UNIVERSITY OF DUBLIN

TRINITY COLLEGE DUBLIN

SCHOOL OF PHARMACY & PHARMACEUITCAL SCIENCES

B.SC. (PHARM.) DEGREE COURSE 2009/10

CONTENTS **PAGE**

Drug delivery for 21st century health care, through excellence and innovation in education, research and professional partnership

1 INTRODUCTION

1.1 SCHOOL VISION

- To produce pharmacy graduates and specialist graduates who will enhance health care through their patient-oriented understanding of aspects of disease, health strategies, medicines and pharmacoeconomics of existing and new therapies.
- To deliver pharmacy and science postgraduates with the qualified specialist skills required by Ireland's pharmaceutical/chemical and biotechnological industries.
- To encourage research by engaging high quality pharmaceutical scientists capable of devising new drug entities, syntheses, analytical protocols and delivery systems.

1.2 SCHOOL MISSION

- To ensure the delivery of the B.Sc. (Pharm.) course in compliance with EU syllabus specifications and educational standards, as well as accreditation requirements of the Pharmaceutical Society of Ireland to a broad, socially inclusive student base comprised of Irish, EU, non-EU, mature and graduate entrants;
- To provide quality educational programmes through the collective input of innovative teaching methodologies delivered by committed academics, researchers and healthcare professionals.
- To develop new postgraduate courses appropriate to national, European and international demands and standards in the pharmaceutical context;
- To double the number of taught postgraduate students through enrolling the maximum number of students into existing taught courses and encouraging life-long learning by devising distance-learning programmes and electronic formatting of modules;
- To double the number of research students and encourage collaboration with other researchers of Schools and Institutes in Health Sciences;
- To enhance the national and international reputation of the School by attracting world-renowned researchers.

1.3 TRADITION

Brief history

The School of Pharmacy at Trinity College Dublin was the first, and until relatively recently, the only centre for pharmaceutical education in Ireland. A Pharmacy Degree has been offered by the School since 1977. The School has also delivered courses leading to Diploma qualifications for Pharmaceutical Assistants (until 1983) and Pharmaceutical Technicians (until 2006). Originally sited in Ballsbridge and teaching a maximum intake of 50 students per year, since October 1997 the School has been located at the East End of the TCD campus in the Panoz Institute, a purpose-built facility (ca. 3000 m^2) for which the School actively fund-raised.

The Pharmacy **undergraduate** syllabus leading to a B.Sc. (Pharm) degree is taught over 4 years and satisfies the requirements of the Pharmaceutical Society of Ireland, *i.e.* the statutory registration body. It also complies with the training standards defined in three pharmaceutically relevant EU Directives. Directives 2001/82/EC and 2001/83/EC specify the educational requirements necessary to perform the functions in the pharmaceutical industry of the 'Qualified Person' i.e, one who is responsible for the supervision and control of the manufacture of pharmaceutical products for human and veterinary use. Directive 85/432/EEC specifies the educational requirements necessary for the mutual recognition of registered pharmacists within the EU member states. Undergraduate students attend both lectures, tutorials, CAL sessions and practical laboratory classes in all subject areas to encourage their understanding of aspects of healthcare, drug sources, medicines preparation, analysis, quality control, chemistry, metabolism, safety, efficacy, regulation, etc. The syllabus content and student contact hours are monitored and are required to be accredited by the Pharmaceutical Society of Ireland (PSI).

Academic Staff in the School though originally assigned to the traditional pharmacy disciplines**:** Pharmaceutics & Pharmaceutical Technology, Pharmaceutical Chemistry, Pharmacology and Pharmacognosy, and more recently Practice of Pharmacy, are now teaching integrated courses formulated in the context of European and international curriculum strategies. Staff of the School provide courses and research facilities for approximately 330 students per year (280 undergraduate B.Sc.(Pharm); 53 postgraduate research). In addition, Staff contribute to 5 postgraduate taught full-

time, part-time and distance-learning M.Sc/Diploma courses. The Pharmaceutical Sciences and Practice of Pharmacy subject areas are currently taught by part- and full-time academic staff, in conjunction with Teacher-practitioners and a number of external lecturers from Community Pharmacy, Hospital Pharmacy, the Pharmaceutical Industry and Regulatory Bodies.

Academic staff are actively engaged in research programmes in the School: The School's research activities are broadly described as consisting of three main research areas. These are: 1. Drug design, discovery and analysis (Chemistry), 2. Drug development (Pharmacology) and 3. Drug delivery (Pharmaceutics). Eleven Research Groups have been formally established with the idea to foster interdisciplinary and collaboration both within the former Pharmacy Departments and with likeminded Schools/Departments within College. These Research Groups are: Advanced Drug Delivery, Clinical Pharmacokinetics, Natural Products, Drug Design and Discovery, Neuropharmacology, Platelets, Inflammatory Bowel Diseases, Drug Transport and Targeting, Pharmacy Practice, Allergy, and Nanosciences.

1.4 CORE VALUES

- courses catering for a broad socially-inclusive student base varying in age, nationality, ability
- educational programmes that integrate pharmaceutical sciences and clinical skills
- practice-based courses which foster life-long learning and continuing professional development
- innovative and flexible research-led teaching using methods to encourage student-oriented learning
- programmes to encourage integration and open partnership with health care professionals
- internationally recognised scholarship at undergraduate and postgraduate levels.

1.5 COURSES OFFERED BY THE SCHOOL OF PHARMACY & PHARMACEUTICAL SCIENCES.

The School provides the B.Sc. (Pharmacy) degree course and a range of Postgraduate courses.

POSTGRADUATE COURSES

Diploma/MSc. in Pharmaceutical Manufacturing Technology,
(for Science graduates wishing to become 'Qualified persons' in the pharmaceutical industry).
This is a two-year distance-learning course leading to the Diploma in Pharmaceutical Manufacturing Technology. The course is aimed at non-Pharmacy graduates working in the pharmaceutical industry who wish to satisfy the educational requirements defined in EC Directives 2001/83/EC and 2001/82/EC for the qualified person, responsible for manufacture of proprietary medicinal and veterinary products respectively. Graduates with the M.Sc/Diploma in Pharmaceutical Manufacturing Technology and with relevant experience may then apply to the competent authority of the member state for inclusion on their company's manufacturing licence as "Qualified Person", (e.g. in Ireland, the Irish Medicines Board).

M.Sc. in Hospital Pharmacy
The M.Sc. in Hospital Pharmacy is designed to enhance the knowledge and skills of hospital pharmacists, by providing a formal course under the auspices of the School of Pharmacy and Pharmaceutical Sciences, Trinity College, Dublin in collaboration with a number of Teaching Hospitals. The course aims to provide experience in all aspects of hospital pharmacy including clinical pharmacy, dispensary and drug distribution, administration and management, aseptic compounding, pharmacoeconomics and medicines information.

Diploma/M.Sc. in Pharmaceutical Analysis
The course is available for full-time study over one calendar year or part-time over two calendar years and consists of lectures, workshops and laboratory work. In addition each student is required either to write a major essay literature on a designated topic in the area of pharmaceutical analysis. Students proceeding to an M.Sc degree will be required to undertake a research project and present a detailed scientific report at the end of the course. The course is intended for suitably qualified graduates currently working in or aspiring to work in the Pharmaceutical Industry - in particular non Pharmacy graduates employed in quality control or quality assurance roles requiring specialised training, retraining or upgrading of skills. The course may also be attractive to technical managers in regulatory affairs, product development and other related areas.

Diploma/M.Sc. in Pharmaceutical Technology
The course is aimed primarily at graduates intending to work or currently working in the formulation and drug delivery system design sectors of the human and veterinary pharmaceutical industries.

Diploma/M.Sc. in Community Pharmacy
These courses have been specifically designed to meet the needs of community pharmacists practising in Ireland. Because of their distance-learning format, participants can continue in full-time employment throughout the courses.

NB. These are in addition to the M.Sc. or Ph.D. degrees by research, which are offered by each Subject Area.

2 STRUCTURES, MANAGEMENT AND SYSTEMS IN PLACE

2.1 IN COLLEGE

For details see*: http://www.tcd.ie/local/structures/governance.php*

2.2 IN FACULTY AND SCHOOL

The School of Pharmacy & Pharmaceutical Sciences is one of the four Schools which make up the Faculty of Health Sciences. The other three are the School of Dental Science, the School of Medicine and the School of Nursing and Midwifery.
For details see*: http://www.tcd.ie/local/structures/governance.php*

Head of School

Professor Marek Radomski, M.A.,M.D. (COPERNICUS ACADEMY OF MEDICINE), PH.D. (COPERNICUS ACADEMY OF MEDICINE), D.SC. (POLISH ACADEMICY OF SCIENCES) F.T.C.D
Heads of School are appointed by, and are formally accountable to, the Board. The Head of School is a member of the College Head of Schools Committee.
For details see: *http://www.tcd.ie/local/structures/govappointheadschool.php*

Director of Teaching and Learning (Postgraduate)

Andrew Harkin, B.SC. (N.U.I.), PH.D. (N.U.I.)
The Director of Teaching and Learning (Postgraduate) has delegated responsibility for the postgraduate affairs of the School and plays a central strategic role with regard to both existing and new research programmes. The Director of PGTL is a member of the College Postgraduate Teaching & Learning Committee. For details see:
http://www.tcd.ie/local/structures/govdirug.php

Director of Research

Carsten Ehrhardt, STAATSEXAMEN PHARMAZIE (HAMBURG), DR. RER. NAT. (SAARBRÜCKEN)
The Director of Research has delegated responsibility for the development of research and innovation in the School. The Director plays a strategic role in promoting and enabling research in the School, working closely with the Head of School.
http://www.tcd.ie/local/structures/govdirres.php

Director of Teaching and Learning (Undergraduate)

Anne Marie Healy, B.SC. (PHARM.), PH.D., M.P.S.I.
The Director of Teaching and Learning (Undergraduate) has delegated responsibility for the undergraduate affairs of the School and plays a central strategic role with regard to both existing and new teaching programmes. The Director of UGTL is a member of the College Undergraduate Studies Committee. For details see:
http://www.tcd.ie/local/structures/govdirug.php

FACULTY AND SCHOOL COMMITTEES AND SUPPORT STRUCTURES
Faculty Committee http://www.tcd.ie/local/structures/govfacctte.php

School Committee http://www.tcd.ie/local/structures/govschoolctte.php
This Committee currently includes 4 Undergraduate Class Representatives

School Executive Committee http://www.tcd.ie/local/structures/govschoolexec.php
This Committee currently includes 1 Undergraduate Class Representative

Curriculum Review Committee (*Syn*. Course Management Committee)
This is a sub-committee of the School Executive and responsible for monitoring, reviewing and making recommendations on the development of the pharmacy degree course.
This Committee currently includes 2 x Representatives from Freshman Pharmacy and 2 x Representatives from Sophister Pharmacy.

Student Representation
Undergraduate students in each of the four years of the course select a representative to relay the ideas and concerns of their year and to report to their year on developments within the School. These representatives are all members of the School Committee and one

Freshman and one Sophister representative is also a member of the Course Management Committee. There is also one student representative on the School Executive Committee.

Student Forum
This is a student-led forum which together with Tutor Representatives discusses issues of student importance. It is currently comprised of the 4 Student Representatives-one from each year.

Student Tutors
Dr. John Quigley, email: jquigley@tcd.ie
Dr. John Walsh, email: jjwalsh@tcd.ie
Dr. Andrew Harkin, email: aharkin@tcd.ie
Dr. Deirdre D'Arcy, email: ddarcy@tcd.ie

Disability liaison officer
Dr Helen Sheridan, email: hsheridn@tcd.ie

Undergraduate Year Coordinators
Junior Freshman year: Dr John Walsh, email: jjwalsh@tcd.ie
Senior Freshman year and Junior Sophister year: Dr John Quigley, email: jquigley@tcd.ie
Senior Sophister year: Dr Deirdre D'Arcy, email: ddarcy@tcd.ie

Undergraduate Research Liaison Officer
Dr Carlos Medina, email: carlos.medina@tcd.ie

Trinity Access Programmes (TAP) contact
Dr John Walsh, email: jjwalsh@tcd.ie

Student Counselling Service: student-counselling@tcd.ie

SCHOOL NOTICE BOARDS
Notice boards for undergraduates and postgraduates are located in the School lobby and also at the entrance to the laboratories.

2.3 THE SCHOOL OF PHARMACY & PHARMACEUTICAL SCIENCES

Academic Staff

Head of School
Professor of Pharmacology
Marek Radomski, M.A., M.D. (COPERNICUS ACADEMY OF MEDICINE), PH.D (COPERNICUS ACADEMY OF MEDICINE), D.SC. (POLISH ACADEMY OF SCIENCES), F.T.C.D (2007)

Lecturers in Pharmacology
Andrew Harkin, B.SC. (N.U.I.), PH.D. (N.U.I.)
Neil Frankish, B.SC. (C.N.A.A.), M.A.,PH.D.(STRATH.)
Carlos Medina, M.B. (LA LAGUNA), PH.D. (A.U. BARCELONA)
Lorraine O'Driscoll, B.SC., M.SC.,PH.D.

Associate Professor of Pharmaceutical Chemistry
Mary Meegan, B.SC. (N.U.I), M.A., PH.D. (N.U.I), C.CHEM., M.R.S.C.

Lecturers in Pharmaceutical Chemistry
John Gilmer, B.A., PH.D
John Quigley, B.SC. (N.U.I), M.A., PH.D. (N.U.I.), M.I.C.I.
Astrid Sasse, STAATSEXAMEN PHARMAZIE (BERLIN), DR. RER. NAT. (BERLIN)

Senior Lecturers in Pharmaceutics and Pharmaceutical Technology
Carsten Ehrhardt, STAATSEXAMEN PHARMAZIE (HAMBURG), DR. RER. NAT. (SAARBRÜCKEN) GERMANY
Anne Marie Healy, B.SC. (PHARM.), PH.D., M.P.S.I.

Lecturers in Pharmaceutics and Pharmaceutical Technology
Deirdre D'Arcy, M.PHARM. (R.GORDON). PH.D. DIP. CLIN.PHARM. (LIV.J.MOORES) MPSI
Lidia Tajber, M.SC. (MEDICAL UNIVERSITY OF SILESIA), PH.D., P.G.DIP.Q1

Lecturer in Biopharmaceutics (Merrion Pharmaceuticals Plc.)
Mariusz Kamionka, M.SC. JAGIELLONIAN UNIVERSITY, KRAKOW, POLAND, PH.D. TECHNICAL UNIVERSITY OF MUNICH, GERMANY

Lecturer in Pharmaceutics (Part-time)
Owen Corrigan, B.SC. (PHARM.) (N.U.I.), M.A., PH.D. (N.U.I.)

Senior Lecturer in Practice of Pharmacy
Martin Henman, B.PHARM. (BRAD.), M.A., PH.D. (BRAD.), M.R.PHARM.S., M.P.S.I.

Lecturer in Practice of Pharmacy
Sheila Ryder, B.SC. (PHARM.) M.SC. (BELFAST), M.P.S.I.

Adjunct Lecturers in Practice of Pharmacy
Catriona Bradley, B.SC. (PHARM.), DIP.(LEGAL) , H.DIP.(Q.I)., M..P.S.I.,PH.D. (TCD)
Cicely Roche, B.SC.(PHARM), M.SC., MPSI

Teacher Practitioner (Part-time) Boots the Chemists
Karen Sheridan, B.SC. (PHARM.), M..P.S.I

Lecturers in Pharmacognosy
John Walsh, B.A., PH.D.
Fabio de Sousa Menezes, B.SC. (UNIVERSITY OF RIO), PH.D. (UNIVERSITY OF RIO)

Lecturers in Pharmacognosy (Part-time)
Ingrid Hook, B.SC.(PHARM), (MANC.), M.A., M.SC. (N.U.I.). M.R.PHARM.S.
Desmond Corrigan, B.SC. (PHARM) (N.U.I), MA. PH.D. (N.U.I), F.P.S.I.
Helen Sheridan, B.SC. (N.U.I.), M.A., PH.D. (N.U.I.), C.CHEM., M.R.S.C.

POSTGRADUATE COURSE COORDINATORS

M.Sc. in Hospital Pharmacy

Course Coordinator: Niamh McMahon, B.SC. (N.U.I.), B.SC. (PHARM.) (BRIGHTON), M.SC. (BELF.), M.R.PHARM.S., M.P.S.I. nmcmahon@stjames.ie

Postgraduate Diploma/M.Sc. in Pharmaceutical Analysis

Course coordinator: John Gilmer, B.A., PH.D. gilmerjf@tcd.ie

Postgraduate Diploma/M.Sc. in Pharmaceutical Technology

Course coordinators:

Deirdre D'Arcy, M.PHARM. (R.GORDON). PH.D. DIP. CLIN.PHARM. (LIV.J.MOORES) MPSI ddarcy@tcd.ie

Lidia Tajber, M.SC. (MEDICAL UNIVERSITY OF SILESIA), PH.D., P.G.DIP.QI ltajber@tcd.ie

Postgraduate Diploma/M.Sc. in Community Pharmacy

Course coordinator: Sheila Ryder, B.SC. (PHARM.), M.SC. (BELF.), M.P.S.I. sryder@tcd.ie

Diploma/M.Sc. in Pharmaceutical Manufacturing Technology

Course coordinator: Lorna Loughrey, B.A., DIP. PHARM. MANUF. TECH. dippmt@tcd.ie

Other lecturers and staff contact details are available on the School's website:
http://www.tcd.ie/pharmacy

Administrative Staff

Ms Aileen Treacy	School Administrator	amtracy@tcd.ie
Ms. Alison Finlay	Senior Executive Officer	finlaya@tcd.ie
Ms. Liesa Eckhardt	Senior Executive Officer	pharmtec@tcd.ie
Ms. Betty Daly	School Executive Officer	edaly3@tcd.ie
Ms. Catherine Coffey	Executive Officer	cacoffey@tcd.ie
Ms. Bernadette McLoughlin	Executive Officer	bmclough@tcd.ie
Ms. Marian Cash	Executive Officer	compharm@tcd.ie

Technical Staff

Mr. Derek Bell	Chief Technical Officer 1	dbell@tcd.ie
Mr. Ray Keaveny	Chief Technical Officer 2	rkeaveny@tcd.ie
Mr. Derek Coss	Senior Technical Officer	cossd@tcd.ie
Ms. Ann Hannan	Senior Technical Officer	hannana@tcd.ie
Ms. Therese Moloney	Senior Technical Officer	tmoloney@tcd.ie
Ms. Rhona Prendergast	Senior Technical Officer	rprndgst@tcd.ie
Mr. Brian Talbot	Senior Technical Officer	talbotb@tcd.ie
Mr. Joseph Reilly	Senior Technical Officer	jreilly@tcd.ie
Mr. Patrick Quinlan	Senior Technical Officer	pquinlan@tcd.ie
Ms. Maureen Brunt	Senior Lab Attendant	bruntm@tcd.ie
Ms. Pauline McGlue	Senior Lab Attendant	mcgluep@tcd.ie
Mr. Brian O'Reilly	Senior Lab Attendant	oreillb@tcd.ie
Ms. Irene Pelow	Senior Lab Attendant	pelowi@tcd.ie
Mr. Conan Murphy	Senior Lab Attendant	murphyc5@tcd.ie
Ms. Trudy Smyth	Senior Lab Attendant	smythtr@tcd.ie

3 SAFETY WITHIN THE SCHOOL

The B.Sc. (Pharmacy) course consists of lectures, laboratory classes, seminars, study visits, tutorials and some work experience. Laboratories by their nature require those working in them to be highly aware of the safety implications of that particular working environment.
The School wishes to establish and maintain a working environment in which the physical and mental well-being of staff and students is maintained at the highest levels practicable, and to provide a basis whereby problems of safety that arise in the working environment are solved in co-operation with staff and students and their representative organisations.

School Safety Officers

Dr C. Medina	Biological Safety Officer	(email: carlos.medina@tcd.ie)
Dr H. Sheridan	Chemical Safety Officer	(email: hsheridn@tcd.ie)
Dr A. Harkin	Radiation Safety Officer	(email: aharkin@tcd.ie)

3.1 General Information:

1. Students are encouraged to bring any concerns re safety to the attention of the School and College Safety Officer, Mr Tom Merriman, ext. 1914 (email: tom.merriman@tcd.ie).

2. All undergraduate students presenting in each year's practical classes are advised by the Staff Supervisor about general safety issues such as fire hazards, smoking, eating, protective clothing, etc. and first aid facilities.

N.B. A Safety Manual is supplied to each Junior Freshman student. Please read this as well as any specific safety requirements included in laboratory schedules etc. **Declaration forms A and B will also be supplied and must be filled in and returned to the appropriate office.**

3.2 Staff and students are obliged to operate the 'neighbour principle'. This involves:

(i) taking reasonable care for their own safety and health and that of others who may be affected by their acts or omissions while at work;
(ii) co-operating with the College to such an extent as will enable the College comply with the provisions of legislation and to meet it's general duties on safety, welfare and health;
(iii) not intentionally interfering with or misusing any means, appliance, equipment or other aid provided for securing the health, safety or welfare of the College community;
(iv) the use of any clothing, equipment or appliance required for the purpose of securing his/her health, safety and welfare at work;
(v) reporting to the College management defects in plant, equipment or procedures which are a danger to safety, health or welfare.

N.B. In the interests of safety, any student who fails to obey regulations or instructions from academic or technical staff, including demonstrators, may be excluded from the laboratory.

3.3 IMPORTANT SAFETY PRECAUTIONS – PLEASE READ CAREFULLY

1. Smoking in College buildings is not allowed.
2. Hallways and passageways must be kept clear.
3. The location of fire exits should always be noted.
4. The location of fire extinguishers and their mode of use should be noted.
5. The location of the first aid cabinet in each laboratory should be noted.
6. **Dress code when working in the laboratories:**
   - white lab coats must always be worn and closed
   - safety spectacles must be worn when appropriate
   - appropriate masks may need to be worn when working with certain types of equipment and /or chemicals
   - no open-toed shoes or sandals may be worn while in the laboratory.
   - long hair must be tied back and kept from covering the face.
7. **Use of mobile/camera phones, iPods, radios and all other electronic equipment unrelated to practical work is prohibited while working in laboratories.**
8. **In the event of an accident** taking place in the laboratory involving injury, no matter how trivia it may seem, the proper procedure is to:
   - call the 'First-Aider' associated with the laboratory to give first-aid if appropriate.
   - phone the College Health Service (Ext. 556) for advice and refer for medical evaluation if he/she is ambulatory and not in distress or otherwise seriously injured.

- if the victim is known to be or likely to be seriously injured always call the College emergency number (1999) for help. **Never transport the victim to hospital in a private car or taxi.**
- report all accidents to a School of Pharmacy & Pharmaceutical Sciences Safety Officer.

9. **Laboratory work** must be performed where at all possible only during normal working hours. No laboratory work of any kind should be undertaken after hours unless at least **two** persons are present

10. Eating and drinking in the laboratories is strictly forbidden.

11. Any suspicious persons / packages / floods etc. must be immediately reported to the College Emergency Number **(1999)** at Front Gate.

4 UNIVERSITY STUDY

The B.Sc. (Pharmacy) course is accredited by the Pharmaceutical Society of Ireland (P.S.I) and is also recognised for "free movement" purposes under the various European Union Directives on Pharmacy which lay down the modules to be studied. The minimum number of study hours for a Pharmacy course form part of National and European accreditation criteria. There are **two types of study** hours set out in this booklet.

1. **Supervised study** which is comprised of the lecture and laboratory practical courses, tutorials, workshops, seminars, study visits and specified work experience. It can also include laboratory report preparation**. School regulations require you to attend all scheduled classes and you may be refused permission to take your written examinations if your attendance is deemed unsatisfactory.** (See TCD Calendar; **General regulations and information** *Non-satisfactory attendance and course work*)

2. **Guided study** is comprised of directed but unsupervised study you must do outside the formal course. It can consist of suggested reading of text book references, published articles in scientific and medical journals, use of electronic data bases (eg Micromedex Healthcare Series), exercises in problem solving, reading and extension of your lecture notes, revision for term tests and annual examinations. The amount of Guided Study on average involves 2-3 hours per lecture and 1 hour for each hour of practical work. The hours specified are very much **minimum** hours of guided study expected of you over the four years of the course.
Independent study, note-taking at lectures and the writing of laboratory reports etc., are an important way of developing your learning abilities and capacity for study. For Pharmacists in particular, the ability to learn continuously is absolutely essential because of the necessity for continuing education at professional level. If you are concerned about study technique at University level you should discuss this with your Tutor and avail of the courses made available each year in College. It is vital that you learn how to use the library efficiently particularly the electronic databases of relevance to Pharmacy and the Pharmaceutical Sciences.

Continuous assessment marks will be allocated based on attendance at practicals, performance and practical write-ups. Laboratory notebooks/manuals must be presented for assessment by the date specified in the notebook/manual. Late submissions will not be assessed unless a valid reason is provided, and students will be deemed not to have satisfied the School's examination requirements.

Academic Integrity and Plagiarism
There is a well established academic convention that work performed and published by other people is acknowledged fully if it is being used in any written work submitted for assessment. This convention applies to all academic work (theses, research papers, text books etc.) but in your case it applies to all material used in assessments, lab books and written examinations. College takes breaches of its regulations on plagiarism very seriously and you must read the next section very carefully.
See TCD College Calendar Part 1 – *General regulations and information.*

Plagiarism

Plagiarism is interpreted by the University as the act of presenting the work of others as one's own work, without acknowledgement. Plagiarism is considered as academically fraudulent, and an offence against University discipline. The University considers plagiarism to be a major offence, and subject to the disciplinary procedures of the University.

