



Faculty of Medicine and Health  
School of Medical Sciences

# PHAR 3102

## Molecular Pharmacology

COURSE OUTLINE

Term 1, 2021

CRICOS Provider Code 00098G

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## PHAR3102 Course Information

Molecular Pharmacology (PHAR3102) is a 3<sup>rd</sup> year Science Course worth six units of credit (6 UOC). The course is usually undertaken as part of a major in Pharmacology in a Bachelor of Science or Bachelor of Medical Sciences and as part of the Medicinal Chemistry Program. This course builds on the information you have already gained in Introductory Pharmacology and Toxicology (PHAR2011).

### OBJECTIVES OF THE COURSE

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You will learn the molecular basis of drug action and explore how cutting-edge biotechnology and biomedical research advances pharmacological knowledge. Detailed coverage includes: genetic variability in drug action, protein structure-activity relationships, receptor-ligand interactions, signal transduction, biochemical and molecular aspects of drug targets and their signalling mechanisms. The course has a strong focus on developing research and analytical skills.

### COURSE CO-ORDINATOR and LECTURERS

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Course Convenor:

Dr Angela Finch

Rm 326 Wallace Wurth Building East ph: (02) 9065 1017

Co-Convenor

Dr Lu Liu

Rm 325 Wallace Wurth Building East

Students wishing to speak to the course convenor(s) should make an appointment *via* email. We will organize to meet you via teams at a suitable time for both parties.

Lecturers in this course:

Dr Jane Carland

[j.carland@unsw.edu.au](mailto:j.carland@unsw.edu.au)

Dr Angela Finch

[a.finch@unsw.edu.au](mailto:a.finch@unsw.edu.au)

Dr Nicole Jones

[n.jones@unsw.edu.au](mailto:n.jones@unsw.edu.au)

Dr Trevor Lewis

[t.lewis@unsw.edu.au](mailto:t.lewis@unsw.edu.au)

A/Prof Lu Liu

[lu.liu@unsw.edu.au](mailto:lu.liu@unsw.edu.au)

Dr Nicola Smith

[n.smith@victorchang.edu.au](mailto:n.smith@victorchang.edu.au)

Please read this manual/outline in conjunction with the following pages on the [School of Medical Sciences website](#):

- [Advice for Students](#)
- [Learning Resources](#)

(or see "STUDENTS" tab at [medicallsciences.med.unsw.edu.au](http://medicallsciences.med.unsw.edu.au) )

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## **COURSE STRUCTURE and TEACHING STRATEGIES**

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Learning activities occur on the following days and times:

- Q&A session: Tuesday 10-11am. The topics covered in the Q&A session will be available online. Students should view these lessons prior to the Q&A session and come to the Q&A session with questions to ask.
- Collaborative Learning Session: Thursday 12 -1 pm or 1 -2 pm
- Practicals: Wednesday 9 am-12 pm

Students are expected to engage with all activities for their full duration (2-3 hours of lectures per week and 3 hours of practical and 1-hour collaborative learning sessions per week). Students are reminded that UNSW recommends that a 6 units-of-credit course should involve about 150 hours of study and learning activities. The formal learning activities are approximately 55 hours throughout the term and students are expected (and strongly recommended) to do at least the same number of hours of additional study *i.e.*, 6-10 hours per week.

Lectures will provide you with the concepts and theory essential for an understanding of molecular pharmacology. To assist in the development of research and analytical skills practical classes and collaborative learning sessions will be held. These classes 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.

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## **APPROACH TO LEARNING AND TEACHING**

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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 engaging and relevant in order to prepare students for future careers.

Although the primary source of information for this course is the lecture material, 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 to prepare for practical classes before attendance. 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.

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## **TEXTBOOKS AND OTHER RESOURCES**

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Due to the cutting-edge nature of this course and the rapid advances made in the field of Molecular Pharmacology, a single primary text which adequately covers the content of this course has not been identified. Therefore, each lecturer will provide you with additional resources to supplement their lecture material. These resources will take the form of textbooks, journal articles or web-based resources. If available, links to the electronic form of these resources will be put on the course Moodle page.

Two textbooks have been identified that together cover the majority of the course content. These texts are also available as online resources from the UNSW library

“Pharmacology in drug discovery: understanding drug response” by T. P. Kenakin.

“Molecular Pharmacology: From DNA to Drug Discovery” by Dickenson, Freeman, Lloyd Mills, Thode, & Sivasubramaniam.

“General and Molecular Pharmacology: Principles of Drug Action” Edited by Francesco Clementi and Guido Fumagalli, will be used as an additional reference text throughout the course.

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## STUDENT LEARNING OUTCOMES

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PHAR3102 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.

