DEPARTMENT OF PHARMACOLOGY

PHAR 3251

Clinical & Experimental Pharmacology

COURSE OUTLINE

SESSION 1, 2016

CRICOS Provider Code 00098G
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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](http://medicalsciences.med.unsw.edu.au))
Clinical & Experimental Pharmacology (PHAR3251) is a 3rd year Science Course worth Six Units of Credit (6 UOC). The course is required as part of a major study plan in Pharmacology for the Bachelor of Science or Bachelor of Medical Sciences. The course will build on the information you have gained in Pharmacology (PHAR2011) and Physiology (2101 & 2201) as well as Biochemistry (BIOC2101/2181) and Molecular Biology (2201/2291) or Chemistry (2021/2041).

OBJECTIVES OF THE COURSE
Building on basic pharmacology skills learned in PHAR 2011, the objectives of this course are to a) introduce and develop an understanding of the use of selected formulae to predict drug concentration in, and clearance from, the human body b) provide both knowledge and conceptual understanding of the use and action of various classes of drugs in the treatment of different human diseases and c) develop an appreciation of the need for further research to identify new drug targets for more effective therapies.

COURSE CO-ORDINATOR and LECTURERS
Course Coordinator: Dr Trudie Binder ph: 9385 8737
Consultation times: By appointment email or phone.

Co – Coordinator: Dr Greg Smith ph: 9385 58075
Consultation times: By appointment email or phone.

Lecturers in this course:
- Dr Trudie Binder  w.binder@unsw.edu.au
- Prof Ric Day  r.day@unsw.edu.au
- Dr Ross Grant  r.grant@unsw.edu.au
- Dr Lu Liu  lu.liu@unsw.edu.au
- Prof Margaret Morris  m.morris@unsw.edu.au
- A/Prof Larry Wakelin  l.wakelin@unsw.edu.au
- Dr Greg Smith  g.smith@unsw.edu.au
- Dr Johnson Liu  johnson.liu@unsw.edu.au

COURSE STRUCTURE and TEACHING STRATEGIES
This is a 6 unit course and consists of:
- 2 lectures per week
- practical/tutorial sessions of up to 4 hours per week.

Students are expected to attend all scheduled activities for their full duration. Students are reminded that UNSW recommends that a 6 units-of-credit course should involve about 150-180 hrs of study and learning activities. The formal learning activities are approximately 76 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 mechanism of action and clinical effects of drug classes. For each disease the pathological process will be outlined in the lecture and the relevant drug targets in the disease process identified and current pharmacological treatments will be described. While lectures will focus on the mechanism of action and adverse effects of drugs currently in use, potential new therapies, drug targets and areas requiring further research for more effective therapies, will be identified and discussed.
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 development as professional scientists.

**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, challenges, and enthuses students. The teaching is designed to be relevant and engaging in order to prepare students for future careers in Pharmacology.

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.

**STUDENT LEARNING OUTCOMES**

PHAR3251 will develop those attributes that the Faculty of Science has identified as important for a Science Graduate to attain. These include; skills, qualities, understanding and attitudes that promote lifelong learning that students should acquire during their university experience.

Graduate Attributes
- A. Research, inquiry and analytical thinking abilities
- B. The capability and motivation for intellectual development
- C. Ethical, social and professional understanding
- D. Effective communication
- E. Teamwork, collaborative and management skills
- F. Information Literacy – the skills to locate evaluate and use relevant information.