Plagiarism can arise from deliberate actions and also through careless thinking and/or methodology. The offence lies not in the attitude or intention of the perpetrator, but in the action and in its consequences. Plagiarism can arise from actions such as:

(a) copying another student's work;
(b) enlisting another person or persons to complete an assignment on the student's behalf;
(c) quoting directly, without acknowledgement, from books, articles or other sources, either in printed, recorded or electronic format;
(d) paraphrasing, without acknowledgement, the writings of other authors.

Examples *(c)* and *(d)* in particular can arise through careless thinking and/or methodology where students:

(i) fail to distinguish between their own ideas and those of others;
(ii) fail to take proper notes during preliminary research and therefore lose track of the sources from which the notes were drawn;
(iii) fail to distinguish between information which needs no acknowledgement because it is firmly in the public domain, and information which might be widely known, but which nevertheless requires some sort of acknowledgement;
(iii) come across a distinctive methodology or idea and fail to record its source.

All the above serve only as examples and are not exhaustive.

Students should submit work done in co-operation with other students only when it is done with the full knowledge and permission of the lecturer concerned. Without this, work submitted which is the product of collusion with other students may be considered to be plagiarism.

It is clearly understood that all members of the academic community use and build on the work of others. It is commonly accepted also, however, that we build on the work of others in an open and explicit manner, and with due acknowledgement. Many cases of plagiarism that arise could be avoided by following some simple guidelines:

(i) Any material used in a piece of work, of any form, that is not the original thought of the author should be fully referenced in the work and attributed to its source. The material should either be quoted directly or paraphrased. Either way, an explicit citation of the work referred to should be provided, in the text, in a footnote, or both. Not to do so is to commit plagiarism.
(ii) When taking notes from any source it is very important to record the precise words or ideas that are being used and their precise sources.
(iii) While the Internet often offers a wider range of possibilities for researching particular themes, it also requires particular attention to be paid to the distinction between one's own work and the work of others. Particular care should be taken to keep track of the source of the electronic information obtained from the Internet or other electronic sources and ensure that it is explicitly and correctly acknowledged.

It is the responsibility of the author of any work to ensure that he/she does not commit plagiarism. Students should ensure the integrity of their work by seeking advice from their lecturers, tutor or supervisor on avoiding plagiarism. All subject areas in Pharmacy should include, in their handbooks or other literature given to students, advice on the appropriate methodology for the kind of work that students will be expected to undertake.

If plagiarism as referred to above is suspected, the Director of Teaching and Learning (Undergraduates) will arrange an informal meeting with the student, the student's tutor and the lecturer concerned, to put their suspicions to the student and give the student the opportunity to respond.

If the Director of Teaching and Learning (Undergraduate) forms the view that plagiarism has taken place, he/she must notify the Senior Lecturer in writing of the facts of the case and suggested remedies, who will then advise the Junior Dean. The Junior Dean will interview the student if the facts of the case are in dispute. Whether or not the facts of the case are in dispute, the Junior Dean may implement the procedures set out in CONDUCT & COLLEGE REGULATIONS (See TCD College Calendar Part 1).

5 B.SC. (PHARM.) DEGREE

The B.Sc. (Pharm) is awarded on the successful completion of the four year undergraduate course. In order to become a registered pharmacist a one-year training period must be undertaken followed by the Licence Examination. The pre-registration year and the Licence Examination are the responsibility of the Pharmaceutical Society of Ireland.

B.SC. (PHARM.) SYLLABUS (see page 20)

General Information

The academic syllabus fulfils the requirements of the following:

(i) Pharmaceutical Society of Ireland for registration purposes

(ii) E.U. Directive 85/432 which entitles the holder of the degree to recognition as a pharmacist throughout the Member States of the European Union; and

(iii) E.U. Directive 2001/83/EC which now incorporates Directive 75/319/EEC and 81/851/EEC which specify the academic qualifications necessary to perform the functions of 'Qualified Person' in the supervision and control of the manufacture of medicines for human and veterinary use.

AN OVERVIEW OF THE B.SC. (PHARM.) DEGREE COURSE

The aim of the B.Sc. (Pharmacy) course is to provide students with a basic education in the Pharmaceutical Sciences and the Practice of Pharmacy in all its forms. To quote from the Accreditation Document of the Pharmaceutical Society of Ireland *"the purpose of undergraduate pharmacy education (the pharmacy degree course), is to produce pharmacy graduates who are able to communicate and apply in their chosen field of practice; the elements of pharmaceutical knowledge and care and whose relevant skills are based upon and underpinned by appropriate and sufficient understanding of the principles and techniques of the pharmaceutical sciences".*

In order to achieve the aims of the course, the Syllabus has been designed to provide you firstly with learning opportunities in some of the basic sciences (such as aspects of Chemistry, Biochemistry, Biology, Physics, Physiology, Microbiology, Mathematics and Statistics) which are relevant to an understanding of the Pharmaceutical Sciences and to the Practice of Pharmacy. Subsequently the Pharmaceutical Sciences (Pharmaceutics and Pharmaceutical Technology, Pharmaceutical Chemistry, Pharmacognosy, Pharmacology and also Practice of Pharmacy) are introduced and taught in an integrated way and your knowledge of them and relevance to pharmacy developed progressively over the four years of the course.

N.B. PLEASE NOTE EXAMINATION REGULATIONS AND COURSE MODULES DETAILS MAY BE SUBJECT TO AMENDMENTS

5.1 LEARNING OUTCOMES FOR THE B.SC. (PHARMACY) DEGREE PROGRAMME

The Pharmacy graduate should be able to:

(i) commit to the ethos of professionalism and in particular should have a duty of care to and respect for the patient and a maturity to make professional decisions in the best interest of the patient;
(ii) commit to life-long learning, in particular an awareness of the need for continuing education and professional development in the chosen field of pharmacy practice and
(iii) adapt to developments in pharmacy and medicine.

The graduate will be able to:

(iv) demonstrate a foundation level of knowledge and understanding of the biological, physical and quantitative sciences underpinning Pharmacy;
(v) explain how medicines are developed, manufactured, tested and brought to the market place;
(vi) demonstrate and describe how different types of medicinal preparations are formulated and be capable of preparing medicines extemporaneously, where appropriate;
(vii) supply medicines in accordance with pharmaceutical knowledge, legislation and codes of professional conduct and practice;
(viii) apply pharmacological, pharmaceutical and clinical knowledge to safely and effectively interpret and evaluate prescriptions and other orders for medicines;
(ix) fulfil their professional role as a pharmacist in advising and counselling patients, other healthcare professionals and others about medicines and their usage;
(x) recognise common disease states and make appropriate responses to presented symptoms;
(xi) apply the principles of quality and quality assurance mechanisms in all aspects of scientific and professional activities;
(xii) employ research methodologies relevant to natural, clinical and social sciences;
(xiii) apply an empirical approach to problem solving.

This handbook applies to all students taking the B.Sc.(Pharm.) Degree taught by the School of Pharmacy & Pharmaceutical Sciences. It provides a guide to what is expected of you on this programme, and the academic and personal support available to you. Please retain for future reference.

The information provided in this handbook is accurate at time of preparation. Any necessary revisions will be notified to students via email. Please note that, in the event of any conflict or inconsistency between the General Regulations published in the University Calendar and information contained in course handbooks, the provisions of the General Regulations will prevail.

COURSE MODULES

JUNIOR FRESHMAN

Course Code	Course Title	ECTS	PSI (Appendix)
PG1001	Physiology	5	**D**
BY1101	Cell and Molecular Biology	10	**B**
BIPH01	Biochemistry	5	**D**
PH1001	Sources and characteristics of Substances used in Medicines	5	**B**
PH1002	Physical Pharmacy I	5	**B**
PH1003	Discovery, Isolation, Separation & Analysis of Substances used in Medicines	10	**B**
PH1004	Introduction to Pharmaceutics & Formulations	5	**C**
PH1005	Mathematical Methods & Pharmaceutical Calculations	5	**C**
PH1006	Practice of Pharmacy I	5	**A**
PH1007	Orientation & Learning Skills and Integrated Pharmacy Studies (incl. Problem Based Learning)	5	**A**

SENIOR FRESHMAN

Course code	Course Title	ECTS	PSI (Appendix)
PH2001	Pharmaceutical Properties of Materials Used in Medicines	5	**B**
PH2002	Physical Pharmacy II	5	**B**
PH2003	Isolation, Separation & Analysis of Substances used in Medicines	10	**B**
PH2004	Formulation & Pharmaceutical Technology	10	**C**
PH2005	Microbiology and Biochemistry	5	**B/D**
PH2006	Practice of Pharmacy II	5	**A**
PH2007	Professional Development & Career Planning	5	**A**
PH2008	Pharmaceutical Biotechnology I	5	**B**
PH2009	General Principles of Pharmacology	5	**D**
PH2010	Molecular Pharmacology and Chemotherapy	5	

JUNIOR SOPHISTER

Course Code	Course Title	ECTS	PSI (Appendix)
PH3002	Medicinal & Pharmaceutical Chemistry III	10	**B**
PH3003	Natural sources of drugs and medicines	10	**B**
PH3004	Sterile Products	10	**C**
PH3005	Pharmaceutical Data Analysis & Bioinformatics	5	**C**
PH3006	Practice of Pharmacy III	5	**A**
PH3008	Pharmaceutical Biotechnology II	5	**C**
PH3009	Endocrine & Reproductive Pharmacology and Veterinary Pharmacy	5	**D**
PH3010	Inflammation, Respiratory & Gastrointestinal Pharmacology	5	**D**
PH3011	Blood, Cardiovascular & Renal Pharmacology	5	**D**

SENIOR SOPHISTER

Course Code	Course Title	ECTS	PSI (Appendix)
PH4002	Medicinal Chemistry 4: Drug Design, Discovery & Development	5	**B**
PH4003	Herbal Medicinal Products & Complementary Medicine	5	**D**
PH4004	Advanced Drug Delivery & Future Directions	5	**C**
PH4005	Pharmacokinetics, Pharmacodynamics, Biopharmaceutics & Drug metabolism	5	**C**
PH4006	Practice of Pharmacy IV[1]	5	**A**
PH4007	Practice of Pharmacy IV[2]	5	**A**
PH4008	Addiction Pharmacy	5	**D**
PH4009	Neuropharmacology	5	**D**
PH4010	Practice of Pharmacy IV[3] -Electives	5	**A**
PH4011	Malignant disease, Immunopharmacology & Pharmacology of the eye	5	**D**
PH4012	PROJECT	10	

Definition of the ECTS:

" The European Credit Transfer and Accumulation System (ECTS) is a student-centred system based on the student workload required to achieve the objectives of a programme of study. " Ref: ECTS Users' Guide (Feb 2005) EU Commission, DG for Education and Culture".

ECTS equivalent for each year of the course is 60 credits.

TCD website: http://www.tcd.ie/Senior_Lecturer/

Bologna Desk/Bologna Process in College

The provision of a common Pharmacy Syllabus allows individual graduates to choose for themselves the branch of pharmacy within which they wish to practice. ***Work Placement in Community and/or Hospital Pharmacy Practice is required to progress through the course.*** While the minimum requirements are stated in the Senior Freshman Module, **PH2007** and the Junior Sophister Module, **PH3006**, we would encourage students and graduates to obtain experience in as many different facets of pharmacy practice as possible since the differing experiences will enrich your subsequent professional career.

Attendance and course work
Students must attend for appropriate academic instruction in each term of each academic year and must satisfy the Head of the School as to their academic progress in each term in order to proceed with their year. The school may, from time to time, draw up regulations determining the required attendance of students at the various forms of instruction.

To rise with their class students must (a) attend satisfactorily the lectures, seminars, tutorials etc. given in the module of their course each term as required by the University Council and the School of Pharmacy and Pharmaceutical Sciences regulations, (b) perform and complete all laboratory work to the satisfaction of the Head of the School, (c) attend and complete to a satisfactory standard all visits and teaching exercises at Practice sites and the prescribed periods of work placement and (d) pass the prescribed examinations (including practical tests and continuous assessment schemes).

Non-satisfactory attendance and course work
At the end of the teaching term, students who have not satisfied the School requirements with regard to attendance may be returned to the Senior Lecturer as non-satisfactory for that term. In accordance with the regulations laid down by the University Council. **Non-satisfactory students may be refused permission to take their annual examinations and may be required by the Senior Lecturer to repeat their year.**

5.2 EXEMPTIONS – MATURE STUDENTS AND TRANSFER STUDENTS

Mature or transfer students may apply for exemptions from coursework and lectures. They do so by applying to the appropriate Module Co-ordinator, who may make a recommendation to the Director of Undergraduate Teaching & Learning. Exemption applications from one or more modules must be made through the student's tutor in the first instance, within four calendar weeks of the start of Michaelmas Teaching Term. All students must present for examinations in all modules. In the case of those who have been granted an exemption from practicals, their theory mark is returned.

5.3 FURTHER INFORMATION FOR STUDENTS

http://www.tcd.ie/disability/

http://www.tcd.ie/local/scholreview/

http://www.pharmaceuticalsociety.ie/

School Office (Ground Floor)
Opening hours: 9.15am – 12.45pm, Monday – Friday
Email: pharmacy@tcd.ie

FACULTY OF HEALTH SCIENCES

5.4 **EXAMINATION REGULATIONS IN THE SCHOOL OF PHARMACY & PHARMACEUTICAL SCIENCES**
Subject to change – as approved by the School Executive Committee or School Committee)

1. General College Regulations shall apply as set out in the University Calendar in the chapter general Regulations and information for students (**http://www.tcd.ie/about/calendar/pdf/general_information.pdf**)

Particular attention is drawn to the following:

1.1 ILLNESS AT EXAMINATIONS

Students who consider that illness will prevent them from attending an examination (or any of the sessions thereof) should see their medical adviser and request a medical certificate for an appropriate period. If a certificate is granted, it must be forwarded immediately to the Senior Lecturer's Office; the certificate will not be accepted more than three days after the beginning of the period of absence from the examination. If the illness is of short duration, the student should complete the remaining sessions of the examination (if any).

Students who are taken ill during an examination session will be escorted to the Student Health Centre. If they recover rapidly, they may complete the paper either in the examination hall, or in another appropriate place. If they are more seriously ill they should see their medical adviser without delay and request a medical certificate. If a certificate is granted, it must be sent immediately to the Senior Lecturer's Office, where it will be taken as notice of withdrawal from the examination. Where the examination in an individual module involving more than one paper has been partially completed the candidate must resit the entire examination in that module. Where an examination has been completed subsequent withdrawal is not permitted. Medical certificates will not be accepted in explanation of poor performance.

Students who are unable to complete their examinations at the Annual or Supplemental Examination may be given permission to repeat the year. Examinations outside these two sessions will only be considered by the Senior Lecturer in exceptional circumstances.

1.2 PLAGIARISM

Candidates for examinations are forbidden to bring books, notes, mobile phones or pagers with them into an examination hall, to copy from or exchange information with other candidates or in any way make use of information improperly obtained. Such actions are regarded as serious offences (see 5 under Conduct and College Regulations) for which a student may be expelled from the University. Students must not leave the hall before the time specified for the examination has elapsed, except by leave of the invigilator. Examinations or other exercises which are part of continuous assessment are subject to the same rules as other College examinations. Where submitted work is part of a procedure of assessment, plagiarism is similarly regarded as a serious offence and is liable to similar penalties.

1.3 USE OF CALCULATORS IN EXAMINATIONS

Electronic calculators are permitted in all examinations provided that they are battery operated, pocket sized, silent in operation and are not capable of using previously recorded programmes. The College does not supply calculators. The operation of calculators is entirely the responsibility of the students. No allowance is made for errors or omissions arising from the malfunction of calculators or the misuse of calculators by students. Calculators may not be passed from one candidate to another during examinations.
It is essential that the stages of numerical work, including intermediate answers, be written clearly to demonstrate knowledge of the problems and their solutions.

1.4 APPEALS

1.5 **ACADEMIC PROGRESS**

A student may not repeat any academic year more than once and may not repeat more than two academic years, except by special permission of the University Council.

To rise with their class students must:

a. attend satisfactorily the lectures given in the modules of their course in each term **as** required by the University Council and the School of Pharmacy & Pharmaceutical Sciences regulations;
b. perform and complete all laboratory work including project work and dissertations to the satisfaction of the Head of the School or module coordinator concerned; and
c. pass, in accordance with the School of Pharmacy & Pharmaceutical Sciences regulations, the prescribed examinations (including practical tests and continuous assessment schemes).

2. **JUNIOR FRESHMAN, SENIOR FRESHMAN AND JUNIOR SOPHISTER STUDENTS**

To be successful at the Annual Examinations, a student will normally be required to pass in each Module. However, the Court of Examiners may allow compensation in one Module (with the exception of **PH1006, PH2006, PH2007 and PH3006**) provided that all the modules concerned have been taken in a single sitting and that the student has

(i) gained a mark of 35% or higher in the module in which they have failed and
(ii) obtained (and are returned with) an average of at least Grade III for all other modules

Compensation will not be allowed where a student is returned as “ungraded” in any module

Students who fail to satisfy the examiners at the annual examination must present for a supplemental examination at the beginning of Michaelmas term. There is no fee for the supplemental examination.

Students who are unsuccessful at the annual examination will normally be given credit for those modules in which they were successful, and will be examined in the supplemental examinations only in those modules in which they are unsuccessful.

Students who are unsuccessful at both an annual and supplemental examination may repeat the year. Repetition requires full attendance at lectures and such other courses as may be prescribed by the Head of the School of Pharmacy & Pharmaceutical Sciences.

Students may not repeat any academic year more than once within the degree programme and may not repeat more than two academic years within the degree programme, except by special permission of the University Council.

3. **B.SC. (PHARM) DEGREE EXAMINATION**

The B.Sc. (Pharm) degree examination will be held in Trinity Term of the Senior Sophister year. The Pharmacy Law paper is however, taken between Michaelmas and Hilary Terms.
A student is normally expected to pass each subject. However, the Court of Examiners may allow compensation in **one** subject (with the exception of **Practice of Pharmacy**) provided that all the subjects concerned have been taken in a single sitting and that the student has
i. gained a mark of 35% or higher in the subject in which they have failed
and
ii obtained (and are returned with) an average of at least Grade III for all other subjects.
Compensation will not be allowed where a student is returned as “ungraded” in any subject.
Compensation in Practice of Pharmacy is precluded by the accreditation criteria of the Pharmaceutical Society of Ireland.

4. **PHARMACY LAW**

The Pharmaceutical Society of Ireland require, as part of their accreditation criteria, that success in an examination in final year in Pharmacy Law, Ethics and Professionalism shall be a condition for the award of the Degree. Accordingly students who fail to satisfy the examiners in the Pharmacy Law examination will be ungraded and will be required to take a supplemental examination.

Students who are unsuccessful at the Annual Examination will normally be given credit for those subjects in which they were successful, and if presenting for a Supplemental Examination, will be examined only in those subjects in which they were unsuccessful. Students who obtain an F-2 grade in any subject will not be given credit and must repeat the entire examination. In order to qualify for the award of the degree, students are required to pass the degree examination in its entirety within eighteen months from the date on which they first became eligible to present for it. There is no fee for the Supplemental Examination. Students who are unsuccessful in one or more subjects at the annual examinations and who subsequently pass the degree examination will be awarded a third class honors degree, however, a requirement to take a Supplemental Examination in Pharmacy Law, Ethics and Professionalism alone, will not of itself, result in the award of a third class honors degree.

Students who are unsuccessful at both the Annual and Supplemental Examinations must apply to the Executive Faculty Appeals Committee for permission to repeat the year. Repetition requires full attendance at lectures and such other courses as may be prescribed by the Director of the School of Pharmacy.

5. EXAMINATION TIMETABLE

Examination timetables are published in advance of the dates of examinations on the College website at http://www.tcd.ie/Examinations/Timetables/vpindex.php. The College reserves the right to alter the published time and date of an examination in exceptional circumstances.
The onus lies on each student to establish the dates of examinations by consulting the relevant webpage. No timetable or reminder will be sent to individual students by any office.

5.5 CALCULATION OF ANNUAL EXAMINATION & FINAL DEGREE GRADES

For Annual Grades - Individual module weightings will be based on ECTS (e.g. a 10 ECTS module would represent 1/6 or a 5 ECTS module would represent 1/12 of the annual result).

A student is normally expected to pass each module. However, the Court of Examiners may allow compensation in one module (with the exception of specific modules as detailed in the Examination Regulations) where only a small deficiency exists and all the subjects concerned have been taken in a single sitting.

Students who fail a module and who present for a repeat examination (in that particular module) are returned with a pass mark in the module

B.SC. (PHARM) DEGREE
In calculating the final degree mark the following proportions will be observed:
50% of the final mark will be awarded on work examined in the SS year
25% of the final mark will be awarded on work examined in the JS year
15% of the final mark will be awarded on work examined in the SF year
10% of the final mark will be awarded on work examined in the JF year

THE DEGREE GRADES ARE AS FOLLOWS:

First Class Honours	70%	+
Second Class Honours Division 1	60-69%	
Second Class Honours Division 2	50-59%	
Third Class Honours	40-49%	

5.6 *Viva Voce* Examinations

Senior Sophister Students may be asked to attend a *Viva Voce* examination in one or more modules. Accordingly they **must** be available for such examinations when the External Examiners are visiting the School. *Viva Voce* examinations must be completed before the first Thursday of June. Dates for *Viva* examinations are published as soon as they are known. However, students should note that *Viva* lists are unlikely to be available until a few days before the actual *Viva*.

5.7 FOUNDATION SCHOLARSHIP EXAMINATION (Ref. University Calendar "Foundation and Non-Foundation Scholarships").

N.B. This examination will be held in January, before the commencement of Hilary Teaching Term. Candidates are examined in their course work up to the end of Michaelmas Term of the Senior Freshman year, together with such additional reading as may be required by the Head of the School of Pharmacy & Pharmaceutical Sciences.

The examination consists of the following:

Three papers, each of 3 hours duration with equal weighting; papers arranged as follows:

Paper 1 – Pharmaceutical Sciences 1
Topics will be drawn from the following modules: Pharmaceutical Properties of Materials Used in Medicines (PH2001) and Isolation, Separation and Analysis of Substances used in Medicine (PH2003).

3 hour paper. Four questions to be answered from four.

Paper 2 – Pharmaceutical Sciences 2
Topics will be drawn from Formulation & Pharmaceutical Technology (PH2004), Practice of Pharmacy II (PH2006) and General Principles of Pharmacology (PH2009)

3 hour paper. Four questions to be answered from five.

Paper 3 – Disease management: Interdisciplinary understanding and research
3 hour paper. Four questions to be answered from five.

In relation to Paper 3, candidate's will be given selected scientific papers at the beginning of the Michaelmas Term.

In the examination candidates will be asked questions relating to, for example;

- the disease state and its molecular basis
- the types of treatment used at present
- the nature of the API, its presentation and the forms of delivery in use
- the provision of care for patients with the condition
- future developments in understanding of the disease, potentially new types and forms of treatment and the challenges of care.

In order for students to be proposed for election to scholarship, they must obtain an overall average first class result (70% or higher) in the Scholarship examinations, and a mark of at least 60% in each of the three papers.

Candidates will no longer be awarded exemptions from Annual Examinations on the basis of their performance in the Scholarship Examinations.

6. JUNIOR FRESHMAN (1st Year) course

Module details may be subject to corrections/amendments.

- *It is each student's responsibility to be aware of dates, times, locations, etc. of lectures, tutorials, seminars and practical classes.*

- *Laboratory notebooks must be presented for assessment by the date specified in the module.*

- *Notebooks submitted after the specified date will not be assessed, unless a valid reason is given, and students will be deemed not to have satisfied the School's examination requirements.*

PHYSIOLOGY
Year 1 (Junior Freshman) **Course Code**: **PG1001**

Staff of the Department of Physiology: Prof. Veronica Campbell, Dr Mikel Egaña, Prof. Marina Lynch, Dr Daniel Ulrich, Dr Alice Witney

Coordinator: Dr Alan Tuffery

AIMS: to provide a basic core knowledge of normal bodily function as the basis for your future application of Physiology to therapeutic practice.

LEARNING OUTCOMES: On successful completion of the module the student will be able to:

- Recognise the structural characteristics of the basic mammalian cell types.
- Describe the functional roles of these cell types and how they interact in the various organ systems studied during the course.
- Explain the mechanisms by which these different organ systems are controlled in the normal human body.
- Describe the functional interrelationships that normally exist between the organ systems during daily life.
- Explain pathophysiological examples in some of the main organ systems
- Recall typical normal values for those physiological variables commonly used in clinical practice.

PRE-REQUISITES - In addition to Matriculation Requirements, students without Leaving Certificate Biology are expected to do some extra reading in areas such as cell structure & function and the basic functions of body organs.

TUTORIALS Computer-supported learning via courscompass.com; a specific support including lecture notes/slides, test questions and exercises.

DIRECTED READING
The standard text (linked to coursecompass) is Stanfield, C & Germann, W. *Principles of Human Physiology* 3rd edn.

ASSESSMENT

In-Course; On-line MCQs on each unit of the course	10% of marks
Written Paper: 3 hours	90% of marks
Section A: 10 short-answer questions; Section B ~43 MCQs	

SUMMARY OF HOURS

Lectures	Practicals	Tutorials	Total Contact	Guided study	TOTAL	ECTS
42	0	0	42	63	105	5

NB This course is taken with students from Clinical Speech & Language Studies and Radiation Therapy.