### Pharmacology Major Learning Outcomes

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

### PHAR3102 Learning Outcomes

On completion of this course students should:

1. be able to describe the genomic regulation of drug action
2. be able to discuss the molecular pharmacology of receptors, channels and enzymes
3. apply their knowledge of molecular biology techniques to the design of an experiment to test a molecular pharmacology hypothesis
4. be able to accurately record experimental data and draw conclusions from experimental data
5. be able to demonstrate their ability to communicate scientific information effectively to a variety of audiences and in a variety of formats.

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## ASSESSMENT PROCEDURES

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|---|------------|
| • Progress exam (45 min duration)               | <b>15%</b> |
| • Laboratory notebook                           | <b>15%</b> |
| • Collaborative Learning Activities             | <b>15%</b> |
| • End of session examination (2 hours duration) | <b>55%</b> |

The *practicals* are provided to support lecture material and practise analytical skills. The practical classes and collaborative learning sessions help you to achieve the learning outcomes 1-5.

In the collaborative learning sessions, you will work in teams to learn about techniques used in molecular pharmacology. You will then apply this knowledge in the critical analysis and interpretation of data presented in a journal article. This assessment task will allow you to develop your research, information literacy, critical analysis skills, communication and time management skills.

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

The *progress examination* will be held in the lecture slot on Tuesday the 16<sup>th</sup> of March, 10am. 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 molecular pharmacology of receptors, channels and transporters, and molecular techniques used in pharmacology but also your ability to apply the knowledge you have acquired from multiple lectures, collaborative learning sessions and practicals to molecular pharmacology scenarios. The examinations may be in the format of MCQ, short and long answer questions. The questions will be based on the material covered in the lectures, practical classes and collaborative learning sessions. Material covered prior to the progress exam may be again

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examined in the final exam. The examinations will address learning outcomes 1-5. The end of session examination will be held during the official examination period.

## **COURSE EVALUATION AND DEVELOPMENT**

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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.

Since the course last ran in 2020, PHAR3102 has undergone a major review and redesign to fit into the new  $\leq 9$ -week format of the term. This has included changes to the topics covered, the practicals are all new to the course with the exception of the first and last practicals, the collaborative learning sessions have been redesigned and will have a new delivery mode. The assessment tasks have also been changed as there is no longer a teamwork task, which is a bit sad as the peer-led activities in the collaborative learning sessions were always fun as well as excellent learning opportunities. While there have been major changes to the course the fundamental essence of the course remains and builds on the feedback and changes provided by former students over the past 12 years. You can read the feedback from previous cohorts below.

Based on the feedback received; in 2009 and 2010: questions were provided to help focus the reading of journal articles for collaborative learning sessions, the proportion of total marks for the final examination was reduced, marks to encourage participation in collaborative learning sessions were given, smaller practical classes and reduction in the length of each experiment to ensure it can be completed within a three hour practical class were implemented; In 2011: the journal club questions are referenced back to the lectures to a greater extent. Dr Finch has worked with Prof Kenakin to develop a textbook that covers some parts of the course; in 2012: formative quizzes have been added to provide more continual feedback and a new textbook was trialled; in 2013: the practical manual was revised. In 2014: the order of the topics covered in the collaborative learning sessions has been changed to better match with the lecture content; in 2015: the unannounced 'spot quizzes' are now timetabled quizzes; additional information is provided for each wiki topic to help focus the wiki to the most relevant information; in 2017: the final exam has been reduced from 60% to 55% and the weighting of the journal club component of the collaborative learning sessions has also been increased; in 2018 the number of questions needing to be answered for the journal club has been reduced. In 2019: the lab notebooks will be marked throughout the term, and a peer contribution mark has been added to the learning activity grading. In 2020, more guidance, including online videos and lessons, has been provided to assist in the completion of the lab book and journal club assessment tasks. Online lectures have been modified to have shorter video/activities and the practicals revised to help with time management. Unfortunately, in term 1 2020 the myexperience survey didn't ask students to comment on the best things about the course or about what could be improved so we can't tell you what all the students thought of the course. The student reps reported that overall, the course was well organised and that they liked the structure and how it built on the material throughout the course and that there was good alignment of the lectures and practicals. They liked that the molecular techniques lessons help with understanding the journal club papers. Students liked that the CLS technique-based understanding helped with broader understanding of the topic and noted that not many courses do this. Students liked the podcast giving feedback on progress exam and that there is a choice of questions in the exams as it takes pressure off. They thought that the formative quizzes were helpful with Quiz 1 being a bit of wake-up call. Overall fair assessment.

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## GENERAL INFORMATION

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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.

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

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

### **Postgraduate degrees**

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

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

### **Enrolment and administrative help**

The Student Administration Officers are available to help with problems with enrolment and scheduling and should be the first point of contact for administrative problems. They can be contacted via the UNSW Student Portal Web Form.