On completion of this subject students should:
- 1. be able to list examples of generic drugs used to treat major classes of disease.
- 2. be able to outline the mechanism of action of specified drug classes used to treat the major types of disease.
- 3. be able to communicate scientific information in a report.
- 4. be able to demonstrate their ability to work in teams and communicate scientific information effectively.
ASSESSMENT PROCEDURES

<table>
<thead>
<tr>
<th>Assessment Procedure</th>
<th>Date due</th>
<th>% final mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Progress exam (40 min duration)</td>
<td>12 April</td>
<td>15%</td>
</tr>
<tr>
<td>Practical assessment (1st report, data analysis)</td>
<td>2 weeks after practical</td>
<td>10%</td>
</tr>
<tr>
<td>Practical assessment (2nd report, Pharmacokinetics)</td>
<td>2 weeks after practical</td>
<td>5%</td>
</tr>
<tr>
<td>Student poster presentation</td>
<td>17th May</td>
<td>10%</td>
</tr>
<tr>
<td>End of session examination (2 hours duration)</td>
<td>TBA</td>
<td>60%</td>
</tr>
</tbody>
</table>

The practicals and tutorials are provided to support lecture material and practice analytical skills. The practical classes and tutorials help you to develop graduate attributes A, C, D & E. During the practical course you will be required to submit a written report for two of the practical sessions.

Written assessment tasks must be submitted electronically via Moodle, through Turnitin (data analysis report) or a hard copy submitted to G7, Bioscience Building (pharmacokinetics report). A penalty will apply for late submissions (10% per day).

Student poster presentation
Students will work in teams to research their topic for presentation as a scientific poster. The poster will be displayed during a poster presentation and viewing session. The student will be expected to answer questions relating to the topic both individually and as a group. The poster will be marked on set criteria by 2 academic/research reviewers or staff. This assessment task 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, D, E & F).

Progress examination
The progress exam will be held during the session in week 6. 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 drugs used to treat major classes of disease but also your ability to apply the knowledge you have acquired from multiple lectures to identifying areas of research on appropriate drug targets. This examination will be in the form of 20 multiple choice 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 again examined in the final exam. The exam will address graduate attributes A and B.

Final Exam
The end of session examination will be held during the official examination period.
<table>
<thead>
<tr>
<th>MARKING CRITERIA FOR DATA ANALYSIS PRAC REPORT</th>
</tr>
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<tbody>
<tr>
<td><strong>Exemplary (≥8.5)</strong></td>
</tr>
<tr>
<td><strong>Very Good (8.4-7.5)</strong></td>
</tr>
<tr>
<td><strong>Good (7.4-6.5)</strong></td>
</tr>
<tr>
<td><strong>Satisfactory (6.4-5.0)</strong></td>
</tr>
<tr>
<td><strong>Unacceptable (&lt;5.0)</strong></td>
</tr>
<tr>
<td><strong>Title and Formatting</strong></td>
</tr>
<tr>
<td>Title clearly indicates the subject matter of the paper. Name and student number and department address given. Times roman, 12 font, 1.5 line-spacing, Margins 3 cm. Word count ~ 1000</td>
</tr>
<tr>
<td>/10 x 0.5</td>
</tr>
<tr>
<td><strong>Introduction</strong></td>
</tr>
<tr>
<td>Concise and clear account of the scientific background and the rationale of the experiment. Final sentence summarises the broad conclusions of the paper</td>
</tr>
<tr>
<td>/10 x 2</td>
</tr>
<tr>
<td><strong>Methods</strong></td>
</tr>
<tr>
<td>/10 x 1</td>
</tr>
<tr>
<td><strong>Results</strong></td>
</tr>
<tr>
<td>Excellent description of the experimental results. No conclusions or interpretation of results presented. Data analysis was performed correctly</td>
</tr>
<tr>
<td>/10 x 1</td>
</tr>
<tr>
<td><strong>Figures &amp; Legends</strong></td>
</tr>
<tr>
<td>Graph axes labelled and units of measurement given in parentheses. Legends explain the figures in sufficient detail that they can be understood without reference to the text</td>
</tr>
<tr>
<td>/10 x 1</td>
</tr>
<tr>
<td><strong>Discussion &amp; Conclusion</strong></td>
</tr>
<tr>
<td>Discussion is clear and succinct. Extensive interpretation of the results with reference to previous scientific studies. No re-statement of the results. Main conclusions conveyed in a final paragraph.</td>
</tr>
<tr>
<td>/10 x 2.5</td>
</tr>
<tr>
<td><strong>Referencing</strong></td>
</tr>
<tr>
<td>In-text citations and reference list follow BJP conventions. Relevant information selected. A wide range of references used.</td>
</tr>
<tr>
<td>/10 x 1</td>
</tr>
<tr>
<td><strong>Writing Conventions</strong></td>
</tr>
<tr>
<td>Excellent sentence structure, correct grammar and word usage. Sentences and paragraphs well connected. Appropriate written expression- using discipline specific vocabulary and formal not oral language. Has been proof read.</td>
</tr>
<tr>
<td>/10 x 1</td>
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<tr>
<td><strong>Total=</strong></td>
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<tr>
<td>/100</td>
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</tbody>
</table>
PHARMACOKINETICS PRACTICAL REPORT