CELL AND MOLECULAR BIOLOGY
Year 1 (Junior Freshman) **Course Code**: **BY1101**

Staff of S**chool of Biochemistry and Immunology:** Prof. L O'Neill
Staff of the School of Genetics and Microbiology: Dr J Farrar, Prof. T Foster, Prof. C Smyth
Staff of the School of Natural Sciences: Dr P Murphy, Dr J Rochford

Coordinator: Dr John Rochford

PRE-REQUISITES: None

AIMS: To provide students with a thorough foundation in all aspects of modern molecular and cellular biology in preparation for more applied professional and clinical studies.

LEARNING OUTCOMES: On successful completion of the module the student will be able to:

- Discuss the fundamental principles of biology, including the structure and function of biologically important molecules; cell structure, function and reproduction; genetics and heredity; developmental biology; and the role and function of microorganisms,
- Use the scientific method as a fundamental mechanism for critical analysis and problem solving,
- Use general texts, reference books and a range of other resources to further develop knowledge of biological issues through continued independent learning,
- Carry out a range of laboratory exercises, demonstrating the development of practical scientific skills.

MOLECULAR AND CELLULAR BASIS OF LIFE
(Prof. Luke O'Neill)
The chemical context of life
Proteins - uniquely suited to life.
A tour of the cell
The origin and evolution of life: from molecules to cells to multicellular organism
The nucleus: from DNA to mRNA
mRNA to protein: The endoplasmic reticulum and Golgi apparatus
Energy and the cell. From photons to protons and electrons to ATP
Lysosomes and peroxisomes
How cells communicate - signal transduction.

GENETICS
(Dr. Jane Farrar)
Mendel's Laws 1. Segregation and random assortment of unit factors (genes). Analysis of mono-hybrid and di-hybrid crosses.
Mendel's Laws 2. Linkage and crossing over. Sex linkage. Gene mapping
Chromosomes. Mitosis, Meiosis. Crossing over and recombination.
What do genes do? Understanding the role and function of genes. Garrod: inborn errors of metabolism. Beadle and Tatum: the "one gene – one enzyme" hypothesis.
What are genes made of? Genes = nucleic acids.
The logic of genetic analysis.
Controlling gene expression.
Developmental Genetics 1 & 2
Genetic Engineering 1 & 2.
12-15 Quantitative Genetics; Population Genetics; Evolutionary Genetics; Applied Genetics.

BIOLOGY OF MICROORGANISMS
(Prof. Cyril Smyth) (Prof. Timothy Foster)
What are microorganisms? - an overview
Diversity of microbial life 1& 2
Growth of bacteria
Cell biology of microbes - organisation, structure and function 1
Bacterial cell structure
Microbial growth and metabolism - nutrition and environmental influences
Control of microbial growth: Disinfection and sterilization
Applied microbiology - exploitation of microbes by man

Microbial relationships
Microbes and Diseases
Defences and Immunity against microbes in plants, animals and humans 1
Immunity to microbial infection:
Viruses
Bacterial genetics: The chromosome. Mutation. Replication.

DEVELOPMENTAL BIOLOGY
(Dr. Paula Murphy)
Introduction to embryology and developmental biology.
Amphibian development 2 & 3
Reptile and bird development 1 & 2 (using the chick as an example).
Mammal development 1 & 2
Introduction to part 2.
Focus on experimental model systems
Differential gene expression
Developmental genetics
How developmental regulatory genes work
Limb development
What developmental genetics can teach us about evolutionary change : evo-devo
Sex determination

PRACTICAL CLASSES (28 HOURS)
(Dr. John Rochford)
1 Molecular Techniques: Pipetting and spectrophotometry
2 Molecular Techniques: Purification of glutathione S - transferase by affinity chromatography
3 Molecular Techniques: Electrophoresis of proteins
4 Molecular Techniques: Assaying glutathione S - transferase
5 Microscopy 1: Use and care of microscopes and examination of simple tissues and cells
6 Microscopy 2: Some features of tissues and cells
7 Genetics: Microcopic examination of chromosomes, continuous variation and examination of pedigrees
8. Microscopy 1: Basic bacteriological techniques, examination of bacteria and fungi, and demonstration of antibiotic resistance and susceptibility
9. Microbiology 2: Continuation of above

Tutorials: A series of informal, small-group tutorials is provided by post-graduate teaching assistants to support the lecture and practical programmes, and provide the students with advice and direction in relation to continued independent learning.

DIRECTED READING:

Biology Campbell, N.A. and Reece, J.B. 8th ed. Pearson/Benjamin Cummings. (2005) ISBN 978-0-321-53616-7.
Other sources, for further information and general background reading, as directed by lecturers.

ASSESSMENTS:	Weighting
Written Paper : XBY11011 Essay and short-answer paper (3 hours). Answer two essay questions from six, and ten compulsory short–answer questions.	66.6 % of total marks
Practical Test: MCQ Test (45 min). 30 questions based on practicals. Answer all questions (no negative marking).	22.2% of total marks
Continuous assessment of Practical work during year.	11.1 % of total marks

SUMMARY OF HOURS

Lectures	Practicals	Tutorials	Total Contact	Guided study	TOTAL	ECTS
48	24	10	82	118	200	10

BIOCHEMISTRY
Year 1 (Junior Freshman) **Course code: BIPH01**

Staff of the School of Biochemistry & Immunology: Dr. Ken Mok (KM), Dr. R Porter (RP), Dr. T Mantle (TM), Dr. P Voorheis (PV).

Coordinator: Dr. Mike McKillen (MMcK)

AIMS: to provide current basic biochemical concepts of cell function, and describe, by way of example, the importance of several protein and cellular functions.

LEARNING OUTCOMES: On successful completion of the module the student will be able to:

- Describe the components of the cell;
- Detail how protein structure leads to protein function;
- Describe how cells grow and divide;
- Discuss how cells extract and transduce energy
- Describe the basics of control of cell functions

PRE-REQUISITES: Matriculation Requirements **and** in **Mathematics** at Leaving Certificate an Ordinary Level grade C or Higher Level grade D or grade B at GCSE level and in **Chemistry** at Leaving Certificate a Higher Level grade C as well as a Higher Level grade C in one of: Physics, Biology, Geology, Geography, Applied Mathematics and Agricultural Science.

LECTURE OUTLINE (Taken with JF Med/SF RT)

1-5	Protein structure and function	TM
6-9	Cell division and cell cycle	PV
10-13	Membranes and transporters	RP
14-17	Enzymology	KM
18-19	Energy metabolism	RP
20-23	Intermediary metabolism (carbohydrates)	RP

BIOINFORMATICS EXERCISE (Computer-Aided-Learning) 5 hrs

ASSESSMENT
MCQ [Two hour exam]

DIRECTED READING
Berg, JM, et al. (2006). 'Biochemistry', 6th edition. WH Freeman & Co.

SUMMARY OF HOURS

Lectures	CAL	Tutorials	Total Contact	Guided Study	TOTAL	ECTS
23	5	-	28	55	83	5

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SOURCES AND CHARACTERISTICS OF SUBSTANCES USED IN MEDICINES
Year 1 (Junior Freshman) Course Code: PH1001

Staff of the School of Pharmacy and Pharmaceutical Sciences: Dr. John J Walsh (JJW), Prof. Mary J Meegan (MM), Dr. John Quigley (JQ),

Coordinator: Prof. M J Meegan

PRE-REQUISITES: Matriculation Requirements **and** in **Mathematics** at Leaving Certificate an Ordinary Level grade C or Higher Level grade D or grade B at GCSE level and in **Chemistry** at Leaving Certificate a Higher Level grade C as well as a Higher Level grade C in one of: Physics, Biology, Geology, Geography, Applied Mathematics and Agricultural Science.

AIMS: To provide the pharmacy student with an appropriate foundation course in Chemistry leading to an understanding of the chemical properties of substances used in human and veterinary medicines.

LEARNING OUTCOMES: On successful completion of the module the student will be able to:

- Describe the structure and nomenclature of simple chemical compounds of relevance in pharmacy
- Explain the influence of atomic structure, stereochemistry and molecular shape on drug design and activity
- Explain and illustrate the mechanisms for simple organic and bioorganic reactions of specific relevance to the synthesis of drug molecules
- Discuss the nature of functional groups and chemical reactivity in drug molecules
- Perform standard synthetic laboratory procedures
- Compile a short pharmaceutical chemistry profile of a drug molecule

Course outline:
The course comprises four sections which are designed to provide the student with a broad understanding of the underlying principles of organic, bioinorganic and pharmaceutical chemistry which are required by Pharmacy students. It will place appropriate emphasis on the relationship of molecular structure to drug activity and will provide an introduction to the basic reaction mechanisms important to drug design.

Unit PH1001A: Structure and bonding in simple chemical compounds of relevance to pharmacy (8 Lectures): (JQ)

1-3 Introduction to structure and bonding in organic compounds; ionic and covalent compounds; ionic bonding; covalent bonding; multiple bonds; nomenclature of simple organic molecules
4-5 Introduction to hybridization and sterochemistry; shape and polarity of covalent molecules
6 Non-bonding interactions between molecules;
7 Covalent bonding and chemical reactivity
8 Review of structure and bonding in organic compounds

Unit PH1001B: Nature of functional groups and chemical reactivity in drug molecules: (17 Lectures) (JJW)

9-10 Functional groups in drug molecules, mechanisms for simple organic and bioorganic reactions of relevance to drug molecules; reaction pathways; writing equations for chemical reactions
11-12 Addition reactions to alkenes and carbonyls, nucleophilic aliphatic substitution
13-15 Elimination reactions from alkyl halides together with electrophilic aromatic substitution reactions
16-23 Chemical properties of important functional groups in drug molecules of use in predicting drug properties and chemical reactivity
24 Structures and properties of bioorganic materials (proteins, carbohydrates and lipids)
25 Review of introductory chemistry of organic compounds

Unit PH1001C: Practical Laboratory skills: (6 Practical laboratory classes) (MM, JJW)
The practical laboratory course is designed to introduce the students to standard synthetic laboratory procedures and provide the basic practical skills required for Good Laboratory Practice with the objective to produce accurate and reproducible results and to develop the skills required in the synthesis and purification of drugs.

1. Technique of crystallization: Purification of acetanilide
2. Paracetamol synthesis and characterisation
3. Esterification of benzoic acid to methylbenzoate
4. Aldol condensation reaction
5. Hydrolysis of esters
6. Aspirin synithesis and characterization

Unit PH1001D: Compilation of the pharmaceutical chemistry profile of a given drug molecule (Written Assignment) (MM)
Students will be required to compile and submit a report (electronic format and hard copy) which will summarise the following information about a specific drug in an independent learning exercise:

(i) Systematic name and chemical structural features;
(ii) Pharmaceutical use and pharmacological action;
(iii) Chemical synthesis with relevant mechanistic detail;
(iv) Metabolism
(v) Pharmaceutical dosage form
(vi) Pharmacopoeial assay method
(vii) List of references.

DIRECTED READING/recommended textbooks
General Chemistry Textbook: *Chemistry, S.S. Zumdahl and S.A. Zumdahl,* 5th Edition, Houghton Mifflin, Boston and New York
Organic Chemistry Textbook: Organic *Chemistry Structure and Reactivity,* S.Ege, 5th Edition, 2004, Houghton Mifflin, Boston and New York

ASSESSMENT	Weighting
Written Theory Paper: 2 hours; 2 Sections, all questions are compulsory;	70% of Total
Section 1: MCQ;	(40% of Written paper total)
Section 2: 5 short questions	(30% of Written paper total)
Written assignment	10% of Total
Continuous practical assessment	20% of Total

SUMMARY OF HOURS

Lectures	Practicals	Tutorials	Total Contact	Pr. Write-up	Guided study	TOTAL	ECTS
25	18	5	48	9	46	100	5

N.B. Students are expected to satisfy the examiners in both written examination and practical components. The pass mark for examinations is 40%. Students who obtain an overall mark of less than 40% will be required to sit the supplemental examinations. Students who fail to satisfy the written requirement (i.e. less than 40%) of the annual examination, but who obtain a Class III or better in the practical section will be ungraded and will be required to take a supplemental examination in the written examination only. Students who fail to satisfy the practical requirement (i.e. less than 40% of the practical component) of the annual examination, but who obtain a Class III or better in the written section will be ungraded and will be required to resubmit in the practical component.

PHYSICAL PHARMACY I
Year 1 (Junior Freshman) **Course Code**: **PH1002**

Staff of the School of Pharmacy: Dr. John Quigley (JQ), Dr. Anne Marie Healy (AMH), Dr. Lidia Tajber (LT)

Coordinator: Dr John Quigley

AIMS: To explain physico-chemical aspects of substances used in pharmacy and medicine.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Describe the phases of matter with particular reference to pharmaceutical systems
- Discuss the importance of physicochemical parameters in relation to drug absorption and distribution
- Explain the theoretical basis of the stability of pharmaceutical agents in solution
- Describe the concept and theory of surface and interfacial phenomena as applicable to pharmaceutical systems
- Demonstrate a competence in related practical laboratory skills.

PRE-REQUISITES Matriculation Requirements **and** in **Mathematics** at Leaving Certificate an Ordinary Level grade C or Higher Level grade D or grade B at GCSE level and in **Chemistry** at Leaving Certificate a Higher Level grade C as well as a Higher Level grade C in one of: Physics, Biology, Geology, Geography, Applied Mathematics and Agricultural Science.

LECTURE OUTLINE

1	Basic principles of Physical Pharmacy –phases of matter, phase rule/diagrams	JQ
2	Basic principles of Physical Pharmacy- real gases	JQ
3-4	Basic principles of Physical Pharmacy- properties of solids and liquids	JQ
5-6	Introduction to solubility and its measurement	LT
7-8	Solid state properties influencing solubility, prediction of solubility	LT
9	Enhancing solubility – cosolvation	LT
10-15	Stability of Pharmaceutical systems (Rate Laws, Arrhenius Equation, Collision/TS theories)	JQ
16	Thermodynamics of Pharmaceutical Systems	JQ
17-29	Ionisation, pK_a, Partitioning	JQ
20-21	Drug Absorption and Distribution	JQ
22-23	Interfaces and surfaces: definition & measurement of their tension, surface and interfacial free energy; contact angles & the wetting of solids	AMH
24	Definition, theory and factors affecting adsorption, effect of interfaces, Gibbs adsorption equation	AMH
25-26	Adsorption isotherms, pharmaceutical applications of adsorption	AMH
27	Surface films, film balance studies and uses in Pharmacy; surfactant uses.	AMH

PRACTICAL CLASSES (3 hours)

1. Solubility relationships of drugs and their metabolites
2. Dependence of reaction rate on concentration and temperature for an oxidation reaction
3. Determination of the critical micelle concentration of sodium lauryl sulphate
4. Determination of lipophilicity constants of sulphonamide substituents

DIRECTED READING

Sinko, Patrick J., *Martin's Physical Pharmacy and Pharmaceutical Sciences* (2006).
Florence, A.T. and Attwood, D., *Physicochemical Principles of Pharmacy*. 4th edition, (2006).

ASSESSMENT		Weighting
Written paper:	2 hours, to answer a compulsory question (comprising short answers) and a choice of 2 essay questions from 3.	85% of total marks
Practical:	Continuous Assessment	15% of total marks

SUMMARY OF HOURS

Lectures	Practicals	Tutorials	Total contact	Pr. Write-ups	Guided study	TOTAL	ECTS
27	15	0	42	8	56	106	5

N.B. Students are expected to satisfy the examiners in both written examination and practical components. The pass mark for examinations is 40%. Students who obtain an overall mark of less than 40% will be required to sit the supplemental examinations. Students who fail to satisfy the written requirement (i.e. less than 40%) of the annual examination, but who obtain a Class III or better in the practical section will be ungraded and will be required to take a supplemental examination in the written examination only. Students who fail to satisfy the practical requirement (i.e. less than 40% of the practical component) of the annual examination, but who obtain a Class III or better in the written section will be ungraded and will be required to resubmit in the practical component.

DISCOVERY, ISOLATION, SEPARATION AND ANALYSIS OF SUBSTANCES USED IN MEDICINES
Year 1 (Junior Freshman) **Course Code: PH1003**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Prof. M Meegan (MM), Dr. J Walsh (JW), Dr. Astrid Sasse (AS), Dr. Fabio de Sousa Menezes (FSM), Dr. J Quigley (JQ), Dr. J Gilmer (JG), Dr Cormac O'Donohue (COD)

Co-ordinator: Dr J Gilmer

PRE-REQUISITES: Matriculation Requirements **and** in **Mathematics** at Leaving Certificate an Ordinary Level grade C or Higher Level grade D or grade B at GCSE level and in **Chemistry** at Leaving Certificate a Higher Level grade C as well as a Higher Level grade C in one of: Physics, Biology, Geology, Geography, Applied Mathematics and Agricultural Science.

This module consists of <u>two units</u>:

<u>UNIT PH1003A</u>: PHARMACEUTICAL, ANALYTICAL AND PURIFICATION METHODS

AIMS: to introduce the concepts of quality, together with appropriate regulatory frameworks and guidance, and the application of analytical techniques to pharmaceutical materials. (The unit is preparatory for module 2003).

LEARNING OUTCOMES: On successful completion of this module the student will be able to:
- Describe the purpose and scope of pharmaceutical analysis
- Define identity, potency and purity
- Describe the structure and purpose of a pharmacopeial monograph
- Interpret and explain basic spectroscopic data
- Interpret simple chromatographic data
- Determine system suitability parameters.
- Conduct pharmacopoeial chromatographic assays

LECTURE OUTLINE:

1	Scope of pharmaceutical analysis, pharmaceutical materials, context	AS
2	The concepts of identity, potency, purity	AS
3	The regulatory framework, pharmacopoeial monographs	AS
4-5	Assay design, units used in pharmaceutical analysis, uniformity of content analysis	JQ
6-8	Introduction to spectroscopy	AS
9-11	Introduction to separation science and chromatography (TLC)	JW
12-13	Pharmaceutical/pharmacopoeial applications of TLC	FSM
14-16	Introduction to column and gas chromatography ((GC)	JW
17-18	Pharmaceutical/pharmacopoeial applications of GC	FSM
19-20	Theory & methodology of HPLC	JW
21	Pharmaceutical/pharmacopoeial applications of HPLC	FSM

<u>UNIT PH1003B</u>: INTRODUCTION TO DRUG DISCOVERY and MEDICINAL CHEMISTRY

AIMS: To explain how from the molecular structure of drugs, their properties and chemical incompatibilities can be predicted. This material is preparatory for modules in medicinal chemistry in the Sophister years.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:
- Describe the basic sources of drugs, where they come from, how they are developed
- Explain what a pharmacophore is
- Explain how functional groups from organic chemistry impart properties to drug substances
- Classify common functional groups as polar or lipophilic
- Define and explain what a prodrug is and be able to give examples
- Summarise the properties of main group elements
- Identify the oxides of carbon and nitrogen relevant to pharmacy and medicine
- Describe co-ordination bonding and its geometries

- Describe heavy metal toxicity

LECTURE OUTLINE

1-2	The drug discovery process	MM
3-4	The natural world as a source drugs	FSM
5	Classification of drugs by mechanism, chemical class, physiological effects	MM
6-8	The concept of the pharmacophore; drug receptor interactions,	JQ
9-11	The relationship between structure, metabolism and disposition	MM
12-14	Prodrugs	JG
15	Survey of Group Metals relevant to medicines	COD
16-18	Bonding in transition metal complexes, TMs in living organisms	COD
19	Heavy metal toxicity- cadmium, lead, mercury	COD

PRACTICAL CLASSES (3 hours each)

1 Determination of boric acid in eye lotion
2 Aspirin determination
3 Determination of calcium carbonate in paediatric chalk mixture and sodium carbonate in capsules
4 Introduction to **T**hin **L**ayer **C**hromatography
5 Introduction to **G**as **C**hromatography
6 Introduction to **H**igh **P**erformance **L**iquid **C**hromatography

DIRECTED READING

Chromatographic Methods A Braithwaite and FJ Smith. 5th Ed.. Blackie Academic & Professional, London. (1996)
Pharmaceutical Analysis: a textbook for pharmacy students and pharmaceutical chemistry. Watson, David G., 2nd Ed. (2005)
Principles of Medicinal Chemistry, Foye WO, Lemke TL, Williams DA, 4th Ed (1995)
ICHQ6A, Preamble and Scope
European Pharmacopoiea, General Notices
Introduction to Medicinal Chemistry, Patrick GL, 2nd Ed., Oxford University Press (2001)
General Chemistry, McMurry-Fay, Fifth Edition

ASSESSMENT

Written theory paper: 3 hour
Six questions to be answered from 7. Question 1 is compulsory. It carries double weighting.

Continuous assessment of Practical write-ups

	Weighting:
Written paper	80%
Continuous assessment	20%

N.B.: Students should pass (i.e. attain 40%) on the written paper and practical assessments. Failure to make a reasonable attempt at the compulsory Question 1 on the written paper will require the student to sit the supplemental examination at the beginning of Michaelmas Term.

SUMMARY OF HOURS

Lectures	Practicals	Tutorials	Total Contact	Pr. Write-ups	Guided study	TOTAL	ECTS
40	18	4	62	16	100	178	10

INTRODUCTION TO PHARMACEUTICS AND FORMULATION
Year 1 (Junior Freshman) **Course Code: PH1004**

Staff of School of Pharmacy & Pharmaceutical Sciences: Dr C Ehrhardt (CE), Dr AM Healy (AMH), Dr D D'Arcy (DD), Dr M Kamionka (MK)

Coordinator: Dr C Ehrhardt

AIMS: to provide an introductory course in Pharmaceutics, so that students may understand the importance and relevance of the subject area to their studies for a Degree in Pharmacy and in subsequent practice, and to be better able to participate in and benefit from work experience in community or another branch of Pharmacy.

LEARNING OUTCOMES On successful completion of this module the student will be able to:

- Articulate the importance of Pharmaceutics for their studies in Pharmacy and subsequent practice
- Select and use appropriate common reference textbooks in hard copy and electronic format and describe the content thereof
- Describe the basic principles of formulation, with particular reference to simple liquid preparations such as solutions and suspensions, topical products such as gels and pastes and solid dosage forms such as capsules and suppositories
- Prepare simple extemporaneous preparations such as solutions, suspensions, gels, pastes, capsules and suppositories, and show competency in performing common pharmaceutical calculations of relevance in pharmaceutical formulation and compounding
- Describe the preparation and uses of pharmaceutical grades of water
- Discuss the importance of proper packaging and labelling of medicines

PRE-REQUISITES: Matriculation Requirements **and** in **Mathematics** at Leaving Certificate an Ordinary Level grade C or Higher Level grade D or grade B at GCSE level and in **Chemistry** at Leaving Certificate a Higher Level grade C as well as a Higher Level grade C in one of: Physics, Biology, Geology, Geography, Applied Mathematics and Agricultural Science.

LECTURE OUTLINE

1	Introduction to Pharmacy and Pharmaceutics	DD
2	Introduction to Pharmaceutics formulation and essential reference books	DD
3	Discussion of reference books, including Pharmacopoeiae and Martindale	DD
4-6	Pharmaceutical calculations relating to pharmaceutical formulation & compounding	CE
7	Introduction to basic principles of formulation	AMH
8, 9	Design and preparation of solutions for oral administration	AMH
10, 11	Design and preparation of suspensions	AMH
12, 13	Water – potable and purified	AMH
14	Products for external or topical application including gels, pastes, lotions an dusting powders, simple solid dosage formulations for oral administration including powders, effervescent powders and cachets	CE
15	Oral hard gelatin capsules, formulation and production, soft gelatin capsules	CE
16	Quality control of capsules, introduction to rectal dosage forms, suppository formulation and production	CE
17	Quality control of suppositories, enemas and rectal capsules, vaginal dosage forms including pessaries	CE
18	Suppository calculations	CE
19	Problem solving from previous examinations	CE
20	Packaging of medicines	CE
21	Packaging of medicines – labelling	MK
22	Tutorial	CE/AMH

PRACTICAL CLASSES

1 Introduction to extemporaneous compounding and dispensing (2 h)
2 Pharmaceutical solutions 1 (2 h)
3 Pharmaceutical solutions 2 (3 h)

4 Pharmaceutical suspensions (3 h)
5 Solid dosage forms - capsules (3 h)
6 Solid dosage forms - suppositories and pessaries (3 h)
7 Topical semisolid products – gels and pastes (3 h)
8 Practice-based formulation exercises (3 h)
9 Practical examination preparation (3 h)
10 Repeat and revision (3 h)
11 Practical examination (2.5 h)

TUTORIALS
Pharmaceutical formulation and calculation

DIRECTED READING
European Pharmacopoeia
British Pharmacopoeia
Martindale
Pharmaceutics 3rd Ed. ME Aulton (editor) Churchill Livingstone (2007)
Pharmaceutical Compounding and Dispensing, JF Marriott *et al.* (editors) Pharmaceutical Press (2006)

ASSESSMENT	Weighting
Written theory paper: 2 hours; 3 questions out of 4 to be answered	60% of total marks
Practical examination: 2.5 hours; 3 questions (no choice)	40% of total marks

Please note that pharmaceutical calculations related to this module will also be tested as part of the Pharmaceutical Calculations Tests in PH1005

NB. Students are expected to satisfy the examiners in both written and practical examination components. The pass mark for the module is 40%. Students who obtain an overall mark of less than 40% will be required to sit the Supplemental examinations. Students who fail to satisfy the written requirement (i.e. less than 40%) in the annual examination, but who obtain a Class II or better in the practical examination will be ungraded and will be required to take a supplemental examination in the written examination only. Students who fail to satisfy the practical requirement (i.e., less than 50% in the practical examination) of the annual examination, but who obtain a Class III or better in the written section will be ungraded and will be required to supplement in the practical examination only.

