, a staff-student liaison group will be set up and students will be invited to become class representatives to seek feedback from their colleagues and meet with academic staff to discuss any issues that arise. Based on feedback given in these meetings changes will be implemented during the course and for future years.

We appreciate student feedback because we are always looking for ways to improve your learning experience in this course. Below is a summary of the feedback from the previous student cohort in this course and our response to how we improved this year's course delivery.

Previous students told us that: They liked the structure and content of the course, especially the real-life examples and that all the components were integrated. Especially that the course covers the Drug Discovery, Design and Development process from start to end providing an understanding of how the industry functions. They commented on the enthusiasm and passion of the teaching staff and that they liked they got to hear from researchers and workers in the field presenting relevant and current content. They commented that the labs were exciting and a highlight for many students was the excursion to the phase I clinical trials unit. They also liked the assessment tasks especially the drug development timeline and thought they were well spaced through the semester.

When asked what could be improved in the course the most frequent responses were regarding allowing more time to complete the manuscript assignment and reduction of the length of the manuscript. Students suggested that more help be provided, possibly in the form of more videos, to help them understand how to use Prism and the other software used in the practical classes. It was also suggested that a peer review component be added to the timeline assignment.

In the last couple of years, we have responded to this feedback by reducing the word count of the practical report along with an online tutorial being developed to help student to complete this task. More explanation of each step of using the software has been provided in the practical manual along with online “how-to” videos. A peer review component has been added to the timeline assignment. In preparation for the transition to the 10-week format student focus groups were consulted and their suggestions and feedback have been incorporated.

GENERAL INFORMATION

The Department of Pharmacology is part of the School of Medical Sciences and is within the Faculty of Medicine. It is located in the Wallace Wurth building. General inquiries can be made online via UNSW Student Portal Web Forms: http://unsw.to/webforms.

Professor Margaret Morris is Head of Department and appointments to meet with her may be made via email (m.morris@unsw.edu.au).

There is an honours program conducted by the School. The Honours program is coordinated by Dr Cristan Herbert (c.herbert@unsw.edu.au), Ph: 9385 8679. Any students considering an Honours year should discuss the requirements with the coordinator.

Honours Administrator: Vicky Sawatt (v.sawatt@unsw.edu.au) Ph:9385 8195.

Postgraduate degrees

The Department of Pharmacology offers students the opportunity to enter the following graduate programs:

Course Work Masters: Masters in Pharmaceutical Medicine. For more information contact Dr Orin Chisholm (o.chisholm@unsw.edu.au)

Research Masters: In Pharmacology. Contact the post-graduate co-ordinators A/Prof Pascal Carrive (p.carrive@unsw.edu.au) and Dr Nicole Jones (n.jones@unsw.edu.au)

Doctorate (***Ph.D)***: In Pharmacology. Contact the post-graduate co-ordinators A/Prof Pascal Carrive (p.carrive@unsw.edu.au) and Dr Nicole Jones (n.jones@unsw.edu.au).

Attendance Requirements

For details on the Policy on Class Attendance and Absence see Advice for Students and the Policy on Class Attendance and Absence.

Practical Classes

The practical class is an opportunity for students to develop graduate attribute C by behaving in an ethical, socially responsible and professional manner within the practical class.

The pre-lab module for each practical class must be completed at least 1 hour prior to attending each practical class. All pre-lab module questions must be completed before you will be allowed entry into the practical class. Students who do not successfully complete the module will need to do the pre-lab module in class prior to starting the experiment. This policy will be strictly enforced. At the start of each class a member of staff will check that the pre-lab is completed and record your attendance in the class roll.

The pre-lab module will inform you of any hazards in the class and safety procedures to follow to mitigate these hazards. Students must take due care with biological and hazardous material and make sure all equipment is left clean and functional. In the interests of safety, special attention should be paid to any precautionary measures recommended in the notes. If any accidents or incidents occur, they should be reported immediately to the demonstrator in charge of the class who will record the incident and recommend what further action is required.

For more details see Advice for Students-Practical Classes

Special Consideration

Please see UNSW-Special Consideration and Student Advice-Special Consideration

If you unavoidably miss the progress exam in PHAR3101, you must lodge a Special Consideration application online via myUNSW. If your request for consideration is granted an alternative assessment will be organised which may take the form of a supplementary exam or increased weighting of the final exam

Student Support Services

Details of the available student support services can be found at Student Advice-Student support services.

Appeal Procedures

Details can be found at Student-Advice-Reviews and Appeals

Academic Integrity and Plagiarism

The School of Medical Sciences will not tolerate plagiarism in submitted written work. The University regards this as academic misconduct and imposes severe penalties. Evidence of plagiarism in submitted assignments, etc. will be thoroughly investigated and may be penalised by the award of a score of zero for the assessable work. Flagrant plagiarism will be directly referred to the Director of Integrity for disciplinary action under UNSW rules.

The UNSW Student Code outlines the standard of conduct expected of students with respect to their academic integrity and plagiarism.

More details of what constitutes plagiarism can be found here

PHAR3101 Drug Discovery, Design and Development – Timetable 2019

Wk	Wednesday 1-2pm Lecture 1 TETB LG07	Wednesday 3-6pm Practical 3 hours	Friday 12pm Lecture 2 ChemSc M10	Friday 3-4,4-5pm Tutorial Mat 106	Online
1	The drug discovery process: Choosing the project A. Finch	Teamwork in pharm industry	Novel target identification and validation P. Gunning	The drug discovery process: Choosing the project	Gene modification techniques in drug discovery N. Smith
2	Target Selection A. Finch	Target validation	Hit identification A. Finch	Target Selection and validation	Prac_Hit optimisation: radioligand binding
3	High-throughput screening A. Finch	Drug validation	Sources of active compounds A. Finch	Hit identification & HTS screening	
4	Ligand-based drug design A. Finch	Hit optimisation: cAMP	Structural biology in drug development A. Stewart	Structure Activity Relationships	
5	**Progress Exam**	Hit optimisation: data analysis	Structure-based drug design A. Finch	Structural based drug discovery	
6	Intellectual property A. Finch	Computational Drug discovery	Bioavailability A. Finch	Sources of active compounds & Intellectual property	Prac_How to write a technical report
7	Pro-drugs and drug delivery T. Binder	Careers in Drug Discovery	Pre-clinical toxicology – *in vitro* N. Smith	Drug Delivery and Bioavailability	
8	Pre-clinical toxicology – *in vivo* N. Jones	Preclinical toxicology: Ames test 1	Clinical trials N. Jones	Pre-clinical toxicology	
9	Clinical trial design N. Jones	Preclinical toxicology: Ames test 2	Ethics of human and animal experimentation N. Jones	Clinical trial design	
10	Biopharmaceuticals T. Domagala	Phase I Clinical Trials	Regulatory Affairs O. Chisholm	Regulatory Affairs & Biopharmaceuticals	Commercialisation O. Chisholm