NOTE: The write up for the Pharmacokinetics practical will require you to answer the questions given at the end of the practical only, see pharmacokinetics practical. A formal report write-up as listed above will not be required.

POSTER PRESENTATION

Academic assessment
Each Student (group) poster will be graded by 2 different academic/staff according to the marking criteria at the scheduled ‘Poster Session’. These marks will be collated by the course coordinator to provide the final grade for the poster.
The group mark will be initially assigned to each member of the group. However an individual’s mark may be scaled down depending on their peer assessment (see, ‘Group-members evaluation’ below).

Poster presentation
Aim: Students will work in teams to research a topic for presentation as a scientific poster. The task requires students to research and evaluate a scientific question and come to a conclusion based on their literature search; this may involve various search strategies. Students can then choose a particular focus, to present in poster format, citing approximately 6-8 of the most relevant papers. Students then present the poster to an audience of their peers, and academic/research staff.

Students present the aims, methods, results and conclusion from their literature search on their chosen topic.
The methodology defines their search strategy and also the background to the data they choose to present some comments on research technique may be provided.

Specifically:
The poster should:
- Clearly state the research question
- Describe the literature retrieval process
- Summarise what is known about the topic on the basis of the review that was conducted
- Answer the research question using the literature found
- Summarise the questions/issues/need for future research (if applicable) that arise from the review conducted
- Makes optimal use of visual aids or other creative elements (pictures, drawings, flow charts, figures, etc.) to illustrate key points and provide additional means for the reader to gain understanding about the technique beyond what is stated in the text.

During the Poster-Presentation-Session all students in the group must demonstrate a knowledge of the topic

Poster Titles - 2016
Posters will be prepared by a group of up to 4 students and will be presented for marking (by 2 reviewers) at the poster session on the 17th of May. The poster presentation will be graded on scientific content, visual communication and verbal presentation.

Poster titles will be made available during week 2 of session 1.
All members of the group will be required to participate in the presentation.
GROUP-MEMBERS EVALUATION (of Poster) FORM

Title of poster: ___________________________________

Name of student doing the assessment: _____________________________

Instructions
Use this form to evaluate the members of your group. Write the name of each group member, including yourself, in one of the columns, then assign a score of 0 to 10 (0 being the lowest grade, 10 the highest) to each group member for each criterion. Because each group member has different strengths and weaknesses, the scores you assign will differ. At the bottom of this sheet, write down any comments you wish to make.

Note: 1) Each student in the group will complete this evaluation for each member of the group.
       2) Students must hand these evaluation forms to the course coordinator during the poster presentation session.
       3) While the overall group mark will be set by the 3 academic reviewers this group member evaluation will be used to scale marks within the group as required.
       4) An individual’s final poster mark will be adjusted if their average peer assessment score is > 15% below the overall average peer assessment score for their group.