SUMMARY OF HOURS

Lectures	Practicals	Tutorials	Total contact	Pr. Write-ups	Guided study	TOTAL	ECTS
21	28	1	50	14	46	110	5

MATHEMATICAL METHODS & PHARMACEUTICAL CALCULATIONS

Year 1 (Junior Freshman) **Course Code: PH1005**

Staff of School of Pharmacy & Pharmaceutical Sciences
Staff of School of Mathematics

Coordinator: Dr John Quigley (JQ)

AIMS: To explain basic techniques in Applied Mathematics and Introductory Statistics and calculations of relevance to Pharmacy.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Use Differential and Integral Calculus
- Explain the fundamental theory of statistical analysis
- Develop systems of linear equations
- Perform calculations relevant to Pharmaceutical Practice
- Determine the derivation of relevant kinetic data as applicable to pharmaceutical systems

PRE-REQUISITES: Matriculation Requirements **and** in **Mathematics** at Leaving Certificate an Ordinary Level grade C or Higher Level grade D or grade B at GCSE level.

LECTURE OUTLINE

Unit PH1005A: MATHEMATICAL METHODS GIVEN BY STAFF OF THE SCHOOL OF MATHEMATICS:

16 lectures & 8 Tutorials / Workshops

- Differential and Integral calculus (Linear, exponential, logarithmic and trigonometric relationships)
- Differential equations (1^{st} & 2^{nd} order)
- Algebra; Systems of linear equations

Unit PH1005B: INTRODUCTORY STATISTICS & PHARMACEUTICAL CALCULATIONS given by Staff of Pharmacy & Pharmaceutical Sciences:

13 Lectures (JQ)

- Random & Discrete variables; Population Parameters & Pharmaceutical Statistics
- Probability Distributions (Poisson & Binomial)
- The Normal (Gaussian) Distribution; Properties & Applications; Cumulative Frequency Curve (Applications & Calculations)
- Derivation of the Rate Laws
- Prescription Compounding and Formulation Calculations; Dilution, Concentration & Alligation; Isotonic & Electrolyte Solutions
- Bioavailability & Bioequivalence; Drugs in different forms; Reconstitution for Oral and Parenteral use

TUTORIALS: Weekly problem sheets and supporting problems classes.

PRACTICAL SESSIONS 6 hours

- Use of Excel; Data Presentation and Analysis; Plotting; Error Estimation;
- Statistical Analysis of repeated measurements; Uniformity of Content & Weight

ASSESSMENT

Written theory paper: 2 hours; 2 Sections, all questions to be answered

Section A (PH1005A Maths Methods): 3 questions;	60% of written paper
Section B (PH1005B Statistics & Calculations): 2 questions	40% of written paper

Continuous Assessment:

*Two term tests	4%
Exercise	4%

*Students will be required to attain a mark of at least an average mark of 70% in these Pharmaceutical calculations tests (comprising 10 questions each). Otherwise, they will be required to present for a further examination (pass mark 70%) prior to the Annual Examination session (comprising 20 questions). The use of calculators will be disallowed. No compensation is allowed in this element of the module assessment.
Facility with simple pharmaceutical calculations, with a mark of a minimum of 70% in Pharmaceutical Calculations Test(s), is a pre-requisite for entry into the Senior Freshman year.

Please note that relevant material from PH1004 will also be assessed in the Pharmaceutical Calculations Tests.

OVERALL WEIGHTING:

Written Paper	92%
Continuous Assessment	8%

SUMMARY OF HOURS

Lectures	Practicals	Tutorials	Total contact	Pr. Write-ups	Guided Study	TOTAL	ECTS
29	6	8	43	3	60	106	5

PRACTICE OF PHARMACY I
Year 1 (Junior Freshman) **Course Code: PH1006**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Dr. M Henman (MH); S Ryder (SR); Dr. D Corrigan (DC)
Teacher-Practitioners: K Sheridan (KS); C Roche (CR); N McMahon (NMcM)
External staff: Librarian; St John's Ambulance Service; Faculty of Health Sciences

Coordinator: S Ryder

AIMS: To introduce the students to all aspects of Pharmacy Practice, including:
the roles and responsibilities of pharmacists, the institutions of pharmacy and the organisation of the health service, the structure and operation of community and hospital practice, the manufacture and supply of medicines, the law relating to medicines, medicine supply schemes and prescription dispensing, communication skills and alternative systems of medicine.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Define pharmaceutical care, identify the characteristics of a profession, outline the development of the profession of pharmacy and explain its professional status.
- Distinguish between drugs, medicinal substances and medicinal products.
- Describe the structure and organisation of the health services in Ireland.
- Describe the drug use process, the characteristics of community and hospital pharmacy practice in Ireland, typical care paths in these settings and the healthcare professionals involved.
- Describe the sequence of events in drug development, production and marketing, identify the regulatory bodies that are relevant to pharmacy, pharmacists and pharmaceuticals, and describe the regulation of product authorisation, drug distribution and supply in Ireland.
- Describe the different components of Irish and EU legislation, their implementation and their relative importance.
- Discuss the obligations of a pharmacist under the 'GMS contract' (Community Pharmacy Contractor Agreement).
- List the principles in the Pharmaceutical Society of Ireland's Code of Conduct, provide detailed examples of areas covered by this and other professional codes and guidelines, and implement these principles when undertaking professional activities.
- Critically discuss case studies in the light of legislation and professional codes.
- Critically discuss the medicine supply schemes existing in Ireland.
- Identify relevant medicine supply schemes when presented with a prescription, provide advice to a patient or prescriber on how these schemes operate, and dispense prescriptions in a legal, safe and appropriate manner.
- Describe the communication process and the structuring of explanations.
- Demonstrate the ability to use the available medicine and pharmacy information resources appropriately.
- Discuss key disease processes, signs and symptoms, dose-response relationships, pharmacodynamics, pharmacokinetics and toxicology.
- Explain the concepts of efficacy, side effects and therapeutic index.
- Describe the principal classes of cellular and molecular targets for drug action;
- Discuss the pharmacology and toxicology of paracetamol.

PRE-REQUISITES: None

Unit PH1006A: Social & Administrative Pharmacy

LECTURE OUTLINE (14 hours)

1	Introduction, pharmacy in Ireland and medicines in Irish society	MH
2	Pharmacy, pharmacists and professions	MH
3-4	History and the institutions of pharmacy	MH
5	The manufacture and supply of medicines	MH
6-7	The health service and health policy	MH
8	Pharmacists' roles and responsibilities	MH
9	Community pharmacy	MH

10	Hospital pharmacy	NMcM
11-14	Legislation, ethics and codes of practice, medicine supply schemes	SR

PRACTICAL CLASSES / WORKSHOPS (15 hours)

Ethics in pharmacy practice	CR
Dispensing 1.1	SR/KS/SR
Dispensing 1.2	SR/KS/SR
Dispensing feedback workshop (Dispensing 1.1, 1.2)	SR/KS/SR
Dispensing 1.3	SR/KS/SR
Dispensing 1.4	SR/KS/SR
Dispensing 1.5 (evaluation)	SR/KS/SR
Dispensing feedback workshop (Dispensing 1.3, 1.4, 1.5)	SR/KS/SR

Unit PH1006B: Pharmaceutical Care

LECTURE OUTLINE (16 hours)

1	Pharmaceutical care	MH
2	Health and illness; patient care	MH
3	Pharmaceutical care using prescription and non-prescription medicines	MH
4	Introduction to pathology and disease	MH
5-7	Introduction to complementary and alternative medicine	DC
8-9	Communication skills	MH
10	Health information and health informatics – applied literacy skills	MH
11-16	Introductory pharmacology	MH

PRACTICAL CLASSES / WORKSHOPS (15 hours)

Communication skills	KS
Clinical skills 1.1	MH
Clinical skills 1.2	MH
Clinical skills 1.3	MH
Health informatics – applied literacy skills	Librarian

Unit PH1006C: DISSERTATION (25 hours)

Tutorial: dissertation skills (1 hr)	MH
Literature review and critical analysis of topic associated with the JF course (24 hrs)	Guided study

Unit PH1006D: *OPTIONAL* FIRST AID COURSE (Certificate evening course, 21 hours)
St. John's Ambulance Service and Faculty of Health Sciences

DIRECTED READING

British National Formulary
IPHA Summary of Product Characteristics Compendium
DrugDex
The Health Services in Ireland, Brendan Hensey, 1998
PSI Pharmacy Practice Guidance Manual
HPAI Code of Ethics: Procurement
GMS Contract
PCRS Handbook: Information and Administrative Arrangements for Pharmacists
Legislation relevant to the course.

ASSESSMENT	Weighting
Written examination: 1.5 hours. Essay (1 question out of 2) and MCQs (20)	80% of total marks
[1]Coursework (practicals) and dispensing evaluation	10% of total marks
[1]Dissertation	10% of total marks

NB: Pharmacy legislation, ethics, professional codes and health schemes are also examinable in 4th year (Practice of Pharmacy Paper 2, XPH4PP2; dispensing examination).

SUMMARY (excludes optional PH1006D)

Unit	Lectures	Workshops/ Practicals	Contact Hours	Practical reports	Guided study	TOTAL	ECTS
PH1006A	14	15	29		20	49	2
PH1006B	16	15	31	4	15	50	2
PH1006C	1		1		24	25	1
TOTAL	**31**	**30**	**61**	**4**	**59**	**125**	**5**

The pass mark for examinations and assessments is 40% except where otherwise indicated. Students should note that College penalties for plagiarism apply to both examinations and continuous assessment.

A specific requirement of the course is that continuous assessment exercises must be presented for evaluation by the specified date(s). They must be presented to a designated member of staff and signed in on the form for this purpose. Work submitted late will not be assessed unless a valid reason is provided.

[1]Students must satisfy the examiners in both the coursework and dissertation components of the module.
Examination marks may be withheld and/or a student may be refused permission to rise with their class until they have satisfied the examiners in the continuous assessment components of the course.

NB: Professional Dress Code
Students are required to dress appropriately and behave in a professional manner for elements of the course entailing attendance at external facilities (professional experience in pharmacies, case review in hospitals, health service facilities, etc.)

ORIENTATION AND LEARNING SKILLS AND INTEGRATED PHARMACY STUDIES
Year 1 (Junior Freshman) **Course Code**: **PH1007**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Dr M Henman ; AN Other
Staff of Learning Support: Dr T O'Connor (TOC)

Coordinator: Dr M. Henman

The module is divided into 2 Units : PH1007A Orientation and Learning Skills MH
PH1007B Integrated Pharmacy Studies MH

Unit PH1007A: Orientation and Learning Skills (9 hours) (MH)

AIMS: To enable the students to acquire a knowledge of the School of Pharmacy and Pharmaceutical Sciences and of the B.Sc. (Pharm.) degree. To encourage the students to appreciate the importance of different study skills and their application in different learning situations. Students will apply Problem-Based Learning (PBL) techniques to selected pharmacy topics.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:
- Describe the B.Sc.(Pharm) degree and the Learning Support available in the College
- Discuss the interrelationships between the different forms of knowledge and the roles of pharmacists in Society
- Discuss the mechanisms by which different approaches to learning and assessment can aid understanding
- Apply the techniques used in Problem-based learning

PRE-REQUISITES: None

LECTURE OUTLINE
1 Introduction to staff, procedures and policies and support networks of the School;
2 Expectations of College and of Pharmacy and survival skills;
3 Learning styles and experiential learning;
4 Scientific method & development of understanding in the Humanities;
5 Effective use of Internet and Library;
6 Academic writing and Presentation skills;
7 Self assessment and Peer group assessment;
8-9 Managing studies and exam techniques.

CAL: 15hs
Tutorials/Workshops: 8hs

ASSESSMENT
Learning Portfolio Satisfactory/Unsatisfactory

Unit PH1007B: Integrated Pharmacy Studies (MH)

AIMS: To introduce students to the learning style of Problem-Based Learning using a common theme and problems that may require the resources of more than one academic subject area for the their solution.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:
- Work in groups
- Clarify the nature and components of a problem
- Identify the resources and resource people who can contribute to its solution
- Allocate tasks and manage a plan of work
- Formulate and evaluate possible solutions
- Develop an agreed solution
- Devise and present the solution as a slide presentation to the class
- Contribute to the individual and group assessment of their peers

PRE-REQUISITES: None

LECTURE OUTLINE (1 hour)
1 Introduction to Problem Based learning method
Problems drawn from the Pharmaceutical Chemistry, Pharmacology, Toxicology, Formulation, Pharmaceutical Technology, Pharmacognosy and Pharmacy Practice of Aspirin and salicylates, will be assigned to 8-10 small groups for development and presentation of a solution to the whole class.

WORKSHOPS (15 hours)
5 Small group workshops facilitated by Staff of the School

PRESENTATION & REVIEW (1 hour) Group presentations and Assessment

ASSESSMENT Group and Individual assessment based upon contribution to Problem Solving and Presentation and Facilitator assessment Satisfactory/Unsatisfactory

Unit	Lectures	Workshops/CAL	Presentation	Total Contact	Guided study	TOTAL	ECTS
PH1007A	9	23		32	29	61	
PH1007B	1	15	3	19	21	40	
TOTAL	10	38	3	51	50	101	5

SENIOR FRESHMAN (2nd Year) course

Module details may be subject to corrections/amendments.

- *It is each student's responsibility to be aware of dates, times, locations, etc. of lectures, tutorials, seminars and practical classes.*

- *Laboratory notebooks must be presented for assessment by the date specified in the module.*

- *Notebooks submitted after the specified date will not be assessed, unless a valid reason is given, and students will be deemed not to have satisfied the School's examination requirements.*

PHARMACEUTICAL PROPERTIES OF MATERIALS USED IN MEDICINES
Year 2 (Senior Freshman) **Course Code: PH2001**

Staff of the School of Pharmacy & Pharmaceutical Sciences : Prof. M Meegan (MM), Dr. John Gilmer (JG)

Co-ordinator: Dr. John Gilmer

AIMS: To develop and consolidate the fundamental pharmaceutical and bioorganic chemistry of the materials used in medicines from first year with emphasis on more advanced topics. Stereochemistry is introduced, the chemistry of some important heterocycles is covered, as is polymer chemistry relevant to pharmacy.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Describe the characteristics of pharmaceutical materials containing conjugated and aromatic systems and consolidate ideas about chemical bonding and its representation.
- Explain the reactivity of benzene and related compounds using mechanistic conventions
- Explain what an azo bond is and how the group behaves in vivo
- Discuss the process of ionisation in acids and bases and electronic and structural factors that affect equilibria
- Identify amine salts and describe their role in solubilisation and stabilization
- Discuss why shape is important in drug molecules;
- Describe how stereochemistry is classified, analysed and how it is accommodated in pharmaceutical science and regulations.
- Explain what a heterocyle is and describe their chemistry and importance in pharmacy
- Explain what a synthetic polymer is, how they are produced, characterised and used in pharmacy.
- Be competent in preparation, purification and characterization of drug substances

PRE-REQUISITES: Successful completion of Junior Freshman (Year 1)

LECTURE OUTLINE

Unit PH2001A: Conjugation, aromaticity and reactivity in pharmaceutical compounds (JG)

1. Review of bonding and electronic structure of unsaturated molecules
2. Conjugation; thermodynamic and reactivity issues
3. MO Theory and modelling of pharmaceutically relevant compounds
4. Aromaticity, stability, electronic structure, 4n+2 rule, quasi-aromatics
5. Electrophilic aromatic substitution, metabolism of benzene containing compounds
6. Directing effects in electrophilic substitution
7. Azo compounds, the diazonium reaction, azocoupling, applications in pharmaceutical analysis and drug delivery

Unit PH2001B: Pharmaceutical properties of drugs containing amines and carboxylic acids; physical and electronic characteristics (JG)

8. Amines, the concepts of basicity, relationship between pH and lipophilicity
9. Factors affecting amino drug basicity
10. Acidity in organic compounds, review of pKa and relationship to electronic structure.
11. Acid derivatives: stability, reactivity, amides, ester drugs

Unit PH2001C: Pharmaceutical properties of drugs containing carbonyl groups; physical and electronic characteristics (JG)

12. Structure and reactivity of aldehydes and ketones, a review
13. Acetals and ketals, the concept of the protecting group

Unit PH2001D: Stereochemistry and pharmacy (MM)

14. Definition and concepts of stereochemistry, nomenclature, single and multiple chiral centres
15. Sources and production of chiral drugs
16. Characterisation of chiral drugs
17. Pharmacology of chiral drugs
18. Regulatory aspects of chiral drugs

Unit PH2001E: Basic heterocyclic chemistry relevant to pharmacy (JG)

19. What is a heterocycle? distribution, nomenclature and uses in pharmacy
20. Six membered compounds: Pyridine, reactivity, tautomerism.
21. Six membered pyrimidine
22. Five membered heterocycles: pyrrole, furan, thiophene, imidazole

Unit PH2001F: Properties of pharmaceutical polymers (MM)

23. Free radical chemistry
24. Monomers, polymers, copolymers; structures and definitions
25. Addition polymerization
26. Condensation polymerization

PRACTICAL CLASSES: Drug specifications and process chemistry (MM)

1. Sulfonamide preparation and specifications
2. Paracetamol: preparation and specifications
3. Aspirin: preparation and specification
4. Pharmaceutical process chemistry I: Nitration of aromatic substrates
5. Pharmaceutical process chemistry II: Alkylation of aromatic substrates
6. Pharmaceutical process chemistry III: Reduction methods for carbonyls

DIRECTED READING

Essentials of Organic Chemistry for Students of Pharmacy, Medicinal Chemistry and Biological Chemistry. Dewick. Wiley 2006.
Mechanism in Organic Chemistry. Sykes.

ASSESSMENT	Weighting
Written Paper: (2 hours) 5 Questions, all compulsory	80% of total marks
Continuous Practical Assessment	20% of total marks

SUMMARY OF HOURS

Lectures	Practicals	Tutorial	Total contact	Pr. Write-ups	Guided study	TOTAL	ECTS
26	18	0	44	13	48	105	5

N.B. Students are expected to satisfy the examiners in both written examination and practical components. The pass mark for examinations is 40%. Students who obtain an overall mark of less than 40% will be required to sit the supplemental examinations. Students who fail to satisfy the written requirement (i.e. less than 40%) of the annual examination, but who obtain a Class III or better in the practical section will be ungraded and will be required to take a supplemental examination in the written examination only. Students who fail to satisfy the practical requirement (i.e. less than 40% of the practical component) of the annual examination, but who obtain a Class III or better in the written section will be ungraded and will be required to resubmit in the practical component.

PHYSICAL PHARMACY II

Year 2 (Senior Freshman) **Course Code: PH2002**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Dr. J Quigley (JQ), Dr. L Tajber (LT), Dr. Mariusz Kamionka (MK)

Coordinator: Dr. John Quigley

AIMS: To explain more fully physicochemical aspects of substances used in pharmacy and medicine.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Appreciate the importance of pH – rate profiles in respect of the stability of pharmaceutical systems
- Describe the principal mechanistic pathways of drug degradation
- Explain the role of physicochemical properties in relation to drug distribution and activity
- Describe the occurrence of polymorphism in pharmaceutical systems
- Summarise the fundamental theory of electrochemical systems
- Discuss the rheological aspects of pharmaceutical systems and products
- Demonstrate competence in related practical laboratory skills.

PRE-REQUISITES: Successful completion of Junior Freshman (Year 1)

LECTURE OUTLINE

1-2	Accelerated Stability Analysis; Extrapolation, Criteria & Limitations	JQ
3-4	pH – rate profiles; V-graphs, determination of minimum pH value	JQ
5	Sigmoid curves (ionisation & pKa) & Bell-shaped curves	JQ
6	Selected examples and Pharmaceutical calculations	JQ
7-10	Hydrolysis & Oxidation of Pharmaceutical Agents	JQ
11-14	Physicochemical properties of drugs in solution (buffers, solubility)	JQ
15	pH – partition profiles / ionisation	JQ
16-18	Electrochemical Definitions; Redox Potentials; Glass Electrode	JQ
19-20	Enhancing solubility – complexation and other methods	LT
21-22	Pharmaceutical implications of Polymorphism	JQ
23	Introduction to rheology	MK
24	Pharmaceutical disperse systems	MK
25	Non-Newtonian systems	MK
26	Measurement of viscosity	MK
27	Texture of pharmaceutical systems	MK

PRACTICAL CLASSES (3 hours each)

1. Colour & Clarity of Solutions / Refractive Index / Optical Rotation.
2. Potentiometric Titrimetry. Potentiometric determination of the pK_a of benzoic acid.
3. Spectrophotometric determination of the Ionisation constant (pK_a). Determined for both bromophenol blue and procaine.
4. Conductivity Measurements. Determination of Λ^0 for a salt. Conductometric titrimitry.
5. The standardization of molecular size by viscosity measurements

DIRECTED READING

Sinko, Patrick J., *Martin's Physical Pharmacy and Pharmaceutical Sciences*, (2006).
Florence, A.T. and Attwood, D., *Physicochemical Principles of Pharmacy*. 4th edition, (2006).
Cairns, D., *Essentials of Pharmaceutical Chemistry* (2000).

ASSESSMENT	Weighting
Written theory examination: 2 hour; to answer 3 questions out of 4	90% of total marks
Practical: Continuous Assessment	10% ot total marks

SUMMARY OF HOURS

Lectures	Practicals	Tutorial	Total contact	Pr. Write-ups	Guided study	TOTAL	ECTS
27	15	0	44	11	54	109	5

N.B. Students are expected to satisfy the examiners in both written examination and practical components. The pass mark for examinations is 40%. Students who obtain an overall mark of less than 40% will be required to sit the supplemental examinations. Students who fail to satisfy the written requirement (i.e. less than 40%) of the annual examination, but who obtain a Class III or better in the practical section will be ungraded and will be required to take a supplemental examination in the written examination only. Students who fail to satisfy the practical requirement (i.e. less than 40% of the practical component) of the annual examination, but who obtain a Class III or better in the written section will be ungraded and will be required to resubmit in the practical component.

ISOLATION & ANALYSIS OF SUBSTANCES USED IN MEDICINES
Year 2 (Senior Freshman) **Course Code: PH2003**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Dr. Fabio De Sousa Menezes, (FdSM), Dr. John Quigley (JQ), Dr. Astrid Sasse (AS)

Coordinator: Dr. Helen Sheridan

AIMS: to reinforce the concepts of quality, together with appropriate regulatory frameworks and guidance, and the application of analytical techniques to pharmaceutical materials (This is a continuation of the course given at JF level). Herbal drugs used as human medicines are introduced as is Pharmaceutical spectroscopy in preparation for the instrumental analysis component at JS level.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Demonstrate competence in obtaining and interpreting data in relation to standard pharmacopoeial monographs.
- Have the ability to verify the identity of synthetic and crude herbal drug material by reference to the chemical, chromatographic, macroscopic or microscopic characteristics;
- Discuss the regulatory framework for specifications of drug substances and products, including those from herbal sources.
- Be proficient in the application and utilisation of chromatographic or chemical techniques to quantify synthetic or herbal drugs in crude samples, formulated products or clinical samples.
- Discuss the theory and evaluate the application of spectroscopic techniques in pharmaceutical analysis (e.g. IR, UV, NMR and MS).

PRE-REQUISITES: Successful completion of Junior Freshman (Year 1)

LECTURE OUTLINE

Methods in Pharmacognosy (11 Lectures) (Dr. Fabio De Sousa Menezes)

1 Herbal drugs/medicines–Pharmacopoeial definitions & methods
2-3 Cell inclusions & vacuolar contents used in pharmacy (e.g. starch)
4-6 Cell types and tissues used in the identification of herbal drugs
6-7 Leaf-derived herbal drugs of pharmaceutical/ Ph Eur importance
8 Bark-derived herbal drugs of pharmaceutical/ Ph Eur importance
9 "Root"-derived herbal drugs pharmaceutical/ Ph Eur importance
10-11 Pharmacopoeial methods used in the Quality Control of herbal drugs

Specifications and regulatory outline (4 lectures) (Dr. Astrid Sasse)

12 Introduction to analysis: objectives, terminology, guidance
13 Setting specifications for drug substances and products: ICHQ6A
14 Drug Master Files; Impurities: ICHQ3A; Residual Solvents: ICHQ3C
15 Quality concepts of pharmaceutical, specifications, the pharmacopoeia

Pharmaceutical spectroscopy (21 Lectures) (Dr. Astrid Sasse)

16-19 UV-Vis Spectroscopy: theory and application in pharmaceutical analysis
20-23 Infrared Spectroscopy (IR): theory and application in pharmaceutical analysis
24-29 Nuclear Magnetic Resonance Spectroscopy (NMR): theory and application in pharmaceutical analysis
30-35 Mass Spectrometry (MS): theory and application in pharmaceutical analysis
36-37 Miscellaneous methods; general problems and solutions in pharmaceutical spectroscopy

PRACTICALS (* 2 hours each, otherwise 3 hours)

Part1: Michaelmas Semester:

1 A) Assay of Ferrous Fumarate / Ferrous Gluconate Tablets. B) Iodine / Thiosulphate titrimetry
2 Assay of Ferric Ammonium Sulphate [Fe (NH_4) $(SO_4)_2$. 12 H_2 O]*
3 Iodine displacement titrations*:
4 Determination of the Iodine Value of an Oil.*
5 A) To determine the % w/v Ca as Ca^{2+} in Calcium Gluconate Injection. B) To determine the % w/v Zinc in Mouthwash Gluconate injection/zinc mouthwash.
6 A) To determine the % w/w Aluminium in the sample provided B) To determine the % w/w Bismuth in Bismuth Carbonate.