<http://unsw.to/webforms>

### **Attendance Requirements**

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For details on the Policy on Class Attendance and Absence see [Advice for Students](#) and the [Policy on Class Attendance and Absence](#).

Attendance at practical and tutorial classes will be recorded on the class roll at the start of each class. Arrival more than 15 minutes after the start of the class will be recorded as non-attendance. It is your responsibility to ensure that the teaching staff records your attendance and no discussions will be entered into after the completion of the class. Satisfactory completion of the work set for each class is essential.

### **Practical Classes**

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

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**

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Please see [UNSW-Special Consideration](#) and [Student Advice-Special Consideration](#)

Final exam period for Term 1, 2021 is Friday, 30 April to Thursday, 13 May  
Supplementary exam period for Term 1, 2021 is Monday, 24 May to Friday, 28 May

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If you unavoidably miss the progress exam in PHAR3102, you must lodge an application with UNSW Student Central for special consideration. If your request for consideration is granted an alternative assessment will be organised which may take the form of an increased weighting of the final exam.

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### **Student Support Services**

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Details of the available student support services can be found at [Student Advice-Student support services](#).

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### **Appeal Procedures**

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Details can be found at [Student-Advice-Reviews and Appeals](#)

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### **Academic Integrity and Plagiarism**

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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 penalized by the award of a score of zero for the assessable work. Flagrant plagiarism will be directly referred to the Division of the Registrar 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](#)

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Wk	starting	Topics Pre-recorded or online modules* (you should schedule time to watch these recordings before the Q&A session)	Q&A Tuesday 10-11am Online	Practical Wednesday 9am-12pm Online except weeks 7/8	Collaborative Learning Thursday 12-1/1-2pm	Assessment
1	15/2	<ul style="list-style-type: none"> <li>• Introduction to Molecular Pharmacology</li> <li>• GPCRs: <ul style="list-style-type: none"> <li>○ Introduction to the Families</li> <li>○ Activation Mechanism</li> </ul> </li> </ul>		Intro to pracs and lab record keeping	Introduction to CLS/ Molecular Techniques	
2	22/2	<ul style="list-style-type: none"> <li>• Advanced Pharmacodynamics <ul style="list-style-type: none"> <li>○ measuring drug response</li> <li>○ binding kinetics</li> </ul> </li> </ul>		Determining Antagonist Potency	Molecular Techniques	Quiz-Wednesday-during prac Lab book-Friday 5pm
3	1/3	<ul style="list-style-type: none"> <li>• Second Messengers</li> <li>• G proteins <ul style="list-style-type: none"> <li>○ Introduction to G proteins &amp; G <math>\alpha</math> subunits</li> <li>○ G <math>\beta\gamma</math> subunits</li> </ul> </li> </ul>		Receptor binding	Journal Club	JC-Thursday-before class Lab book-Friday 5pm
4	8/3	<ul style="list-style-type: none"> <li>• Constitutively Active Receptors/ Inverse agonists</li> <li>• Regulation of GPCR Signalling</li> <li>• Internalisation &amp; Endosomal Signalling</li> </ul>		Is my drug biased? Week 1	Molecular Techniques	Quiz-Wednesday-during prac
5	15/3	Receptor Theory: <ul style="list-style-type: none"> <li>○ Occupation and Operational Models</li> <li>○ Ternary Complex Model and ETCM</li> <li>○ Induced Fit vs Conformational Selection</li> </ul>	<b>Mid-term EXAM</b>	Is my drug biased? Week 2	Journal Club	JC-Thursday-before class
6	22/3	Flexibility week				
7	29/3	<ul style="list-style-type: none"> <li>• Biased Signalling</li> <li>• Allosteric Modulators</li> </ul>		Is my drug biased? (On campus Group 1)	Molecular Techniques	Quiz-Wednesday-during prac
8	5/4	<ul style="list-style-type: none"> <li>• Orphan Receptors</li> <li>• Ligand-Gated Ion Channel</li> </ul>		Is my drug biased? (On campus Group 2)	Journal Club	JC-Thursday-before class
9	12/4	<ul style="list-style-type: none"> <li>• Nuclear Receptors /Transcription Factors</li> <li>• Pharmacogenetics/genomics</li> </ul>		Is my drug biased? Data analysis	Molecular Techniques	Quiz-Wednesday-during prac Lab book-Friday 5pm
10	19/4	<ul style="list-style-type: none"> <li>• Transporters</li> <li>• Catalytic Receptors</li> </ul>		Pharmacogenetics	Journal Club	JC-Thursday-before class Lab book-Friday 5pm JC reflection- Monday 26th 9 am