The adjustment will generally be made according to the following formula:

\[
\text{Adjusted score} = \frac{\text{Academic poster mark} \times \text{individuals average peer assessment score}}{\text{overall average peer assessment score}}
\]

Criteria | Group Members (name) |
--- | --- |
Regularly attends meetings |  |
Is prepared at the meetings |  |
Meets deadlines |  |
Contributes good ideas |  |
Effort given to researching subject |  |
Submits high-quality work |  |
Listens to other members |  |
Give constructive feedback |  |
Responds to constructive feedback |  |
Your PEER assessment Score of this person’s contribution ( /10) |  |
Comments: |  |
TEXTBOOK AND READING LIST

Recommended Primary Texts

Other relevant texts
Waller, Renwick Hillier Medical Pharmacology and Therapeutics. 2nd ed. Elsevier, Saunders, 2005
Koda-Kimble et al., Applied Therapeutics (The Clinical use of Drugs) 9th ed., Lippincott Williams & Wilkins Pty Ltd, 2009

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 Course and Teaching Evaluation and Improvement [CATEI] Process of the UNSW 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 student feedback forum 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 from students the following changes have been made: The weighting of the end of session final examination has been reduced from 65% to 60%. In addition, extra tutorials have been provided and the Pain pharmacology practical has been replaced with a new practical class ‘Topical analgesia/anaesthesia’ to provide an extra ‘wet practical’ inductive to reasoning in clinical assessment

GENERAL INFORMATION
The Department of Pharmacology is part of the School of Medical Sciences and is within the Faculty of Medicine. It is located on the, 3rd floor of the Wallace Wurth building. General inquiries can be made at the School of Medical Sciences Student Enquiries Counter, located on the Ground Floor, Room G27 Biosciences Building. Office hours are 9.00 am - 5:00pm.

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

Departmental Vacation Scholarships: The Department of Pharmacology supports several summer vacation scholarships each year to enable good students to undertake short research projects within the department. For further details contact the Administrative Officer.

There is an honours program conducted by the School. The Honours program is coordinated by Dr Thomas Fath (t.fath@unsw.edu.au), Ph: 9385 9690. Any students considering an Honours year should discuss the requirements with the coordinator. Outstanding students may be considered for scholarships offered by the University and these are offered annually.

Postgraduate degrees
The Department of Pharmacology offers students the opportunity to enter into the following graduate programs:
**Course Work Masters:** Masters in Drug Development. For more information contact Dr Orin Chisholm (o.chisholm@unsw.edu.au)

**Research Masters:** In Pharmacology. For more information contact the post-graduate co-ordinator Dr Pascal Carrive (p.carrive@unsw.edu.au)

**Doctorate (Ph.D):** In Pharmacology. For more information contact the post-graduate co-ordinator Dr Pascal Carrive (p.carrive@unsw.edu.au)

**The School Teaching Administrator**
Ms Carmen Robinson is able to provide additional information on any courses offered by the School. Student Enquires Counter, Room G27, Biosciences Building, ph:9385 2464. Email: Carmen.Robinson@unsw.edu.au

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**OFFICIAL COMMUNICATION**

All communicate will be via your official UNSW email please see [Advice for Student-Official Communication](mailto:Carmen.Robinson@unsw.edu.au) for more details.

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**ATTENDANCE REQUIREMENTS**

For details on the Policy on Class Attendance and Absence see [Advice for Students](mailto:Carmen.Robinson@unsw.edu.au) and the [Policy on Class Attendance and Absence](mailto:Carmen.Robinson@unsw.edu.au).

Guidelines on extra-curricular activities affecting attendance can be found on the School of Medical sciences Website. [http://medicalsciences.med.unsw.edu.au/sites/default/files/Extra-curricularActivitiesSOMS.pdf](http://medicalsciences.med.unsw.edu.au/sites/default/files/Extra-curricularActivitiesSOMS.pdf)

Attendance at practical classes is compulsory, and must be recorded in 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 demonstrator 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. It should be noted that non-attendance for other than documented medical or other serious reasons, or unsatisfactory performance, for more than 1 practical class during the session may result in an additional practical assessment exam or ineligibility to pass the course. Students who miss practical classes due to illness or for other reasons must submit a copy of medical certificates or other documentation to the course coordinator.

**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.

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](mailto:Carmen.Robinson@unsw.edu.au)

**Handwriting**

Please see [Student Advice-handwriting](mailto:Carmen.Robinson@unsw.edu.au).
Academic Integrity and Plagiarism

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.