7 A) To determine the purity of Sulphadimidine B) Determination of % w/w Aniline Hydrochloride in a sample

Part 2: Hilary Semester

8 Plant cell inclusions (crystals, starch grains), identification, microscopical measurements (including micromeritics with Pharmaceutics)
1 Introduction to plant cells and tissues
2 Examination and qualitative methods used for standardization of leaves/herbs used in pharmacy
3 Examination and qualitative methods used for standardisation of medicinal barks
4 Examination and qualitative methods used for standardisation of "roots' and seeds
5 Quality evaluation of herbal drug (Cinnamon Ph Eur vs USP)

TUTORIALS
Tutorials (6 tutorials, 2hrs each) arranged to complement the lecture theory and practical programme

DIRECTED READING

- European Pharmacopoeia.
- Introductory Plant Biology. Stern. McGraw-Hill, 9th edition, 2003.
- Plant Anatomy. An Applied Approach. Cutler, Botha and Stevenson. Blackwell Publishing, 2008.
- Pharmacognosy. Trease & Evans. Elsevier, 15th edition, 2002.
- ICH Q6A, Q3A, Q3C http://www.ich.org
- Watson, Pharmaceutical Analysis, 2nd Edition, Elsevier, 2005.
- Silverstein, The Spectrometric Identification of Organic Compounds, 7th Edition, Wiley, 2005.
- Pavia, Lampman, Kriz, Introduction to Spectroscopy, 3rd Edition, Brooks/Cole Thomson Learning, 2001.
- Holler, Skoog, Crouch, Principles of Instrumental Analysis, 6th Edition, Thomson, Brooks/Cole, 2007.
- Watson, Sparkman, Introduction to Mass Spectrometry, 4th Edition, Wiley, 2007.

ASSESSMENT Weightings

- Written paper (3 hours): consists of 2 sections. 80% of total

  [Section A 60%, Section B 40%]
  Section A: 3 essay-type questions (no choice)
  Section B: short answer (two of three) /MCQs (no choice)

- Practical Examination (3 hours) 10% of total
- Practical Book reports: continuous assessment 10% of total

SUMMARY OF HOURS

Lectures	Practicals	Tutorials	Total contact	Pr. Write-ups	Guided Study	Total	ECTS
37	36	12	85	28	80	193	10

N.B. Students are expected to satisfy the examiners in both written and practical examination components. The pass mark for examinations is 40%. Students who obtain an overall mark of less than 40% will be required to sit the supplemental examinations. Students who fail to satisfy the written requirement (i.e. less than 40%) of the annual examination, but who obtain a Class III or better in the practical section will be ungraded and will be required to take a supplemental examination in the written examination only. Students who fail to satisfy the practical requirement (i.e. less than 40%) of the practical examination) of the annual examination, but who obtain a Class III or better in the written section will be ungraded and will be required to supplement in the practical examination only.

FORMULATION AND PHARMACETICAL TECHNOLOGY
Year 2 (Senior Freshman) **Course Code: PH2004**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Dr A.M. Healy (AMH), Dr Lidia Tajber (LT)

Coordinator: Dr. L. Tajber

AIMS: To provide a continuation course in the formulation of some common pharmaceutical dosage forms, together with aspects of unit operations related to the production of effective medicines.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Describe theoretical and practical aspects of colloids and colloidal preparations
- Discuss physical stability problems associated with production of stable pharmaceutical emulsions
- Describe the manufacture stable pharmaceutical suspensions, solubilised preparations, ointments, creams, and emulsions
- Explain the mass and heat transfer processes of pharmaceutical importance
- Discuss the various unit processes used in the manufacture of pharmaceutical materials and formulations
- Describe the operation of various types of equipment used in unit processes
- Outline the importance of particle size, particle size analysis and powder flowability of pharmaceuticals and discuss different techniques to characterise powder size and flow
- Describe the role and basic methods used in preformulation studies of pharmaceutical solid dosage forms
- Describe the formulation and production of tablets
- Apply appropriate (pharmacopoeial and non- pharmacopoeial) testing procedures in assessment of quality of various types of tablets
- Explain GMP considerations in the production of such dosage forms

PRE-REQUISITES: Successful completion of Junior Freshman (Year 1)

LECTURE OUTLINE		**LECTURER**
Unit PH2004A: Formulation - colloids and emulsions		
1.	Introduction to colloids and pharmaceutical nanotechnology	LT
2.	Classification of colloids, lyophobic and lyophilic colloids	LT
3.	Kinetic and optical properties of colloids	LT
4.	Electrical properties and charge of colloids	LT
5.	Physical stability of colloids, DLVO theory	LT
6.	Micellar colloids, surfactants	LT
7.	Liposomes and liposomal drug delivery systems	LT
8.	Solubilization by micelle formation, ternary phase diagrams	LT
9.	Terminology and classification of emulsions, emulsion-based drug delivery systems	LT
10.	Thermodynamics of emulsions, primary and secondary emulgents, HLB classification	LT
11.	Major emulgent types, emulsion formulation by HLB method	
12.	Factors affecting emulsion stability	LT
13.	Pickering emulsions, preparation of emulsions	LT
14.	Suspension formulation using controlled flocculation and structured vehicles	LT
15.	Tutorial	LT
Unit PH2004B: Pharmaceutical unit processes		
16.	Introduction to mass transfer processes, mass transfer in still/stagnant gases	AMH
17.	Mass transfer in moving fluids, interfacial mass transfer, examples of mass transfer operations	AMH
18.	Heat transfer by conduction and convection, heat transfer through walls and across pipes and tubes, heat exchange between fluids across a solid boundary. Heat transfer to boiling liquids	AMH
19-20.	Comminution	AMH
21-22	Mixing	AMH

23-24. Filtration	AMH
25-26. Drying	AMH
27-28. Evaporation	AMH
29-30. Distillation	AMH

Unit PH2004C: Micromeritics

31. Microscopy as a technique for particle size analysis	AMH
32. Sieving as a technique for particle size analysis	AMH
33. Particle size analysis using sedimentation techniques	AMH
34. Electrical sensing zone (Coulter Counter) method for particle size analysis	AMH
35. Particle size analysis using laser light scattering techniques - laser diffraction particle size analysis and photon correlation spectroscopy	AMH
36. Surface area measurement techniques - gas adsorption and permeametry	AMH
37. Methods of presentation and interpretation of particle size analysis results	AMH
38. Particulate solids in bulk - fundamental and derived properties, factors affecting the flow properties of powders	AMH
39. Assessment of powder flow, angle of repose and friction, Carr's index, use of glidants, flow of solids in hoppers and through orifices, the behaviour of powders in the fluidised state	AMH

Unit PH2004D: Tabletting

40. Introduction to tabletting terminology, types of tablets	LT
41-42. Preformulation testing of drugs for compressed tablets	LT
43-44. Formulation of compressed tablets	LT
45. Tablet presses, tooling and mechanism of tablet compression	LT
46. Direct compression	LT
47. Dry and moist granulation procedures	LT
48. Coating of tablets	LT
49. Processing problems	LT
50. Tablet evaluation	LT
51. GMP considerations for solid dosage form production	LT
52. Quality by design and statistical approaches in production of solid dosage form	LT

PRACTICAL CLASSES (3 hours each)

PH2004A/B/C

1. Influence of suspending agent and electrolyte on the flocculation rate and redispersal of a suspension and optical properties of a hydrophobic sol associated with particle size stability.
2. Solubilized preparation
3. Ointments
4. Emulsifying waxes and ointments, creams and applications
5. Creams continued
6. Oral emulsions
7. Dilutions
8. Revision and repeat
9. Practical Examination (2.5 hours)
10. Mixing and milling

PH2004D

11. Effervescent granules and bioavailability exercise
12. Practical aspects of tabletting
13. Direct compression bases, tablet compression
14. Preliminary compression, feed evaluation
15. Moist granulation, tablet evaluation
16. Moist granulation continued, tablet evaluation, CAL package on GMP
17. Factory visit to tabletting plant

TUTORIALS 1 on pharmaceutical formulation and calculation

DIRECTED READING

European Pharmacopoeia

British Pharmacopoeia
Martindale
Pharmaceutics. The Design and Manufacture of Medicines 3rd Edition, M E Aulton, editor, Churchill Livingstone (2007)

ASSESSMENT	Weighting
Written theory paper: 3 hours; 5 questions (no choice)	70% of total marks
Practical examination: 2.5 hours; 3 questions (no choice)	20% of total marks
Continuous assessment of practical	10% of total marks

SUMMARY OF HOURS

Lectures	Practicals	Tutorials	Total contact	Pr. Write-ups	Guided Study	TOTAL	ECTS
52	48	1	101	32	105	238	10

NB. Students are expected to satisfy the examiners in both written and practical examination components. The pass mark for the module is 40%. Students who obtain an overall mark of less than 40% will be required to sit the Supplemental examinations. Students who fail to satisfy the written requirement (i.e. less than 40%) in the annual examination, but who obtain a Class II (50%) or better in the practical examination will be ungraded and will be required to take a supplemental examination in the written examination only. Students who fail to satisfy the practical requirement (i.e., less than 50% in the practical examination) of the annual examination, but who obtain a Class III (40%) or better in the written section will be ungraded and will be required to supplement in the practical examination only.

MICROBIOLOGY AND BIOCHEMISTRY
Year 2 (Senior Freshman) **Course Code: PH2005**

Dept of Microbiology: Prof C Smyth (CS); Dr R Russell (RR); Dr F Falkiner (FF); Dr U Bond (UB); Prof T Rogers (TR)
Dept. of Biochemistry and Immunology: Dr T Mantle (TM), Prof J Scott (JS), Prof K Tipton (KT)

Coordinator: Dr. M. McKillen (Biochemistry), Dr Angus Bell (Microbiology)

AIMS
PH2005A (MI2005): To enable the student to appreciate how microbiology impinges on many aspects of Pharmacy

PH2005B (BI2005): To provide an overview of biochemical aspects of metabolism

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Describe microbial structure, culture and identification
- Discuss host response to infective mechanisms
- Describe medically significant bacteria and pathogenic mechanisms
- Explain the mechanism of action of the different groups of antibiotics
- Discuss epidemiology, zoonoses and fungal infections
- Explain the mechanism of action of the major antifungal drugs
- Discuss determinants of the immune response, autoimmunity, immunocompetence & immunotherapy
- Describe viral structure, multiplication and viral diseases
- Explain the mechanism of action of the different classes of antiviral drugs
- Discuss nutrition and metabolism – intermediary and alcohol

PRE-REQUISITES – None

UNIT PH2005A (MI2005) MICROBIOLOGY		**LECTURER**
LECTURE OUTLINE (*Michaelmas Term)*		
1	The microbial world I: Bacteria	CS
2	Immunology	RR
3	Pathogenic mechanisms	CS
4	Immunology	RR
5	The microbial world II: Viruses	CS
6-7	Pathogenic mechanisms	CS
8	Immunology	RR
9	Gastrointestinal infections	FF
10	Viruses	CS
11	Meningitis/septicaemia	UB
12	Urinary tract infections	FF
13	Fungi & antifungal therapies	TR
14	Hospital acquired infections	FF
15	Anaerobic bacteria	UB
16	Viruses	CS
17	Respiratory infections	UB
18	Viruses	CS
19	Vaccines	RR

PRACTICAL CLASSES (9 hrs)

1	Identifying and staining bacteria
2	Aseptic Technique/Nutritional and atmospheric requirements
3	Differential and selective media
4	Enumeration of bacteria
5	Antibiotics, minimum inhibitory concentration
6	Identification of bacteria
7	Virology

DIRECTED READING (PLEASE NOTE: MAY BE SUBJECT TO CHANGE)
Hugo and Russell,Pharmaceutical Microbiology 7th ed (2004) S-LEN 615.329 L74*6
And other material to be advised by the lecturers.

MICROBIOLOGY ASSESSMENT (PLEASE NOTE: MAY BE SUBJECT TO CHANGE)
• Written Paper: 2 hours
Multiple-choice, 30 questions 40%
4 short questions (no choice) 40%
Practical assessment (reports) 20%

SUMMARY OF HOURS

Lectures	Practicals	Total contact	Pr. Write-ups	Guided Study	Total	ECTS
19	9	28	5	30	63	3

UNIT PH2005B (BI2005) BIOCHEMISTRY

LECTURE OUTLINE (Biochemistry with JF Med/SF RT)	**LECTURER**
1-4 Intermediary metabolism (lipids)	TM
5-8 Intermediary metabolism (amino acids)	TM
9-13 Nutrition – anaemias, iron, folate & B12	JS
14-15 Alcohol metabolism	KT

BIOCHEMISTRY ASSESSMENT
MCQ examination (1 hour)

SUMMARY OF HOURS

Lectures	Practicals	Total contact	Pr. Write-ups	Guided Study	Total	ECTS
15		15		20	35	2

PLEASE NOTE: STUDENTS MUST PASS EACH UNIT OF THIS MODULE. THE PASS MARK FOR EACH UNIT IS 40%.

PRACTICE OF PHARMACY II
Year 2 (Senior Freshman) **Course Code**: **PH2006**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Dr M Henman (MH); S Ryder (SR); I Hook (IH); Dr D Corrigan (DC)
Teacher-Practitioners: K Sheridan (KS); C Roche (CR)

Coordinator: S Ryder

AIMS: Students will appreciate the impact of nutrition on health and illness, the importance of nutritional support for specific patients, and the different forms of nutrient delivery. They will also develop an understanding of appliances and dressings, expand their knowledge of pharmacy legislation and develop their clinical skills in responding to symptoms and prescribed therapy.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:
- Describe the components of adequate nutrition and their role in maintaining health.
- Explain the provision of energy by the body in response to trauma and illness.
- Discuss the role of nutritional support in patients.
- Describe the characteristics of oral, enteral and parenteral nutrition and their role in supporting patients after surgery and those with ongoing illness.
- Describe the types and uses of ostomy appliances and vascular support hosiery and related materials.
- Explain the significance of dietary supplements of lipids and of chemoprevention.
- Tabulate the poisonous properties of certain plants and food contaminants.
- Describe common oral and dental conditions and their treatment.
- Illustrate wounded skin and the healing process.
- Tabulate the actions and uses of different dressing types.
- Outline the provisions of the Medicinal Products (Prescription and Control of Supply) Regulations and the requirements for dispensing prescriptions.
- Dispense mock prescriptions in accordance with legal requirements.
- Describe the requirements for establishing a community pharmacy.

PRE-REQUISITES: None

Unit PH2006A: – Nutrition and Dietetics

	LECTURE OUTLINE (15 hours)	**LECTURER**
1-2	Nutrition and dietetics	MH
2-4	Nutrition in health and disease	MH
5	Oral supplements	MH
6-7	Enteral and parenteral feeding	MH
8	Parenteral nutrition compounding, additives and stability	MH
9	Complications of artificial feeding	MH
10-12	Vitamins	MH
13	Lipids as dietary supplements	IH
14	Chemoprevention	DC
15	Poisonous food constituents	IH

SEMINARS/TUTORIALS/DEMONSTRATIONS (2 hours each)

Nutrition delivery devices and products	Practice of Pharmacy staff
Nutrition of infants and children under 5 years	External
Nutrition, cardiovascular disease and weight control seminar	External

Unit PH2006B: – Appliances and Dressings (12 hours)

LECTURE OUTLINE		**LECTURER**
1-3	Ostomy	KS
4-5	Vascular support hosiery and surgical hosiery	KS
6-7	Dental health	KS
8-12	Wound types, healing, wound dressings; bandages	Practice of Pharmacy staff

SEMINARS/TUTORIALS/DEMONSTRATIONS (2 hours each)

Surgical dressings	KS

Ostomy and vascular support hosiery KS

Unit PH2006C: – Pharmacy legislation, clinical and research skills

LECTURE OUTLINE (4 hours)		**LECTURER**
1-3	Medicinal Products (Prescription and Control of Supply) Regulations	SR
4	Requirements for establishing a Pharmacy	SR

PRACTICAL CLASSES / WORKSHOPS (22 hours)

Dispensing 2.1	SR/KS/CR
Dispensing 2.2	SR/KS/CR
Dispensing 2.3	SR/KS/CR
Dispensing feedback workshop (Dispensing 2.1-2.3)	SR/KS/CR
Dispensing 2.4	SR/KS/CR
Dispensing 2.5	SR/KS/CR
Dispensing 2.6 (evaluation)	SR/KS/CR
Dispensing feedback workshop (Dispensing 2.4-2.6)	SR/KS/CR
Clinical skills 2.1	MH
Clinical skills 2.2	MH
Clinical skills 2.3	MH

DISSERTATION: Literature review and critical analysis of topic from the SF course using library materials and information sources. (25 hours)

ASSESSMENT:	Weighting
Examination (1.5 hours): Essay (1 question out of 2) and MCQs (20)	80% of total marks
[1]Coursework (practicals) and dispensing evaluation	10% of total marks
[1]Dissertation	10% of total marks

NB: The Medicinal Products (Prescription and Control of Supply) Regulations are also examinable in 4th year (Practice of Pharmacy Paper 2, XPH4PP2; dispensing examination).

SUMMARY OF HOURS

Unit	Lectures/ Seminars/ Tutorials	Workshops/ Demos/ Practicals	Contact hours	Guided Study	Total	ECTS
PH2006A	15	6	21	15	36	1.5
PH2006B	12	4	16	9	25	1
PH2006C	4	22	26	37	63	2.5
TOTAL	**31**	**32**	**63**	**61**	**124**	**5**

The pass mark for examinations and assessments is 40% except where otherwise indicated. Students should note that College penalties for plagiarism apply to both examinations and continuous assessment.

A specific requirement of the course is that continuous assessment exercises must be presented for evaluation by the specified date(s). They must be presented to a designated member of staff and signed in on the form for this purpose. Work submitted late will not be assessed unless a valid reason is provided.

[1]Students must satisfy the examiners in both the coursework and dissertation components of the module.
Examination marks may be withheld and/or a student may be refused permission to rise with their class until they have satisfied the examiners in the continuous assessment components of the course.

NB: Professional Dress Code
Students are required to dress appropriately and behave in a professional manner for elements of the course entailing attendance at external facilities (professional experience in pharmacies, case review in hospitals, health service facilities.

PROFESSIONAL DEVELOPMENT AND CAREER PLANNING
Year 2 (Senior Freshman) **Course Code: PH2007**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Dr M Henman (MH); C Bradley (CB)
External staff: Anne Nolan (AN); **Staff of Careers Advisory Service**: Ms S Ryan (SRy) & CAS

Coordinators: Dr M. Henman

N.B. This module may be substituted with a Broad Curriculum module. In the case where a student is taking a Broad Curriculum module the work placement requirement (see below) must still be fulfilled.

AIMS: The students will acquire an understanding of the purpose and potential value of work experience within the undergraduate degree programme. Students will consider the relative merits of Continuing Education and of Continuous Professional Development for Pharmacists in Ireland and their relation to Fitness-to-Practice requirements. Students will acquire a knowledge of and practice the skills needed for self-development and career planning.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Describe the role and functions of the Irish Centre for Continuing Pharmaceutical Education (ICCPE)
- Describe the different forms of postgraduate learning opportunities for pharmacists
- Discuss the requirements for Fitness-to-Practice under Irish Law
- Describe the different skills required to practice in different branches of pharmacy
- Describe the facilities offered by the Careers Advisory Service
- Develop a curriculum vitae and practice interviewing techniques

PRE-REQUISITES: None

LECTURE OUTLINE		**LECTURER**
1	Continuing Education and Continuous Professional Development	MH
2	ICCPE	ICCPE
3	Career Planning	SRy
4	Community Pharmacy	CB+pre-reg
5	Hospital Pharmacy	NMcM+pre-reg
6	Industrial Pharmacy	ROR(Ext)+pre-reg
7	Postgraduate Research in Pharmacy	ANO+PG
8	Starting your own Business & Entrepreneurship	CAS
9	Curriculum vitae	SRy
10	Work Experience, Internships and the Pre-Registration year	MH
11-12	Interview techniques & Career Progression	SRy

ON-LINE COURSE MATERIALS Your degree in Pharmacy – What next? (20 hours)

WORKSHOPS & ROLE PLAY CAS
Interview skills (2hrs)

ASSIGNMENT: Group project to determine skill set and research career opportunities in one of a number of areas.

ASSESSMENT

Students will be given the opportunity to gain practical experience and write up of this experience will be submitted for assessment as satisfactory/unsatisfactory.

WORK PLACEMENT – the student's report on their one week work placement completed during the summer vacation must be submitted before the start of the academic year. Their report will be graded as satisfactory/unsatisfactory and forms part of the assessment of PH2007

SUMMARY OF HOURS

Lectures (hrs)	Seminars/ Tutorials (hrs)	Total contact hrs	Guided study (hours)	Practice experience	Total	ECTS
12	4	16	22 + 20	38	96	5

PHARMACY OPPORTUNTIES PROGRAMME: Attend employer's seminars and Exhibition

PHARMACEUTICAL BIOTECHNOLOGY I

Year 2 (Senior Freshman) **Course Code: PH2008** **(PSI Appendix B)**

Staff of School of Pharmacy & Pharmaceutical Sciences: Dr. C. Ehrhardt (CE), Prof. M.J. Meegan (MM), Dr. L. O'Driscoll (LOD), Dr. A. Sasse (AS)
External contributors: Dr Andrew Bowie (AB, Biochemistry), Dr. Daniela Zisterer, (DZ, Biochemistry), Dr. Mike McKillen (MMc, Biochemistry).

Coordinator: Dr. Astrid Sasse (AS)

AIMS: The aim is to help the student to understand the characteristics of proteins and their components and to provide an introduction to Pharmaceutical Biotechnology including gene structure and expression, genetic engineering and upstream processing.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Explain the term 'pharmaceutical biotechnology'
- Describe the structure and properties of amino acids and peptides
- Discuss the source, preparation and use of representative examples of therapeutically important peptides
- Illustrate the hierarchy of protein structure and some of the characteristics of proteins relevant to medicines production and use
- Describe structures and relevance of nucleosides and carbohydrates in medicines
- Explain the basic principles of gene transcription.
- Discuss the practical approaches to analysing and handling biological materials

PRE-REQUISITES: Successful completion of Junior Freshman (Year 1) Cell and Molecular Biology Module

	LECTURE OUTLINE	**LECTURER**
1	Gene structure and expression – DNA structure	AB
2	Gene structure and expression – DNA Replication	DZ
3-4	Gene structure and expression – Transcription	AB
5	Gene structure and expression – Translation	DZ
6	α-Amino acids; structure, sources and pharmaceutical uses	MM
7	Physical properties and ionization of α-Amino acids	MM
8	α -Amino acids; Chemistry, bioorganic chemistry and production methods	MM
9	Pharmaceutical Peptides: primary structure and physicochemical characteristics	MM
10	Pharmaceutical peptide sequencing methods	MM
11	Production of pharmaceutical peptides: solid phase synthesis	MM
12	Chemical and physical stability of pharmaceutical peptides	MM
13	Peptide drugs, design and pharmaceutical properties	MM
14	Pharmaceutical proteins; tertiary structure and physico-chemical properties	MM
15	Introduction to Carbohydrates in Pharmacy	AS
16	Classification of Carbohydrates	AS
17	Monosaccharides: structure and physical characteristics	AS
18	Monosaccharides: stability, chemical reactivity, identification	AS
19	Disaccharides: structure, reactivity and pharmaceutical importance	AS
20	Polysaccharides in pharmacy	AS
21	Naturally occurring glycosides and aminoglycosides	AS
22	Introduction to Pharmaceutical Biotechnology	CE
23-24	Genetic Engineering; the recombinant process	CE
25-27	Upstream processing	CE
28-29	Biotechnology related techniques	LOD

TUTORIALS: 3x1 hour (MJM, AS)

The following practicals from BIOCHEMISTRY accompany this pharmaceutical biotechnology course.

PRACTICAL CLASSES (4 hours each)

1. Subcellular Fractionation (Part 1)
2. Subcellular Fractionation (Part 2)
3. Protein purification
4. Detecting Polymorphisms (Part 1)
5. Detecting Polymorphisms (Part 2)
6. Oxidative phosphorylation

Practical Tutorials (2 hrs)

DIRECTED READING

- Alberts, Johnson, Walter, Lewis; Molecular Biology of the Cell; 5th revised Edition, Garland Publishing Inc, 2008.
- Berg, Tymaczko, Stryer; Biochemistry; 6th revised Edition, WH Freeman & Co., 2006.
- Voet, Voet, Pratt; Principles of Biochemistry; 3rd Edition, Wiley, 2008.
- Crommelin, and Sindelar (eds.); Pharmaceutical Biotechnology: Fundamentals and Applications; 3rd Edition, Informa Healthcare, 2007.
- Lemke and Williams; Foye's Principles of Medicinal Chemistry; 6th Edition, Wolters Kluwer, Lippincott Williams & Wilkins, 2008.

ASSESSMENT	Weighting
Theory written paper: 2 hours; 5 questions out of 5 to be answered (some internal choice may be available)	80 % of total marks
Continuous assessment of practical work	20 % of total marks

SUMMARY OF HOURS

Lectures	Practicals	Tutorials	Total Contact	Pr. Write-ups	Guided Study	TOTAL	ECTS
29	24	3	56	12	48	116	5

N.B. Students are expected to satisfy the examiners in both written examination and practical components. The pass mark for examinations is 40%. Students who obtain an overall mark of less than 40% will be required to sit the supplemental examinations. Students who fail to satisfy the written requirement (i.e. less than 40%) of the annual examination, but who obtain a Class III or better in the practical section will be ungraded and will be required to take a supplemental examination in the written examination only. Students who fail to satisfy the practical requirement (i.e. less than 40% of the practical component) of the annual examination, but who obtain a Class III or better in the written section will be ungraded and will be required to resubmit in the practical component.

General Principles of Pharmacology
Year 2 (Senior Freshman) **Course Code: PH2009**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Dr. A Harkin (AH)

Coordinator: Dr. A Harkin

AIMS: To introduce the student to the basic principles of pharmacology, drug development and experimental techniques used in pharmacology.

LEARNING OUTCOMES: On successful completion of this course the student will be able to

- State the variety of targets to which drugs bind in the body and illustrate their transduction and cell signalling mechanisms
- Define agonist (full, partial and inverse), antagonist (competitive and non-competitive) and recall selected examples of each
- Analyse receptor binding experiments and deduce the receptor binding parameters B_{MAX} and K_D
- Construct dose response curves and calculate drug potency of both agonists and antagonists
- Illustrate the principles of drug absorption, distribution, metabolism and excretion and define the terms, pKa, bioavailability, volume of distribution, clearance, half life, and Kel.
- Illustrate the organisation and mode of neurotransmission within the sympathetic, para sympathetic, enteric and somatic nervous systems
- Describe the mechanisms of action and clinical uses of cholinergic and adrenergic drugs within the peripheral nervous system
- Define the key steps associated with excitatory and inhibitory neurotransmission in the brain and provide selected examples of drugs which influence these steps
- Describe the various stages of drug discovery, development and the clinical trials process

PRE-REQUISITES: Successful completion of Junior Freshman (Year 1)

LECTURE OUTLINE (AH)

1 Introduction.
2-3 Targets of drug action. Receptor pharmacology and cell signalling.
4-6 Pharmacodynamics (drug action, agonism and antagonism, specificity and side-effects); Dose-response.
7-8 Basic pharmacokinetics (drug absorption, distribution, metabolism and excretion).
9-18 General ANS pharmacology. Sympathetic and para-sympathetic nervous transmission.
19-23 Central neurotransmission and the biochemical basis of neuropharmacology.
24-25 Overview of drug development and testing.

PRACTICAL CLASSES (3 hours each)

- Drug targets and receptor transduction
- Introductory Pharmacokinetics Workshop. Computer simulated experiments and data analysis
- Dose response – the guinea pig ileum preparation. Computer simulated experiments and data analysis
- Quantifying Antagonist Activity – the $_{P}$A2 scale: Computer simulated experiments and data analysis
- Receptor Binding Workshop – saturation binding: Laboratory demonstration
- Receptor Binding Analysis
- Blood Pressure

TUTORIALS: (1 hour)

1. Course review.

DIRECTED READING:

Rang and Dale's Pharmacology (6th edition) by H.P. Rang, M.Maureen Dale, James M. Ritter, Rod Flower .
Brody's Human Pharmacology: Molecular to Clinical 4th Edition by Kenneth P. Minneman
The Biochemical Basis of Neuropharmacology 8th Edition, by Jack R. Cooper, Floyd E. Bloom, Robert H. Roth

ASSESSMENT : Weighting

Written Examination: 1.5 hrs, to answer 4 questions out of 6	60% of total marks
Multiple Choice in Hilary Term: 1 hour, 40 questions, answer all questions; negative marking scheme	30% of total marks
Continuous assessment practicals (5 Assignments carrying 2% each)	10% of total marks

SUMMARY OF HOURS

Lectures	Tutorials	Practicals	Total Contact	Practical write-ups	Guided study	TOTAL	ECTS
25	1	21	47	15	46	108	5

MOLECULAR AND CHEMOTHERAPEUTIC PHARMACOLOGY
Year 2 (Senior Freshman) **Course Code: PH2010**

Staff of the School of Pharmacy and Pharmaceutical Sciences: Prof M Radomski (MR); Dr N Frankish (NF)

Coordinators: Dr N Frankish

AIMS: To allow the student to understand how chemical mediators modulate the body's response to injury and infection; to enable the student to appreciate how microbiology impinges on many aspects of Pharmacy; to acquire a knowledge of the mode of action of antibiotics, anti-parasitic drugs and anti-viral agents.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Describe with the various chemical mediators of inflammation and their physiology and pathology
- Explain the mechanism of action of the different classes of anti-inflammatory drugs, their clinical use, cautions and side effects.
- Describe the mechanism of action of the different groups of antibiotics as a basis for their selective toxicity.
- Summarise the clinical use of antibiotics, their side effects and cautions to use.
- Discuss the nature of antibiotic use and the means to reduce antimicrobial resistance.
- Explain the epidemiology of zoonoses and fungal infections
- Describe the mechanism of action of antifungal drugs, their clinical use and side effects
- Classify determinants of the immune response, autoimmunity, immunocompetence & immunotherapy
- Describe viral structure, mechanisms of viral multiplication and viral diseases
- Explain the mechanism of action of the different classes of antiviral drugs, their clinical use and side effects

PRE-REQUISITES: Successful completion of Junior Freshman (Year 1)

LECTURE OUTLINE The Module is divided into two Units.

Unit PH2001A– Chemical Mediators and Disease (Lectures: 12h; Seminar: 2h)

1-2	Inflammation and inflammatory mediators	MR
3-4	Nitric Oxide	MR
5-6	Aspirin & Non-selective COX inhibitors	MR
7	Selective COX inhibitors	MS
8-9	Corticosteroids	MS
10	DMARDS	MR
11	Anti-lymphocyte agents	MR
12	Anti-cytokine drugs	MR
Seminar	Rheumatoid arthritis & treatment of joint diseases	MR

DIRECTED READING
Reference material supplied

SUMMARY OF HOURS

Lectures	Seminars	Practicals	Contact hours	Guided study	TOTAL	ECTS
12	2	0	14	36	50	2.5

UNIT PH2010B – CHEMOTHERAPY OF INFECTIOUS DISEASE

LECTURE OUTLINE

1	Antimicrobials: mechanism of action of main antibiotics	NF
2	Antimetabolite	NF
3	Cell wall Inhibitors	NF
4	Drugs acting at the cell membrane	NF
5-6	Inhibitors of DNA/Protein synthesis	NF
7-8	Tuberculosis and antitubercular drugs	NF
9-10	Fungal Diseases and antifungal agents	NF
11	Endotoxin shock	NF
12-13	Protozoal & Parasitic diseases in man and their treatment	NF
14-17	Antivirals	CM
Seminar	Drug resistance & strategies to counteract it	NF

DIRECTED READING

Manual of antibiotics and infectious diseases : treatment and prevention / John E. Conte, Jr.. Philadelphia, Pa. ; London : Lippincott, Williams & Wilkins, c2002.
The antimicrobial drugs., Scholar, Eric M. Oxford University Press, 2000.
Shakespeare M. Zoonoses. 2002. Zoonoses. Pharmaceutical Press, UK.

Lectures	Seminars	Total Contact	Guided Study	TOTAL	ECTS
17	2	19	31	50	2.5

PHARMACOLOGY ASSESSMENT:

Part A: 1 hr 50 MCQ questions
Part B: 1 hr 50 MCQ questions

MODULE SUMMARY ECTS

2.5 + 2.5 = 5

Lectures	Seminars	Total contact	Guided Study	Total
Unit PH2010A 12	2	14	36	50
Unit PH2010B 17	2	19	31	50
Total 29	4	33	67	100

JUNIOR SOPHISTER (3rd Year) course

Module details may be subject to corrections/amendments.

- *It is each student's responsibility to be aware of dates, times, locations, etc. of lectures, tutorials, seminars and practical classes.*
- *Laboratory notebooks must be presented for assessment by the date specified in the module.*
- *Notebooks submitted after the specified date will not be assessed, unless a valid reason is given, and students will be deemed not to have satisfied the School's examination requirements.*

MEDICINAL and PHARMACEUTICAL CHEMISTRY III
Year 3 (Junior Sophister) **Course Code: PH3002**
Staff of the School of Pharmacy & Pharmaceutical Sciences: Prof. Mary J Meegan (MM); Dr. John M.Quigley (JQ), Dr. John F. Gilmer (JG); Dr. Astrid Sasse (AS)

Coordinator: Prof. Mary J Meegan

AIMS: To develop an understanding of the theory and practice of medicinal chemistry in the context of pharmacy and to provide an understanding of analysis and characterisation of pharmaceutical materials in a regulatory context.

LEARNING OUTCOMES: On successful completion of this module the student will be able to**:**

- Apply and interpret Quantitative Structure - Activity Relationship studies (QSAR) in pharmaceutical applications.
- Explain the function of receptors, agonists and antagonists together with the action of drugs at selected receptors
- Describe the medicinal chemistry of selected major therapeutic classes of drugs which act as enzyme inhibitors e.g. NSAIDs, ACE inhibitors and various antibiotics
- Demonstrate competence in the practical laboratory techniques used in the analysis and characterisation of pharmaceutical materials

PRE-REQUISITES: Pharmaceutical properties of Materials used in Medicines (PH2001); Physico-chemical Aspects & Specifications of Substances used in Medicines II (PH2002); Isolation, Separation & Analysis of Substances used in Medicines (PH2003)

LECTURE OUTLINE & LECTURER:

Unit PH3002A: Techniques in Drug design and optimization
Quantitative Structure Activity Relationships ; Physical organic chemistry of drugs (JQ)

1. Biological Activity and Physicochemical Properties
2. Electronic Parameters: The Hammett Constant
3. Resonance Contributions, Inductive Substituent Constants; Structure/Activity Studies
4. Lipophilic Parameters: The Partition Coefficient, The Hansch-Fujita Substituent Constant
5. Determination of the Partition Coefficient
6. Empirical Approaches to Estimation of Log P
7. Complications in QSAR due to Ionization
8. The Fragmentation Constant
9. The Additivity Concept; Structural explanation of deviations observed
10. Structure/Activity Studies: Linear & Nonlinear dependence
11. The Hansch Kinetic Model (multicompartmental analysis), log P_0
12. Steric Parameters: Taft & STERIMOL Parameters

Unit PH3002B: Enzyme Inhibitors (JG)

1. Overview of enzyme inhibitors in pharmacy
2. Kinetic models of enzyme inhibition 1
3. Kinetic models of enzyme inhibition 2
4. Methods and prospects in enzyme inhibitor drug design
5. Case history: the development of the ACE inhibitors
6. COX-1 inhibitor medicinal chemistry, SAR, MOA
7. COX-2 inhibitors, development SAR and biological effects
8. Inhibitors of acetylcholinesterase I
9. Inhibitors of acetylcholinesterase II

Unit PH3002C: Medicinal Chemistry: Chemotherapeutics, Antibiotics and antimicrobial agents (MM)

1. Molecular targets for antibiotics: Penicillin and cephalosporin antibiotics: structure and clinical examples; Molecular mechanism of action of penicillins;
2. Characterisation and chemical stability properties of penicillins
3. Production methods for 6-APA and semisynthetic penicillins
4. Broad spectrum semisynthetic penicillins; SAR and clinical prodrugs
5. Cephalosporins; structures, characterization and chemical reactivity
6. Production methods for 7-ACA; SAR for semisynthetic cephalosporins

7. Case study development of a semisynthetic cephalosporin
8. Beta-lactamase inhibitors; structure and clinical role of betalactamase inhibitors
9. Macrolides, aminoglycosides, glycopeptide, oxazoladinones and quinolones: structures, clinical examples and mechanism of action

Unit PH3002D: Drugs as receptor agonists and antagonists (AS)

1. Classification of receptors as targets for drugs
2. Drugs, receptors and drug-receptor interactions

Unit PH3002E: Drugs acting at Nuclear receptors: Steroid drugs (AS)

1. Steroid drugs: Introduction to steroid drug structure and stereochemistry
2. Androgens: Steroids derived from testosterone
3. Estrogens: Steroids derived from estrogen and SERM
4. Progestins: Steroids derived from progesterone
5. Adrenocorticoid types; Structural modification and activity
6. Case study and review

Unit PG3002F: Drugs acting at Cholinergic and adrenergic receptors (MJM)

1. Cholinergic receptor structure: The role of acetylcholine as a neurotransmitter
2. Cholinergic agonists
3. Cholinergic antagonists
4. Adrenergic receptor antagonists

Unit PH3002G: H_2 receptor Receptor antagonist design: (JQ)

1. Histamine: protonation, tautomerism, ionisation & conformation
2. Chemical evidence of active form at H_1 & H_2 receptors
3. The lead compound - N^{α}-guanylhistamine; Isothiourea analogue
4. Thiourea derivative (pure antagonist); development of burimamide
5. Development of metiamide (pK_a of the imidazole ring)
6. Analogues of cimetidine; Effect of pK_a of substituent
7. Conformational isomers of cimetidine
8. Keteneaminals
9. Desolvation and dipole orientation of derivatives wrt activity

Unit PH3002H: H_1 receptor Receptor antagonist design: (JG)

1. Imidazoles and pyridines: histamine, and the H_1 antagonists 1.
2. Imidazoles and pyridines: histamine, and the H_1 antagonists 2.

PRACTICAL LABORATORY CLASSES: (3 hours each)
Quality Specifications for Pharmaceutical materials

1. UV Spectroscopy
2. Quality Specifications of a Steroid
3. Quantitation by Extraction, Diazotitration
4. Stability Study of Nifedipine (HPLC-MS)
5. Aspirin Hydrolysis Kinetics
6. Polarimetry, Identification of Carbohydrates
7. HPLC-Fluorescence
8. Infrared Spectroscopy
9. Aquametry
10. Gas Liquid Chromatorgraphy (GLC)
11. pH Validation
12. NMR (supported by a CAL prgram)

SEMINARS AND TUTORIALS: 6 x 1 hour seminars
Seminars are based on topics in Pharmaceutical Analysis

DIRECTED READING
Principles of Medicinal Chemistry; Foye, Lemke and Williams; 6th Edn. 2008
Pharmaceutical Analysis, D.G. Watson, Elsevier, 2nd Ed. 2005.
Medicinal Chemistry, G. Thomas, Wiley, 2000.
An Introduction to Medicinal Chemistry, G. L. Patrick , 4th Edn, Oxford University Press, 2009.

ASSESSMENT Weighting

Written Paper: 3 hours, 5 questions out of 5 to be answered (some internal choice is available) 70% of total marks

Practical:
based on continuous assessment (10%), final report (10%) and written test (MCQ) (10%)

30% of total marks

Students are required to take a written test in the Trinity Term. This Examination comprises short questions or multiple choice questions based on the theory underlying the practical class in the Junior Sophister year.

N.B. Students are expected to satisfy the examiners in both written examination and practical components. The pass mark for examinations is 40%. Students who obtain an overall mark of less than 40% will be required to sit the supplemental examinations. Students who fail to satisfy the written requirement (i.e. less than 40%) of the annual examination, but who obtain a Class III or better in the practical section will be ungraded and will be required to take a supplemental examination in the written examination only. Students who fail to satisfy the practical requirement (i.e. less than 40% of the practical component) of the annual examination, but who obtain a Class III or better in the written section will be ungraded and will be required to resubmit in the practical component.

SUMMARY OF HOURS

Lectures	Practicals	Seminars	Total Contact	Practical write-ups	Guided + private study	TOTAL	ECTS
54	36	6	96	18	136	250	10

NATURAL SOURCES OF DRUGS and SUBSTANCES USED IN MEDICINES
Year 3 (Junior Sophister) **Course Code: PH3003**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Dr. J. Walsh (JW), Dr. H. Sheridan (HS), Ingrid Hook (IH), Dr Dr. Fabio de Sousa Menezes (FdSM).

Coordinator: Dr J. Walsh

AIMS: To provide the student with an understanding of the sources and properties of those drugs and related pharmaceutical materials used in medicine, which are produced from natural sources.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Describe the biosynthetic pathways employed by plants and fungi to produce compounds of pharmaceutical importance.
- Identify and describe the sources and general properties of key phytochemical groups especially alkaloids, anthranoids, phenolics, cardiac glycosides, saponins, mono-, di- and sesquiterpenes.
- Recognise and explain methods for the isolation of natural products.
- Use both analytical and structural techniques to determine the purity and identity of compounds from natural sources.
- Outline the different types, sources and properties of lipids, including fatty acids, and explain their importance in living systems and their influence on health and disease.
- Outline the types and importance of analytical procedures used to identify and determine the quality of lipids used in the preparation of medicines and nutraceuticals (dietary supplements).
- Advise on and critically assess the importance of lipid types in the diet and their use in medicine formulations.
- Describe the types of toxic and allergenic constituents produced by plants, animals and microorganisms occurring naturally in the environment and food, idenstify the risks associated with their occurrence, together with their treatment and/or prevention.
- Recognise the importance of biodiversity prospecting as well as being aware of biodiversity preservation.
- Recognise and describe several approaches to screening natural materials for bioactivity and when is appropriate to apply each one of these different approaches.

PRE-REQUISITES Isolation, Separation and Analysis of Substances used in Medicines (PH2003)

LECTURE OUTLINE		**LECTURER**
1 – 6	Plants as phytochemical laboratories	JW
7 – 12	Biodiversity prospecting	FdSM
13 – 18	Alkaloids – general properties and phytochemistry	HS
19 – 22	Key alkaloid groups (tropane, quinoline, isoquinoline, indole)	HS
23 – 25	Glycosides (general properties), anthranoids, simple and complex phenolics.	FdSM
26	Plant polysaccharides	FdSM
27 – 33	Dietary lipids (simple & complex): isolation, composition, uses.	IH
34 – 38	Terpenoids including steroid glycosides their origin and uses with emphasis on Valerian, Feverfew, *Ginkgo biloba* and Artemisia.	JW
39 – 44	Phytotoxicology, mycotoxins, allergens.	IH
45 – 46	Plant protection products	HS
47 – 48	Scabicides etc, lice infestations	HS

LABORATORY CLASSES

1. Phytochemical screening – glycosides.
2. Phytochemical screening – alkaloids (including opiates).
3. Isolation and structural elucidation eg. quinine.
4. Characterisation of essential oil-containing plants used in Aromatherapy.
5. Chromatographic isolation and structure elucidation of valtrate from *C. ruber*.
6. Pharmacopieal monographs for Herbal Medicinal Products I (quality of commercial mint products).
7. Pharmacopoeial monographs for HMPs II group initiative.

8. Quantitative measurement of secondary metabolites I – Titrimetric assay of tropane alkaloids.
9. Quantitative measurement of secondary metabolites II – colorimetric assay of sennosides.
10. Quantitiative measurement of secondary metabolites III – HPLC of caffeine.
11. Plant polysaccharides – group project.
12. Fats, oils, waxes used in Pharmacy – group project.

DIRECTED READING

European Pharmacopoeia
Trease & Evans' *Pharmacognosy* 15th Edn. WC Evans (Ed), Elsevier Ltd.
Pharmacognosy-Phytochemistry, Medicinal Plants. 2nd Edn., J. Bruneton, Intercept Ltd.
Pharmacognosy & Pharmacobiotechnology. Robbers J, Speedie M, Tyler V., Williams & Wilkins
Medicinal Natural Products 2nd Edn. , PM Dewick, JohnWiley & Sons, Ltd.

ASSESSMENT	Weighting
Written paper: 3 hours; 3 Sections; 7 questions, 5 to be answered - **one** from each Section**	70% of total marks
Practical Term Tests (2 x 0.5 hours) + Practical Lab Test (3 hours) (marks equally divided)	25% of total marks
Practical Book reports: continuous assessment	5% of total marks

N.B. **Failure to comply with the instruction will result in a requirement to sit the Supplemental examination in Michaelmas term.

SUMMARY OF HOURS

Lectures	Practicals	Tutorials	Total contact	Practical Write-ups	Guided + private study	Total	ECTS
48	36	0	84	24	20	228	10

STERILE PRODUCTS
Year 3 (Junior Sophister) **Course Code: PH3004**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Dr. D D'Arcy (DD), Dr. L Tajber (LT), M Kamionka (MK)

Coordinator: Dr. Deirdre D'Arcy

AIMS: To provide a continuation course in formulation and production, concentrating on sterile medicinal product and radiopharmaceuticals.

LEARNING OUTCOMES: At the end of the course the student will:

- Discuss the requirement for sterility for certain classes of pharmaceutical products.
- With respect to the formulation of the major classes of sterile products, such as injections, infusion fluids and eye drops, explain the necessity for certain classes of excipients (and packaging), and perform appropriate calculations in the formulation of these products.
- Describe the main sterilization methods relevant to pharmaceuticals, define the common terms used when describing sterilization kinetics.
- Summarize common tests and parameters measured in assessing the microbial/particulate quality of a sterile product and its environment, and of the sterilization method used.
- Describe the main aspects of pharmaceutical clean room design, operation and environmental control, and summarize the applications of a clean room environment within a hospital/clinical pharmacy setting.
- Discuss the formulation, testing and use of commonly used disinfectants and antiseptics
- Discuss the applications of and risks associated with production and use of radiopharmaceuticals, including radioimmunoassay.

PRE-REQUISITES: Introduction to Pharmaceutics and Formulation module (PH1004), Formulation and Pharmaceutical Technology module (PH2004), Microbiology and Biochemistry (PH2005)

	LECTURE OUTLINE	**LECTURER**
Unit PH3004A	**INTRODUCTION TO FORMULATION, TESTING AND USE OF STERILE PRODUCTS**	
1.	Introduction; definitions; microbial limits for non-sterile pharmaceuticals; products required to be sterile; official categories in BP	DD
2.	Concept and requirement for isotonicity, Calculation of isotonicity	DD
3.	Endotoxins/pyrogens; pyrogen/endotoxin tests, limits	MK
4.	Packaging: glass, plastic	MK
5.	Elastomeric closures, biological reactivity tests, feasbililty tests, biotech considerations	MK
6.	Principles of preservative efficacy test, Particulate tests – visible, subvisible, PhEur, BP;	MK
7.	Vehicles for parenteral medicaments; aqueous/non-aqueous; water for injections - production and QC	DD
8.	Formulation of parenterals: buffers, antioxidants, preservatives	DD
9.	Electrolytes, LVP's LVP's – composition and use Particulate contamination: clinical consequences	DD
10.	Labelling: SVP, LVP	DD
11.	Ophthalmic preparations: approaches to ophthalmic drug delivery, solutions, suspensions, excipients - viscosity	DD
12.	Ophthalmic preparations – excipients – tonicity, preservative, buffer, stabiliser	DD
13.	Preparation: drops, lotions, semi-solids; packaging: single-dose, multiple dose	DD
14.	Ophthalmic preparations – contamination concerns and labeling. Contact lens solutions: formulation and practice	DD
Unit PH3004B:	**PHARMACEUTICAL PROCESSING FOR STERILE PRODUCTS**	DD
15.	Sterilization: Official procedures, kinetics, sterility concepts and resistance	
16.	Moist heat sterilisation – steam lethality, autoclave design and operation	DD

17.	Dry heat sterilization, equipment, use, applications, heat resistance	DD
18.	Filtration sterilization, filter testing, blow-fill-seal	DD
19.	Ionising radiation sterilisation	DD
20.	Gaseous sterilization – introduction to validation	DD
21.	Validation and process monitoring (physical and biological indicators)	DD
22.	Sterility testing	DD
23.	Tutorial	DD
24.	Clean room: concept, sources of contamination, design	DD
25.	Clean room: operation, validation, standards, monitoring	DD
26.	Aseptic services – cytotoxic production	DD
27.	Aseptic services – CIVAS and TPN	DD
28.	Principles of disinfection process	MK
29.	Different agents used as disinfectants and antiseptics	MK
30.	Design of formulations containing antiseptics and disinfectants evaluation	MK

Unit PH 3004C: RADIOPHARMACEUTICALS

31.	Introduction to radiopharmaceuticals, modes of radioactive decay, radioactive units, calculation and use of decay constant/half life	LT
32.	Production of radioisotopes of pharmaceutical importance, instrumentation for measuring radioactivity	LT
33.	Gamma cameras, theory and use of generators for short-lived radioisotopes	LT
34.	Radionuclidic and radiochemical purity determination, radioimmunoassay	LT
35.	Regulatory and handling aspects of radiopharmaceuticals	LT

PRACTICAL CLASSES (3 hours each)

1. Introduction to autoclaving, injections and packaging 1.
2. Multidose injections and packaging 2
3. Filtration sterilisation, concentrated injections and MIC 1
4. Solutions for infusion and MIC2
5. Ophthalmic preparations 1 and packaging 3
6. Ophthalmic preparations 2, autoclave cycles and specific routes of administration
7. Mixed vehicle injection, sterilization cycles, filter test
8. Revision lab before practical exam
9. Radiopharmaceuticals (CAL Package) gaseous and radiation sterilization-rotation
10. Aseptic procedures –broth transfer trial (Aseptic Suite rotation)

DIRECTED READING

European Pharmacopoeia
British Pharmacopoeia
Martindale
Pharmaceutical Codex, 12th Edition.
*Aulton's Pharmaceutics. The Design and Manufacture of Medicine s*3rd Edition, M E Aulton, editor, Churchill Livingstone (2007)
Pharmaceutical Practice, 3rd ed, Winfield and Richards, editor Churchill Livingstone (2004)

ASSESSMENT	Weighting
Written paper: 2 hours, 3 questions to be answered out of 4	70% of total marks
Practical Exam: 2.5 hours, 2 questions in 2 hours	20% of total marks
Practical Book reports: continuous assessment	10% of total marks

SUMMARY OF HOURS

Lectures	Practical	Tutorials	Total contact	Practical Write-ups	Guided + private study	Total	ECTS
35	30	1	66	20	114	200	10

NB. Students are expected to satisfy the examiners in both written and practical examination components. The pass mark for the module is 40%. Students who obtain an overall mark of less than 40% will be required to sit the Supplemental examinations. Students who fail to satisfy the written requirement (i.e. less than 40%) in the annual examination, but who obtain a Class II or better in the practical examination will be ungraded and will be required to take a supplemental examination in the written examination only. Students who fail to satisfy the practical requirement (i.e., less than 50% in the practical examination) of the annual examination, but who obtain a Class III or better in the written section will be ungraded and will be required to supplement in the practical examination only.