MISSED EXAMS AND SPECIAL CONSIDERATION

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

If you unavoidably miss an exam in PHAR3251, you must lodge an application with UNSW Student Central for special consideration.

PLEASE NOTE that if you miss any examinations for medical reasons you must lodge a medical certificate with UNSW Student Central within 3 DAYS. Your request for consideration will be assessed and a supplementary exam may be granted. You cannot assume you will be granted supplementary assessment.

The supplementary exams for the School of Medical Sciences in Semester 1, 2016 will be held on the 12th, 13th and 14th July, 2016.

MISSED PROGRESS EXAM

If you unavoidably miss the progress exam in PHAR3251, you must inform the course coordinator within 3 DAYS. You must supply adequate documentation (medical certificate) to be considered for any supplementary progress exam. 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.

MEDICAL CERTIFICATES

Students who miss practical classes due to illness or for other reasons must submit a copy of medical certificates or other acceptable documentation to the course coordinator.

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.
LECTURE OVERVIEW AND SUMMARIES

The course timetable can be found on Moodle.
The course is divided into 4 main themes covering the major diseases and therapeutics;

1. Predicting drug concentrations in the body (pharmacokinetics)
2. Drugs affecting diseases and disorders of major systemic organ systems
3. Infection and antimicrobial drugs
4. Cancer chemotherapy

Anti-Hypertensive Drugs
Definition of hypertension, primary (essential) and secondary hypertension, consequences of untreated hypertension, guidelines for treating hypertension, non-pharmacological treatment including lifestyle issues, pharmacological treatment including ACE inhibitors, angiotensin 2 receptor blocking agents, diuretics, calcium channel blocking agents and beta receptor blocking agents

Cardiac Failure
Types of heart failure, causes of heart failure, signs and symptoms of heart failure, pathophysiological changes, non-pharmacological treatment, pharmacological treatment including ACE inhibitors, angiotensin 2 receptor blocking agents, diuretics, beta receptor blocking agents, spironolactone and digoxin

Lipid lowering drugs
Dyslipidaemia is considered a primary contributor to the development of atherosclerosis leading to heart disease. This lecture will outline briefly the pathogenesis of atheroma and the process of lipid transport before discussing the mechanism of action of the major classes of lipid lowering drugs. Limitations of current lipid therapies will be discussed with an emphasis on possible areas of new drug targets.

Haemostasis and Thrombosis drugs
This lecture will review the fundamentals of blood coagulation emphasizing primary elements that underlie haemorrhagic and thrombotic disease. Using this as a foundation the lecture will then discuss the role and mechanism-of-action of the anticoagulant, anti-platelet and thrombolytic drugs currently used in clinical medicine. Limitations of current anticoagulant and thrombotic therapy and possible new drug targets will then be discussed.

Endocrine 1 & 2
After a brief overview of endocrine function, major issues regarding treatment of endocrine disorders will be addressed. The lecture will focus on two common endocrine disorders, thyroid disease and diabetes. Their epidemiology and rationale for treatment will be discussed, including the adverse effects of therapy. The need for ongoing monitoring of therapy will be highlighted.

Renal Pharmacology
This lecture will outline the role played by the kidney in the development of oedema and hypertension. The mechanism of action of important drug classes that act on the kidney will be outlined and their relative merits in controlling disease will be discussed within the clinical context.

Pharmacokinetics 1&2: These lectures will provide an introduction to the calculation of major pharmacokinetic parameters based on either single or 2 compartment modelling. Parameters covered include; half-life, volume of distribution, clearance, dosing rate, maintenance dose and bioavailability. Numerical examples will be given. The accumulation of drugs and fluctuations in plasma levels during long term drug treatment will be discussed.
**Drugs for young and old**
The objectives of this lecture are to understand the factors influencing drug handling in the very young and elderly patient and to be able to describe the effects of ageing on pharmacodynamics and pharmacokinetic parameters. Polypharmacy, multiple diseases and optimal prescribing practice will be discussed.