PHARMACEUTICAL DATA ANALYSIS AND BIOINFORMATICS
Year 3 (Junior Sophister) **Course Code: PH3005**

Staff of the School of Computer Science and Statistics

Coordinator: Mr. Eamonn Mullins

AIMS: Students will encounter statistical ideas and methods during their careers as pharmacists in many different settings: in community surveys, clinical trials, laboratory practice, academic research, drug development and manufacture, epidemiological studies. The aim of this course is to introduce students to these ideas and methods, using a broad range of real examples.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Discuss the importance of statistical variation in the data deriving from surveys, drug development studies, epidemiological investigations, clinical trials, measurement systems, and drug manufacture;
- Apply the basic statistical methods that appear regularly in pharmaceutical and medical journals;
- Discuss critically the statistical sections that appear in their professional journals;
- Discuss the statistical issues that arise in the design of data collection exercises – for example, they should be able to discuss the determination of sample size, and the need for randomised allocation and blinding in clinical trials;
- Carry out elementary analyses using the statistical package Minitab.

Pre-requisites: None

LECTURE OUTLINE:
This is a new course and, accordingly, the content will be determined partly in relation to the development of my understanding of student needs as the course unfolds. The central core of the course will be based on the following list of topics:

- Data summaries and graphs
- Statistical models
- Sampling distributions: confidence intervals and tests
- Simple comparative experiments: t-tests, confidence intervals, design issues
- Design and analysis of factorial studies of many system parameters simultaneously
- Counted data: confidence intervals and tests for proportions
- Cross-classified frequency data: chi-square tests
- Introduction to Regression Analysis
- Introduction to Analysis of Variance
- Statistical computing laboratories

Statistical Laboratories:
The material covered in the lectures will form the basis of a series of statistical laboratories, which will involve use of the statistical package Minitab. These will come towards the end of the semester, by which time a reasonable body of material will have been discussed in class. Most statistical packages produce essentially the same output, so students should be able to pick up very quickly other packages should they have need to do so in the future. Solutions to the classroom examples will be presented in the form of computer output, so, at the end of the course, students should have a strong grasp of how to interpret analyses presented in this way.

DIRECTED READING
The course will not be based on any one book; I will give extensive handouts during the semester. The following are, however, useful references for particular aspects of the course. They will also be useful as references where students need to go beyond the topics covered – for example, in their Senior Sophister reports/dissertations associated with other modules.

E. Mullins, Statistics for the quality control chemistry laboratory, Royal Society of Chemistry, 2003.
D.G. Altman, Practical statistics for medical research, Chapman and Hall, 1991.
L. Daly and G.J. Bourke, Interpretation and uses of medical statistics, Oxford : Blackwell Science, 2000.
J.E. De Muth, Basic statistics and pharmaceutical statistical applications, Chapman and Hall, 2006.

ASSESSMENT	Weighting
Written paper	90% of total marks
Continuous Assessment:	10% of total marks

SUMMARY OF HOURS

Lectures	Pract/Tuts	Total contact	Guided Study	Total	ECTS
31	5	36	72	108	5

PRACTICE OF PHARMACY III
Year 3 (Junior Sophister) **Course Code: PH3006**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Dr M Henman (MH); S Ryder (SR); Dr D Corrigan (DC)
Teacher-Practitioners: K Sheridan (KS); C Roche (CR), E Deasy (ED)

Coordinator: S Ryder

AIMS: To develop students' understanding and knowledge of pharmacy practice particularly in epidemiology and public health, pharmacovigilance and pharmacoepidemiology, health economics and the principles of evidence-based assessment. To introduce students to the legislation concerning drugs that may be misused and animal remedies, and to the practical requirements in supplying and using medicines containing those drugs.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Describe epidemiology, the sources of data, the incidence of common conditions and their relationship to public health in Ireland.
- Explain the global burden of disease and role of international bodies in recording and responding to this challenge.
- Describe the research methods used in epidemiology, in clinical pharmacology and in assessing interventions.
- Discuss drug utilization and the monitoring and follow up of adverse drug reactions in Ireland and the EU.
- Describe the methods for estimating risk.
- Explain the different types of clinical trials, the importance of blinding and randomisation.
- Describe the use of NNTs and the evidence-based approach to drug evaluation.
- Outline the significance of the scarcity of resources and the importance of accurate estimation of costs in economics and health economics.
- Distinguish between the various approaches to the evaluation of benefits including HRQoL.
- Describe the different methods of analysis used in health economics and pharmacoeconomics.
- Critically discuss legislation relating to drug of abuse, unlicensed medicines, clinical trials, animal remedies, poisons, health and safety, and data protection.
- Dispense prescriptions and respond to case studies relating to the above areas, in a legal, safe and appropriate manner.

PRE-REQUISITES: None

Unit PH3006A: – Pharmacoepidemiology and Pharmacoeconomics

	LECTURE OUTLINE (17 hours)	**LECTURER**
1	Epidemiology and descriptive data	MH
2	Epidemiology, causation and investigative methods	MH
3	Public health and antibiotic usage, resistance and policies	MH
4	Case studies and case control studies	MH
5	Cohort studies	MH
6	Clinical trials	MH
7	Clinical trials and meta-analysis	MH
8	Risk estimation	MH
9	Pharmacoepidemiology and pharmacovigilance	MH
10	Health service organisation and drug use control	MH
11	Evidence-based assessment of information	MH
12	Pharmacy, pharmaceutical and medicines databases	MH
13	Economics and health economics	MH
14	Costs, benefits and values and cost-minimisation analysis	MH
15	Cost effectiveness analysis	MH
16	Cost benefit analysis and cost utilisation analysis	MH
17	Pharmacoeconomics and health-related quality of life	MH

Unit PH3006B: –Pharmacy Legislation and Patient Care

LECTURE OUTLINE (14 hours)		**LECTURER**
1-3	Misuse of drugs legislation	SR
4	Unlicensed medicines: Product liability and consumer protection	SR
5-6	Animal remedies legislation	SR
7	Poisons legislation	SR
8	Data protection legislation	SR
9	Clinical trials legislation	SR
10-11	Health and safety legislation	SR
12-14	Dispensing procedures, medication errors and risk management	KS

PRACTICAL CLASSES/WORKSHOPS (28 hours)	
Dispensing 3.1	SR/KS/CR
Dispensing 3.2	SR/KS/CR
Dispensing 3.3	SR/KS/CR
Dispensing feedback workshop (Dispensing 3.1-3.3)	SR/KS/CR
Dispensing 3.4	SR/KS/CR
Dispensing 3.5	SR/KS/CR
Dispensing 3.6 (evaluation)	SR/KS/CR
Dispensing feedback workshop (Dispensing 3.4-3.6)	SR/KS/CR
Compliance devices and promotion of compliance	KS/CR
Clinical skills 3.1 – Clinical interviewing and responding to symptoms	MH
Clinical skills 3.2 – Counselling patients on POMs [small group]	MH
Clinical skills 3.3 – Counselling patients on OTCs [small group]	MH
Clinical skills 3.4 – Medication history taking (hospital)	ED/MH

ASSIGNMENT

Dissertation (3,000 word essay) literature review and critical analysis of topic from the JS course using library materials and information resources. MH

EXTRA-CURRICULAR COURSE WORK:

Work placement – Students are required to undertake four weeks of practice experience in a community or hospital pharmacy setting and to complete a report for submission before the start of the following academic year.

ASSESSMENT

	Weighting
Examination: 1.5 hrs. Essay (1 question out of 2) and MCQs (20)	70% of total marks
[1]Coursework (practicals) and dispensing evaluation	10% of total marks
[1]Dissertation	20% of total marks
Work placement report (satisfactory/unsatisfactory)	

NB: All legislation is also examinable in 4th year (Practice of Pharmacy Paper 2, XPH4PP2; dispensing examination).

SUMMARY OF HOURS

Lectures	Practicals/ workshops	Total contact	Practical reports	Guided + private study	TOTAL	ECTS
31	28	59	16	50	125	5

The pass mark for examinations and assessments is 40% except where otherwise indicated. Students should note that College penalties for plagiarism apply to both examinations and continuous assessment.

A specific requirement of the course is that continuous assessment exercises must be presented for evaluation by the specified date(s). They must be presented to a designated member of staff and signed in on the form for this purpose. Work submitted late will not be assessed unless a valid reason is provided.

[1]Students must satisfy the examiners in both the coursework and dissertation components of the module.

Examination marks may be withheld and/or a student may be refused permission to rise with

their class until they have satisfied the examiners in the continuous assessment components of the course.

NB: Professional Dress Code

Students are required to dress appropriately and behave in a professional manner for elements of the course entailing attendance at external facilities (professional experience in pharmacies, case review in hospitals, health service facilities, etc.

PHARMACEUTICAL BIOTECHNOLOGY
Year 3 (Junior Sophister) **Course Code: PH3008**

Staff of School of Pharmacy & Pharmaceutical Sciences: Dr C Ehrhardt (CE), Dr JF Gilmer (JG), Dr Fabio De Sousa Menezes (FDSM), Mariusz Kamionka (MK), Sheila Ryder (SR), Dr Lorraine O'Driscoll (LOD)
External contributors: Dr John Milne BioUetikon Ltd. (JM)

Coordinator: Dr Lorraine O'Driscoll (LOD)

Learning Outcomes: On successful completion of this module the student will be able to:

- Describe the major therapeutic applications and categories of biopharmaceuticals
- Explain how biotech products work in the body and their disposition and dosing
- Describe how therapeutic proteins are purified and formulated
- Explain how biological products are defined in law, regulated and qualified for release
- Discuss specific professional issues arising in the use of biotech products in pharmacy practice
- Roadmap potential future directions in this rapidly changing area.

PRE-REQUISITES Pharmaceutical Biotechnology I (PH2008), Pharmaceutical Analysis (PH2003), Cell and Molecular Biology (BY1P10)

	LECTURE OUTLINE	**LECTURER**
1	Biotherapeutics: value chain from discovery to pharmacological intervention.	LOD
2	Development of antibodies as diagnostics & therapeutics	LOD
3	Examples of Clinical Application of mAbs & their pharmacology	LOD
4-5	Downstream processing	MK
6-7	Formulation	CE
8	Pharmacology of recombinant proteins I (examples: hormones)	LOD
9	Pharmacology of recombinant proteins II (examples: ILs; GFs)	LOD
10	Enzymes: production & pharmacology	LOD
11	Vaccines: production & pharmacology	LOD
12	Other areas of therapeutic biotechnology & associated pharmacological implications (incl. cell therapy; stem cells) and pharmacology of biotherapeutic agents)	LOD
13	Regulatory process for biotechs, definitions, biosimilars	JG
14	ICHQ6B Protein Specification-, Protein ID, content	JG
15	Heterogeneity, purity & analytical approaches	JG
16	Safety- viral safety/contamination Q5A	JM
17	Delivery of biotherapeutics	CE
18-19	Plant biotechnology	FdSM
20	Pharmaceutical Biotechnology: Future Prospects	LOD

Factory Visit to Wyeth Biopharma

Biopharmaceutical Tutorial LOD

Clinical Use Tutorial SR

ASSESSMENT
Written paper - 3hrs - essay-type questions (choice: answer 3 of 5 questions)

DIRECTED READING
Pharmaceutical Biotechnology, 2nd ed.,Crommelin DJA, Sindelar RD
Medical Biotechnology, ed. Pongracz J, Keen M
Biopharmaceuticals-Biochemistry and Biotechnology, 2nd ed., Walsh G
Crommelin, et al 'Pharmaceutical evaluation of biosimilars. *Eur. J Hosp Pharm Sci* 11 (1): 11-17, 2005

SUMMARY OF HOURS

Lectures	Factory Visits	Tutorials	Total Contact	Visit write-ups	Guided + private study	Total	ECTS
20	3	4	27	3	75	105	5

ENDOCRINE & REPRODUCTIVE PHARMACOLOGY AND VETERINARY PHARMACY
Year 3 (Junior Sophister) Course Code: PH3009

Staff of School of Pharmacy & Pharmaceutical Sciences: Dr. M. Henman (MH), Dr. L O'Driscoll (LOD)
External contributors: Mr. Christof Blau (CB), Mr. Brian Kilgallen (BG), Mr. Giles Barrett (GB), Prof. Pat Deasy

Coordinator: Dr. L O'Driscoll (LOD) (PH3009A); Dr. A.M. Healy (PH3009B)

This module consists of two separate Units:
PH3009A: Endocrine & Reproductive Pharmacology
PH3009B: Veterinary Pharmacy

AIMS:

PH3009A: The student will acquire knowledge of the health sciences relevant to the use of drugs and medicines in endocrinology and reproductive endocrinology.

PH3009B: To provide a review of aspects of veterinary physiology and pharmacology, veterinary formulation and use of veterinary medicines.

LEARNING OUTCOMES
On successful completion of this module the student will be able to:

- Discuss the abnormal functioning of the endocrine system, the tests and procedures used to assess those conditions and the role of drugs in the treatment of endocrine-related conditions
- Describe the pathology and treatment of the different forms of Diabetes Mellitus
- Explain the use of show an ability to use, the drug delivery devices and monitoring devices associated with the treatment of Diabetes Mellitus
- Describe normal bone metabolism, of Osteoporosis, Paget's Disease and hypercalcaemia, and their treatment
- Discuss the physiology and pathology of the reproductive system
- Describe the actions and uses of drugs in the treatment of menstrual disorders, infertility, menopausal symptoms and as contraceptive preparations
- Describe comparative anatomy & physiology & veterinary pharmacology
- Discuss formulation aspects of selected veterinary medicinal products
- Discuss as aspects of veterinary Pharmacy in practice

PH3009A

LECTURE OUTLINE & LECTURER

1	Introduction to Endocrinology	LOD
2	Mechanisms of hormone action	LOD
3	Evidence-based endocrinology & clinical epidemiology	LOD
4	Hypothalamus & pituitary gland	LOD
5	Posterior pituitary	LOD
6	Growth	LOD
7	Thyroid gland	LOD
8	Growth Hormone	LOD
9	Bone Metabolism & metabolic bone disease	LOD
10	Glucocorticoid & adrenal androgens	LOD
11	Adrenal Cortex	LOD
12	Endocrine pancreas	LOD
13	Insulin secretion	LOD
14	Type 1 diabetes	LOD
15	Type 2 diabetes	LOD
16	Oral hypoglycaemics	LOD
17	Reproductive Endocrinology – Female reproductive endocrinology	LOD
18	Reproductive Endocrinology – Male reproductive endocrinology	LOD
19	Reproductive Endocrinology – Menstrual disorders	LOD
20	Reproductive Endocrinology – Infertility, endometriosis	LOD
21	Reproductive Endocrinology – Hormonal contraception	LOD

22	Reproductive Endocrinology – The endocrinology of pregnancy	LOD
23	Reproductive Endocrinology - The endocrinology of pregnancy	LOD
24	Humoral Manifestations of Malignancy	LOD

SEMINARS/TUTORIALS/DEMONSTRATIONS

Thyroid diseases	LOD
Bone diseases & calcium metabolism	LOD
Diabetes Devices	MH
ReproEndo Menstrual disorders, Infertility & endometriosis	LOD
ReproEndo Risks & benefits of hormonal contraception	LOD

DIRECTED READING – will be indicated, as relevant at each lecture

ENDOCRINE & REPRODUCTIVE PHARMACOLOGY ASSESSMENT

Continuous assessment - assignments that contribute to JS Pharmacology Coursework mark: 10%

Written paper - 3hrs - essay-type questions (choice: answer 3 of 5 questions) 90%

Lectures	Practicals/Tutorials Workshops	Total Contact	Guided + private study	TOTAL	ECTS
24	15	39	60	99	4

PH3009B

LECTURE OUTLINE & LECTURER

1-2	Comparative anatomy & physiology	CB
3-7	Veterinary pharmacology	CB
8-9	Formulation of pharmaceutical veterinary preparations	PBD
10-11	Veterinary Pharmacy in community practice	GB

DIRECTED READING

Veterinary Pharmacy, Kayne SB & Jepson MH, Pharmaceutical Press, 2004

VETERINARY PHARMACY ASSESSMENT

MCQ/short answer question examination (1 hr paper, no choice)

NB. Veterinary medicines legislation is also examinable in 4th year (Practice of Pharmacy Paper 2, XPH4PP2; dispensing examination).

SUMMARY OF HOURS

Lectures	Tutorials	Seminars	Total Contact	Guided + private study	TOTAL	ECTS
10	1	1.5	12.5	12.5	25	1

PLEASE NOTE: STUDENTS MUST PASS EACH UNIT OF THIS MODULE. THE PASS MARK FOR EACH UNIT IS 40%.

INFLAMMATION, RESPIRATORY AND GASTROINTESTINAL PHARMACOLOGY
Year 3 (Junior Sophister) **Course Code: PH3010**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Dr. C. Medina (CM), Dr. M.Santos-Martinez (MS), Prof. M. Radomski (MR)

Coordinator: Dr. Carlos Medina

AIMS: Students will learn basic pathophysiological principles of inflammatory, gastrointestinal and respiratory tract diseases and acquire the knowledge of pharmacological use of drugs used in these conditions.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Describe the basic anatomy and physiology of joints, lungs and gastrointestinal tract
- Demonstrate the ability to recognise inflammatory, respiratory and gastrointestinal clinical symptoms
- Differentiate and classify several respiratory and gastrointestinal diseases
- Explain the mechanism of action of the different drugs used for the treatment of all those conditions
- Apply knowledge in advising and counselling patients with inflammatory, respiratory and gastrointestinal symptoms and make appropriate responses to presented symptoms

PRE-REQUISITES: Completion of Year 2

LECTURE OUTLINE	**LECTURER**
1. Inflammation I	MR
2. Inflammation II	MR
3. Inflammation III	MR
4. Inflammation IV	MR
5. Introduction to respiratory pharmacology	MS
6. Bronchodilators I	MS
7. Bronchodilators II	MS
8. Glucocroticoids, omalizumab and cromones	MS
9. Allergen immunotherapy	MS
10. Anti-histamines and decongestants	MS
11. Mucolytics, expectorants and antitussives	MS
12. Asthma	MS
13. COPD	MS
14. Smoking cessation	MS
15. Introduction to gastrointestinal pharmacology	CM
16. Control of acid secretion	CM
17. Cytoprotective agents	CM
18. Antacids	CM
19. Histamine receptor antagonists	CM
20. Proton pump inhibitors	CM
21. Peptic ulcer disease	CM
22. NSAIDs-related ulcers	CM
23. GORD	CM
24. Anti-emetics	CM
25. Constipation	CM
26. Diarrhoea	CM
27. Irritable Bowel Syndrome	CM
28. Inflammatory bowel disease I	CM
29. Inflammatory bowel disease II	CM
30. Coeliac disease	CM
31. Alimentary Allergies & Lactose intolerance	CM
32. Liver pharmacology I	CM
33. Liver pharmacology II & Haemochromatosis	CM
34. Pancreas and biliary tree	CM
35. Cystic fibrosis	CM
36. Pharmacological Research	CM

SEMINARS
Gastrointestinal pharmacology
Respiratory pharmacology

DIRECTED READING – will be indicated, as relevant at each lecture

ASSESSMENT	Weighting
MCQs	90% of total marks
Continuous assessment	10% of total marks

SUMMARY OF HOURS

Lectures	Seminars/ workshops	Total contact	Guided + private study	TOTAL	ECTS
36	18	51	65	117	5

BLOOD, CARDIOVASCULAR and RENAL PHARMACOLOGY
Year 3 (Junior Sophister) **Course Code: PH3011**

Staff of the School of Pharmacy & Pharmaceutical Sciences : Prof. M. Radomski (MR), Dr. N. Frankish (NF)

Coordinator: Dr. N. Frankish

AIMS: The student will acquire a knowledge of pharmacology relevant to the use of drugs and medicines in cardiovascular and thrombotic conditions and oedematous states.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Describe the underlying pathology and aetiology of the varying forms of cardiovascular disease.
- Explain the various risk factors and how lifestyle behaviour can influence cardiovascular disease.
- Classify drugs used to treat cardiovascular disease and
- Describe their mechanism of action, their adverse effects and potential drug interactions and their clinical use.
- Describe the pathophysiology of the different forms of anaemia and their treatment
- Describe the physiology of lipid metabolism, the role of lipids in atherosclerosis and pancreatitis and how drugs modify lipid metabolism
- Describe the use of anti-hyperlipidaemics in prophylaxis, their clinical use and potential side effects

PRE-REQUISITES: Completion of Year 2

Cardiovascular Pharmacology

LECTURE OUTLINE	**LECTURER**
1. Basic cardiovascular pharmacology	NF
2. Renin-angiotensin system	NF
3. Circulation and cardiac function	NF
4. Circulation and cardiac function	NF
5. Dysrhythmias	NF
6. Dysrhythmias	NF
7. Angina	NF
8. Angina	NF
9. Antihypertensive drugs	NF
10. Antihypertensive drugs	NF
11. Hypertension	NF
12. Drugs used to treat congestive heart failure	NF
13. Drugs used to treat congestive heart failure	NF
14. Anaemia	NF
15. Anaemia	NF
16. Anaemia	NF
17. Diuretics	MR
18. Diuretics	MR
19. Diuretics	MR
20. Lipids	MR
21. Lipid-lowering drugs	MR
22. Lipid-lowering drugs	MR
23. Coagulation & anticoagulants	MR
24. Anticoagulants	MR
25. Anticoagulants	MR
26. Thrombosis & antiplatelet agents	MR
27. Anti-thrombotics	MR
28. Fibrinolysis & clot dissolution	MR
29. Streptokinase & thrombolytics	MR

CAL/SEMINARS

- Cardiovascular pharmacology
- Renal function and diuretics
- Calcium channel blocking drugs

DIRECTED READING – will be indicated, as relevant at each lecture

ASSESSMENT	Weighting
Written examination - 2 hours (100 MCQ questions)	90% of total marks
Continuous assessment through laboratory reports and CAL assignments	10% of total marks

SUMMARY OF HOURS

Lectures	CAL/Seminars	Examination	Contact hours	Guided study	Total	ECTS
29	15	2	44	63	108	5

SENIOR SOPHISTER (4th Year) course

Module details may be subject to corrections/amendments.

- *It is each student's responsibility to be aware of dates, times, locations, etc. of lectures, tutorials, seminars and practical classes.*
- *Laboratory notebooks must be presented for assessment by the date specified in the module.*
- *Notebooks submitted after the specified date will not be assessed, unless a valid reason is given, and students will be deemed not to have satisfied the School's examination requirements.*

MEDICINAL and PHARMACEUTICAL CHEMISTRY: DRUG DESIGN, DISCOVERY AND DEVELOPMENT
Year 4 (Senior Sophister) **Course Code: PH4002**
Staff of the School of Pharmacy & Pharmaceutical Sciences: Prof. MJ Meegan (MM); Dr. J.Quigley (JQ), Dr. J. Gilmer (JG), Dr. Astrid Sasse (AS);

Coordinator: Prof. MJ Meegan

AIMS: The aims of this course are to provide the student with an understanding of the role of pharmaceutical chemistry in contemporary drug design, discovery and development. The course provides a comprehensive overview of the concepts of modern medicinal chemistry as applied to selected major therapeutic drug classes and an introduction to the concepts and uses of prodrugs for enhanced delivery of drugs.

LEARNING OUTCOMES: On successful completion of the module the student should be able to demonstrate:

- Discuss the general principles and applications of modern drug design
- Explain the pharmaceutical chemistry basis of current prodrug design and use
- Describe the molecular mechanism of action of antiviral and anticancer drugs and process of new drug development in these areas
- Summarise the regulatory requirements for characterization and specification of pharmaceutical materials
- Explain the relevance of pharmaceutical chemistry in the pharmaceutical industry and in drug development
- Demonstrate competence in specialised practical laboratory techniques used in the analysis of pharmaceutical products.