**Therapeutics of the G.I.T.**
The gastrointestinal tract (G.I.T.) is a complex organ system that, in addition to its digestive capability, possesses an extensive neuronal network and major endocrine functions. A wide range of pathologies affect the G.I.T. and contribute significantly to morbidity within the society. This lecture will discuss the rationale for therapy and the mechanism of action of current drugs affecting gastric secretion and motility and will highlight limitations of current therapy and possible new areas for drug targets.

**Reproductive Pharmacology**
This lecture will review the physiological actions of estrogens, progestins and androgens. The molecular basis of their actions at nuclear receptors will be discussed. The clinical uses of these hormones and antagonists of their receptors in contraception, hormone replacement therapy, prostate cancer and benign prostate hypertrophy will be addressed. The treatment of erectile dysfunction will also be covered.

**Anti-Cancer Drugs 1&2**
Cancer biology including epidemiology, incidence and mortality, tumour genetics, apoptosis, metastasis, tumour vasculature, approaches to cancer treatment, reasons for treatment failure, mechanisms of cancer drug resistance, cancer drug classes including antimetabolites, hormones, hormone antagonists, mitotic spindle inhibitors and DNA-binding agents. Targeting P13 kinase in cancer.

**Antibacterials 1&2**
Lecture 1 covers antibiotic resistance mechanisms and drugs that target DNA biochemistry, including dihydropteroate synthase inhibitors, dihydrofolate reductase inhibitors, and DNA gyrase inhibitors. Lecture 2 addresses cell wall biochemistry and inhibitors of cell wall synthesis (penicillins, cephalosporins, vancomycin), and protein biosynthesis and inhibitors of ribosome function (tetracyclines, aminoglycosides, macrolides).

**Respiratory Pharmacology**
This lecture builds upon the concepts encountered in Introductory Pharmacology ‘The Pharmacology of asthma’. The lecture will focus on chronic airway limitation, a disease state characterized by airflow limitation that is not fully reversible (unlike asthma) leading to chronic bronchitis’s and emphysema. The lecture encompasses bronchodilators, anti-inflammatory drugs, antitussives and respiratory stimulants (analeptic drugs).

**Opioids in pain management:**
This lecture encompasses: analgesic agents; historical introduction to the use of opioids, *Papaver somniferum* and opium; mode of action; the opioid receptors; the endogenous opioids; assessment of analgesic activity, pain measurement and pain control; adverse effects; commonly used opioids including, morphine, codeine, pethidine, methadone, heroin, fentanyl, oxycodone, naloxone, and buprenorphine; tolerance, dependence and opioid kinetics.

**Antiinflammatory/Antiarthritic Drugs**
This lecture will provide a brief overview of the use of pharmacotherapy in the two types of arthritis broadly classified as inflammatory and non-inflammatory arthritis. The objective of drug therapy in these conditions is for symptom control (pain, stiffness, loss of function) and suppression of disease activity in order to prevent long-term damage. The mechanisms of pain, inflammation and joint damage and the pharmacological approaches to dealing with these will be presented.
**Topical Formulations**
This lecture will enable students to describe the different types of topical application, discuss topical and transdermal administration of drugs and the factors which affect bioavailability and pharmacokinetics of topically applied drugs. Students will be able to describe the principal behind the transdermal delivery systems outline in the lecture.

**Tropical Medicine**
This lecture will cover a brief overview of fungal and protozoal infections, the life cycle of the malaria parasite, antimalarial drugs, tuberculosis, drugs used to treat tuberculosis and resistance to antimicrobial drugs.

**Anti-Viral Pharmacotherapy**
A brief overview will be given on viruses and their classification. The infectious process for a virus will be discussed and the biochemical targets for antiviral therapy developed from that discussion, using the Human Immunodeficiency Virus (HIV) as the main example. The major antiviral drug classes will be presented, as well as treatment limitations and failures, highlighting the need for the development of new agents.