PRE-REQUISITES: Medicinal & Pharmaceutical Chemistry III (PH3002) and Natural Source of Drugs and Medicines (PH3003)

LECTURE OUTLINE & LECTURER:
Unit PH4002A: Drug discovery and design; Advanced quantitative structure-activity relationships and related topics: (JQ)

1. Rationale of QSAR study; Summary of Hansch Model
2. The Bilinear Model; Introduction, The McFarland Model
3. log P_0 (π_o)/ Transport Rate Constants
4. Three-dimensional Structure : topological Indices
5. Craig Plots
6. The Topliss scheme
7. Principal Component Analysis
8. The Free-Wilson Method

Unit PH4002 B: Prodrugs (JQ)

9 Introduction: bipartite & tripartite prodrugs
10 Carboxyl Groups; Ampicillin prodrugs
11 Carboxyl Groups; Butyric acid prodrugs, cytodifferentiation in neoplastic cells, examples
12 Hydroxy derivatives: Timolol prodrugs, Introduction
13 Timolol Prodrugs: degradation Kinetics
14 N-Mannich bases: Structural effects on decomposition
15 N-Hydroxyalkyl and N-Acyloxyalkyl derivatives
16 Prodrugs of 5-fluorouracil: examples
17 Prodrugs of 5-fluorouracil: Lipophilicity & solubility data

Unit PH4002C: Agents acting on DNA; Medicinal chemistry of antiviral and anticancer pharmaceuticals; 12 lectures (MM)

18 DNA structure and replication: design of nucleoside type antiviral agents
19 Nucleoside and non-nucleoside antiviral agents active against DNA viruses
20 Production and stability of agents active against DNA polymerase
21 Nucleoside antiviral agents active against RNA viruses
22 Design, structure and function of clinical antiretroviral agents
23 Mechanism of action of protease inhibitors and antisense oligonucleotides
24 Mechanism of action and molecular targets for anticancer drugs

25 Alkylating agents; cyclophosphoramide and related drugs; mechanism of action, stability and analogue design
26 Cisplatin and related organometallic agents
27 Intercalating agents, topoisomerase targetting and DNA chain cutting agents
28 Antimetabolite and hormone based anticancer agents
29 Antimitotic agents; current clinical drugs and future potentially useful drugs

Unit PH4002D: Drug Development and Regulatory Affairs (AS, JG, JQ, MM)
(12 hours)

1. Regulatory affairs: Stability of drug substances and drug products(AS)
2. Advanced NMR characterisation methods for drug substances(JG)
3. Methods in drug discovery: Ligand and Structure based drug design: (MJM)
4. Computer aided drug design: review of calculation of molecular properties (JQ)

PRACTICALS (12 hours)

1. Analytical methods for penicillins (MJM)
2. Structure/activity case studies: Determination of partition and transport rate constants for drugs (JQ)
3. NSAID prodrug studies (JG)
4. Product evaluation (AS)
5. Molecular modeling

DIRECTED READING

The organic chemistry of drug design and drug action. Silverman, Richard B. 2nd Ed. Amsterdam ; London : Elsevier Academic Press, Second Edition, 2004.
Principles of Medicinal Chemistry; Foye, Lemke and Williams; 6th Edn. 2008

ASSESSMENT	Weighting
Written Examination Paper : 3 Hours; 5 questions to be answered out of 6	40% of total marks
Practical:	20% of total marks

The practical mark is based on continuous assessment and assignment (16%) and practical test (4%).
The practical test of 1 hours duration is held in the Hilary Term and takes the form of short or multiple choice questions based on the theory underlying the relevant practical classes of the Junior Sophister and Senior Sophister years.

SUMMARY OF HOURS

Lectures	Seminars/ Practicals	Total contact	Practical write-ups	Guided Study	TOTAL	ECTS
29	12 + 12	53	8	60	121	5

HERBAL MEDICINAL PRODUCTS and COMPLEMENTARY MEDICINES

Year 4 (Senior Sophister) **Course Code: PH4003**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Dr. J. Walsh (JW), Dr Fabio deSousa Menezes (FdSM), Dr. Helen Sheridan (HS)
External Contributors: Practitioners of Aromatherapy, Homoeopathy & TCM

Coordinator: Dr. Helen Sheridan

AIMS: To provide the student with an understanding of the types and concepts of Complementary and Alternative Medicine (CAM) with particular emphasis on developing critical approaches to the evidence based for the safety and efficacy of Phytotherapy, Aromatherapy and Homoeopathy.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Explain the conceptual differences between conventional medicine and CAM.
- Describe the nature of therapies such as Reiki, Shiatsu, Naturopathy etc.
- Discuss the concepts underlying Homoeopathy.
- Explain differences between Medical Herbalism and Rational Phytotherapy.
- Evaluate the phytochemical, phytopharmacological and clinical evidence base for the efficacy of Herbal Medicinal Products (HMPs) used in Rational Phytotherapy.
- Evaluate the evidence base for the safety of HMPs, including drug-herb interactions.

LECTURE OUTLINE		**LECTURER**
1 – 2	CAM – definition, types, concepts.	FdSM
3 – 5	Aromatherapy – sources and properties of essential oils.	JW
6 – 7	Herbalism – TCM, Ayurvedic and Western.	FdSM
8 – 9	Phytotherapy – phytochemistry and phytopharmacology of phenolics, flavonoids and lignans.	FdSM
10 – 11	Phytochemistry and phytopharmacology of terpene containing plants such as Ginseng,Gingko,Valerian, Chamomile.	JW
12	Clinical evidence base for phytotherapy.	FdSM
13 – 15	Case studies in phytotherapy (student led)	
16 – 17	The evidence base for ADRs, interactions and contraindications in phytotherapy.	FdSM
18 – 23	The European Regulatory framework for assessing quality efficacy and safety of HMPs.	HS

WORKSHOPS

Workshop on practical Aromatherapy	(2 hours)	External
Workshop on Homoeopathic pharmacy	(2 hours)	External
Workshop on TCM	(2 hours)	External

DIRECTED READING

Kayne SB *Complementary Therapies for Pharmacists*. Pharmaceutical Press, London, 2002
Ernst E, Pittler M, Wider B. *The Desktop Guide to Complementary and Alternative Medicine – an Evidence-based Approach.* 2nd Edn. Mosby Elsevier, 2006
Kayne SB *Homeopathic Pharmacy*. 2nd Edn., Elsevier Edinburgh, 2006
Barnes J, Anderson L & Phillipson JD. *Herbal Remedies*. 3rd Edn., Pharmaceutical Press, London, 2007

ASSESSMENT

Workshop Reports
Case Study Report
Annual Examination – Essay type questions

SUMMARY OF HOURS

Lectures + Tutorials	Workshops/ Practicals	Total contact	Practical write-ups	Guided Study	TOTAL	ECTS
23	6	29	6	67	102	5

ADVANCED DRUG DELIVERY and FUTURE DIRECTIONS of MEDICINE
Year 4 (Senior Sophister) **Course Code: PH4004**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Dr C Ehrhardt (CE), Dr JF Gilmer (JG), Dr AM Healy (AMH), Dr D D'Arcy (DD), Dr L Tajber (LT), Prof. M Meegan (MM)

Coordinator: Dr C Ehrhardt

AIMS: To provide an overview on advanced drug delivery strategies, alternative routes of drug absorption for local and systemic delivery. To familiarise the students with the anatomical and patho(physiological) particularities of those pathways, and *in vitro* models mimicking the respective biological barriers. To give an introduction to molecular pharmaceutics, including drug transporter proteins and metabolic enzymes.

LEARNING OUTCOMES: On successful completion of this module, the student will be able to:

- Describe the impact of drug transporters and metabolic enzymes on limiting/enhancing drug bioavailability and impact of pharmacogenomic profiling
- Describe alternative routes of systemic drug delivery
- Describe of the anatomical and patho(physiological) particularities of epithelial barriers of the skin, mucosae, eye, and respiratory system.
- Explain basic principles in vitro cell culture techniques
- Describe the biopharmaceutics classification system and its application in research and development (BCS)
- Explain the prodrug approach to enhancing delivery and targeting.

PRE-REQUISITES: Pharmaceutical Biotechnology I-II, Anatomy and Physiology, JF-, SF-, JS-Pharmacology

LECTURE OUTLINE		**LECTURER**
1-4	Inhalation therapy	AMH
5-8	Gene therapy	CE
9	Anti-sense technology	MM
10-13	Design of drug delivery systems	DD
14	In vitro methods for drug absorption studies	CE
15	Drug disposition after oral administration	CE
16	Drug transporters and efflux pumps	CE
17	Metabolic enzymes	CE
18	Pharmacogenomics and personal medicine	ANO
19, 20	Biopharmaceutics Classification System	CE
21-23	Transdermal drug delivery	CE
24	Nasal drug delivery	CE
25, 26	Pulmonary drug delivery	CE
27	Mucosal (buccal, vaginal) drug delivery	CE
28	Occular drug delivery	CE
29-32	The prodrug approach, ADEPT, GDEPT.	JQ/JG
33-35	Controlled release formulation	DD
36	Matrix tablets	DD
37-39	Microencapsulation	LT
40, 41	Advanced polymers, polymers as drug carrier systems	MM

DIRECTED READING (A selection from the following)

- Blakenstein, T. *Gene Therapy. Principles and Applications*, Boston, Birkhäuser Verlag, 1999
- Davis, H. and Whalen, R.M. *DNA-based immunization, Molecular and Cell Biology of Human Genetic Therapeutics*, Chapman & Hall, 1995
- Williams, A.C. *Transdermal and topical drug delivery*, Pharmaceutical Press, London, 2003
- *Pharmaceutics* 2nd Edition, M.E. Aulton, ed., Churchill Livingstone, 2002
- Kabanov, A. *et al. Self-assembling complexes for gene delivery. From laboratory to clinical trial*. New York, Wiley, 1998
- Tukker, J.J. In vitro methods for the assessment of permeability, in J.B. Dressman and H. Lenneras (eds.) *Oral drug absorption - prediction and assessment*, Marcel Dekker, 2000
- Donnelly, J. *et al.* DNA vaccines. *Annual Rev Immunol* **15**:617-648, 1997

- Kabanov, A. *et al.* Self-assembling complexes for gene delivery. From laboratory to clinical trial. New York, Wiley, 1998
- Ledley, F.D. Nonviral gene therapy: the promise of genes as pharmaceutical products, *Human Gene Ther* **6**:1129-1144, 1995
- Middaugh, C.R. *et al.* Analysis of plasmid DNA from a pharmaceutical perspective, *J Pharm Sci* **87**:130-146, 1998
- Miller, D.A. Human gene therapy comes of age, *Nature* **357**:455-460, 1992
- Wolff, J.A. and Lederberg, J. An early history of gene transfer and therapy, *Human Gene Ther* **5**:469-480, 1994
- Artursson, P. and Karlsson, J. Correlation between oral drug absorption in humans and apparent drug permeability coefficients in human intestinal epithelial (Caco-2) cells, *Biochem Biophys Res Commun* **175**:880-885, 1991
- Waiver of in vivo bioavailability and bioequivalence studies for immediate-release solid oral dosage forms based on a biopharmaceutics classification system; http://www.fda.gov/cder/guidance/3618fnl.htm
- Wu, C.Y. and Benet, L.Z. Predicting drug disposition via application of BCS; *Pharm Res* **22**:11-23, 2005
- Junginger, H.E. *et al.*; Recent advances in buccal drug delivery and absorption – in vitro and in vivo studies, *J Control Release* **62**:149-159, 1999
- Rowe, R.C. By gum – a buccal delivery system. *Drug Discov Today*, **8**:617-618, 2003
- Smart, J.D. Recent developments in the use of bioadhesive systems for delivery of drugs to the oral cavity, *Crit Rev Ther Drug Carrier Syst*, **21**:319-344, 2004
- Veuillez, F. *et al.* Factors and startegies for improving buccal absorption of peptides, *Eur J Pharm Biopharm*, **51**:93-109, 2001
- Davis, S.S. Delivery of peptide and non-peptide drugs through the respiratory tract, *Pharm Sci Technol Today* **2**:450-456, 1999
- Illum, L. and Davis, S.S. Nasal vaccines, *Adv Drug Deliv Rev* **51**:1-211, 2001
- Illum, L. Nasal drug delivery – possibilities, problems and solutions, *J Control Release* **87**:187-198, 2003
- Groneberg, D.A. Fundamentals of pulmonary drug delivery, *Respir Med* **97**:382-387, 2003
- Sanjar, S. and Matthews, J. Treating systemic diseases via the lung, *J Aerosol Med*, **14**:S51-S58, 2001
- Gonda, I The ascent of pulmonary drug delivery, *J Pharm Sci* **89**:940-945, 2000
- Byron, P.R. and Patton, J.S Drug delivery via the respiratory tract, *J Aerosol Med* **7**:49-75, 1994
- Roberts, M.S. and Walters, K.A. Dermal absorption and toxicity assessment *Drugs Pharm Sci*, **91**, 1998
- Mitragotri, S. Breaking the skin barrier, *Adv Drug Deliv Rev*, **56**:555-716, 2004

ASSESSMENT – to be confirmed

SUMMARY OF HOURS

Lectures	Practicals	Total contact	Guided study	TOTAL	ECTS
41		41	70	111	5

PHARMACOKINETICS, PHARMACODYNAMICS, BIOPHARMACEUTICS and DRUG METABOLISM
Year 4 (Senior Sophister) **Course Code: PH4005**
Staff of the School of Pharmacy & Pharmaceutical Sciences: Prof. M J Meegan, (MM), Dr D D'Arcy (DD) AN Other (ANO)

Coordinator: Dr D D'Arcy

AIMS: To provide a course on Pharmacokinetics with its implications for the design and usage of medicines. To provide the kinetic concepts describing/underlying the processes of absorption, distribution and elimination and metabolism of drugs.

LEARNING OUTCOMES:
Learning outcomes PH 4005A. On successful completion of this module the student will be able to:
- Explain the rationale for employing different pharmacokinetic models to interpret biopharmaceutical data.
- Employ appropriate pharmacokinetic equations to calculate basic pharmacokinetic parameters when presented with appropriate data.

Learning outcomes PH 4005B. On successful completion of this module the student will be able to:
- Interpret the relative importance of pharmacokinetic parameters of a drug when designing a drug delivery system.
- Relate the pharmacokinetic and formulation parameters of a drug delivery system to the methods employed in determining bioavailability.

Learning outcomes PH4005C. On successful completion of this module the student will be able to:
- Relate the principles of pharmacokinetics to the role of the pharmacist in provision of patient care
- Identify common clinical situations where therapeutic drug monitoring principles should be applied
- Apply provided empirical pharmacokinetic equations to selected clinical scenarios to optimise dosing regimens with an emphasis on clinical outcomes.

Learning outcomes PH 4005D.
- Describe the common metabolic processes of drugs
- Predict the metabolic products formed by drugs
- Discuss the role of metabolism in the modern drug discovery process

PRE-REQUISITES: Introductory Pharmaceutics (PH1004), SF and JS modules in Pharmaceutics & Pharmaceutical Technology, Pharmaceutical Chemistry and Pharmacology.

LECTURE OUTLINE

Unit PH4005A: Basic Pharmacokinetics

1	Introduction: Bolus IV / urinary excretion / multiple dosing	ANO
2	One compartment / infusion	ANO
3	First order administration	ANO
4	Multi dose administration	ANO
5	Amount absorbed versus time plots: Wagner-Nelson method	ANO
6	Two compartment model. Bolus IV injection	ANO
7	Three and multi compartment/flow models	ANO
8	Model independent pharmacokinetics	ANO
9.	Non-linear pharmacokinetics	

Unit PH4005B: Biopharmaceutics

10.	Bioavailability determination	DD
11	Dissolution, bioequivalence and BCS	DD
12	Design of bioequivalence studies	DD
13	In vitro in vivo correlation	DD
14	Biowaivers and measuring dissolution profiles	DD
15	Effects of food on absorption	DD

16	Pharmacodynamics 1	ANO
17	Pharmacodynamics 2	ANO
18.	Models to describe and predict mechanisms of oral drug absorption	DD
		DD

Unit PH4005C: Clinical Pharmacokinetics

19.	Introduction to clinical pharmacokinetics	
20.	Role of renal function in pharmacokinetics	DD
21.	Worked examples - Digoxin	DD
22.	Role of hepatic function in pharmacokinetics- clearance and interactions	DD
23.	Role of hepatic function in pharmacokinetics- hepatic disease and PK	DD
24.	Worked examples- theophylline	DD
25.	Anti-epileptics and non-linear pharmacokinetics-clinical applications	DD
26	Effects of ageing on pharmacokinetics	DD
27.	Tutorial	DD

Unit PH4005D: Drug Metabolism **(MM)**

28.	The process of drug Metabolism and ADME; Chemical and biological factors affecting metabolism; metabolic enzymes	MM
29.	Phase I metabolism of drugs; the role of cytochrome P450;	MM
30.	Phase II metabolism of drugs; conjugation and detoxification	MM
31.	Examples of metabolite formation for selected groups of drugs	MM
32.	Metabolism studies in drug development: The role of metabolism in drug design and development	MM

PRACTICAL CLASSES

1	Absolute bioavailability
2	Relative bioavailability / computer simulations
3	Two compartment model – data analysis

TUTORIALS - 1 on Pharmacokinetics

DIRECTED READING

Pharmaceutics 2nd Edition, M E Aulton, editor, Churchill Livingstone (2002),
Clarke, B. & Smith, D.A. *An Introduction to Pharmacokinetics*. Blackwell Sci. Publications, Oxford.
Gibaldi, M. 1990. *Biopharmaceutics and Clinical Pharmacokinetics.* 4th Edition. Lea & Febiger (UK) Ltd. Kent.
Wagner, J.G. 1979. *Fundamentals of Clinical Pharmacokinetics.* Drug Intelligence Publications.
Wagner, J.G. 1993. *Pharmacokinetics for the Pharmaceutical Scientist*. Technomic Publishing Company.
Derendorf, H. & Meibohm, B. 1999. Modeling of Pharmacokinetic/Pharmacodynamic (PK/PD) Relationships: Concepts and Perspectives. *Pharmaceutical Research*. 16(2).
Jusko, W.J. & Ko. H.C. 1994. Physiologic indirect response models characterize diverse types of pharmacodynamic effects. *Clinical Pharmacology & Therapeutics.* 56(4). October 1994.
Derendorf, H. 1994. Pharmacodynamic aspects of systemic drug delivery. *Drug Development and Industrial Pharmacy.* 20(4): 458-502.
Pharmacokinetics and Pharmacodynamics, *BSc. Pharm. Senior Sophister: Notes*. School of Pharmacy & Pharmaceutical Sciences, Pharmaceutics & Pharmaceutical Technology.
Winter, M.E. 2004. *Basic Clinical Pharmacokinetics*. 4th Edition. Lippincott Wiliams & Wilkins.
J J. Tukker; In Vitro Methods for the Assessment of Permeability; in Jennifer B. Dressman and Hans Lenneras (eds.) Oral Drug Absorption - Prediction and Assessment, Marcel Dekker, 2000
Per Artursson and Johan Karlsson; Correlation between oral drug absorption in humans and apparent drug permeability coefficients in human intestinal epithelial (Caco-2) cells; *Biochem. Biophys. Res. Commun.* **175**:880-885
Waiver of In Vivo Bioavailability and Bioequivalence Studies for Immediate-Release Solid Oral Dosage Forms Based on a Biopharmaceutics Classification System; http://www.fda.gov/cder/guidance/3618fnl.htm
Chi-Yuan Wu and Leslie Z. Benet; Predicting Drug Disposition via Application of BCS; Pharm. Res. **22**:11-23; 2005 Basic
Pharmacokinetics, Jambhekar and Breen, Pharmaceutical Press 2009
EMEA, CHMP, London, 2008. Guideline on the investigation of bioequivalence (DRAFT).
FDA – Guidance for industry: Bioavailability and bioequivalence studies for orally administered drug products-general considerations

Amidon, GL, Lennernas, H, Shah, VP, Crison, JR. A theoretical basis for a biopharmaceutic drug classification: the correlation of in vitro drug product dissolution and in vivo bioavailability. Pharm Res., vol. 12, no. 3 1995
Relevant chapters of USP: 1088, 711.
FDA-Guidance for Industry-Dissolution testing of immediate release solid oral dosage forms (CDER 1997)
FDA-Guidance for Industry-Extended Release oral dosage forms: development, evaluation and application of in vitro in vivo correlations
FDA-Guidance for Industry-SUPAC-MR: modified release solid oral dosage forms
FDA-Guidance for Industry-SUPAC-IR: Immediate release solid oral dosage forms
EMEA-Note for guidance on quality of modified release products: A Oral dosage forms B Transdermal dosage forms Section 1 (Quality)
Clinical Pharmacokinetics, Dhillon and Kostrzewski, Pharmaceutical Press, 2006. Practically useful.
Clinical pharmacokinetics, Concepts and Applications, Rowland and Tozer, Lea and Febiger.
Clinical pharmacokinetics handbook – Larry Bauer. McGraw Hill, 2006.
The pharmaceutical journal – 4 articles: 2004vol 272 pg. 769, pg.806, vol 273 pg. 153, pg. 188 (A Thomson).

ASSESSMENT Weighting

Theory written paper: 3 hours, 4 questions to be answered out of 6 Plus 15 MCQ to be answered	85% of total marks
Continuous assessment of practical work	15% of total marks

SUMMARY OF HOURS

Lectures	Practicals	Tutorials	Total contact	Practical write-ups	Guided study	TOTAL	ETCS
32	9	1	42	8	65	115	5

PRACTICE OF PHARMACY IV-1
Year 4 (Senior Sophister) **Course Code: PH4006**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Dr. M Henman (MH); S Ryder (SR)
Teacher Practitioners: K Sheridan (KS); C Roche (CR); N McMahon (NMcM); E Deasy (ED)
External Contributors: Ms A Nolan (AN); ANO (Law School); E Condon (EC); N Quinn (NQ); C Kerr (CK); K Mulvenna (KM); L Horgan (LH); M Catibusic (MC); K O'Donnell (KOD); Hospital Pharmacists' Association of Ireland (HPAI)

Coordinator: S Ryder

AIMS: To bring together key topics in the Practice of Pharmacy and to provide the range of understanding and practical knowledge necessary for the student to practice satisfactorily under present circumstances and to respond to changes in the requirements of the health service and the profession.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- State the roles and responsibilities of the Pharmaceutical Society of Ireland and illustrate how these may change as the profession develops.
- Explain the importance of management science and discuss how it may be applied to pharmacy practice.
- Outline the factors governing the control of a commercial business and identify the skills needed to run a business.
- Explain the necessity for auditing service provision in pharmacy practice.
- Describe the organisation and procedures for the distribution and reimbursement of medicines in Ireland.
- Discuss the principles governing the reform process within the Irish health service and the main influences on the provision of pharmaceutical services.
- Critically discuss the provisions of IMB legislation, medicinal products legislation, the Pharmacy Act and Pharmaceutical Society of Ireland Regulations, and relevant EU legislation.
- Critically discuss the law governing family planning, medical devices and methylated spirits.
- Integrate changes in legislation covered earlier in the degree course with his/her existing knowledge.
- Be able to supply medicines in accordance with prescriptions and other appropriate documents and identify the legal, drug-related, administrative and communication problems that are presented or may arise after dispensing.
- Critically discuss the organisation and procedures for the distribution and reimbursement of medicines in Ireland.
- Explain the general principles of tort and of contract law.
- Critically review the law governing and the functions and operation of the Irish Medicines Board.

PRE-REQUISITES: None

Unit PH4006A: MANAGEMENT SCIENCE, BUSINESS SKILLS & HEALTH SERVICE - POLICY & PRACTICE

LECTURE OUTLINE (21 hours)		**LECTURER**
1-7	Management Science applied to Pharmacy	AN (Ext)
8-10	Business Management skills in pharmacy	EXT
11	Audit of professional services	EXT
12	Drug Distribution in Ireland	EC (Ext)
13	Pharmaceutical Industry in Ireland	AN (Ext)
14	Health Service: Department of Health & Children	NQ (Ext)
15	Health Service: HSE Primary Care	CK (Ext)
16	Health Service: HSE Corporate Issues	KM (Ext)
17	Health Service: Community Pharmacy	KS (Ext)
18	Health Service: Hospital Pharmacy	HPAI (Ext)
19	Pre-Registration Year	LH (Ext)
20	PSI	LH (Ext)
21	Irish Medicines Board	MC/KOD(Ext)

SEMINARS (4 hours)

Ethics in pharmacy practice	CR

UNIT PH4006B: PHARMACY LAW, DISPENSING AND DRUG DISTRIBUTION (18 HOURS)

LECTURE OUTLINE		**LECTURER**
1-5	Medicinal Products legislation	SR
6-8	Pharmacy Acts, PSI Regs, EU legislation	SR
9	IMB act	SR
10-11	Medical Devices	SR
12	Family planning legislation, methylated spirits legislation	SR
13-14	Legislation update	SR
15-16	Review and integration of legislation	SR
17	Law of Contract	Law School
18	Tort of Negligence	Law School

PRACTICALS / WORKSHOPS (15 hours)

Dispensing 4.1	SR/KS/CR
Dispensing 4.2	SR/KS/CR
Dispensing feedback workshop (Dispensing 4.1-4.2)	SR/KS/CR
Dispensing 4.3	SR/KS/CR
Dispensing 4.4 (Hospital)	NMcM/ED/MH
Dispensing feedback workshop (Dispensing 4.3-4.4)	SR/KS/CR
Dispensing 4.5	SR/KS/CR
Dispensing 4.6 (mock exam)	SR/KS/CR
Dispensing feedback workshop (Dispensing 4.5-4.6)	SR/KS/CR

ASSESSMENT

This module is evaluated in conjunction with PH4007 and PH4010. For summary of assessment see page 95.

Unit PH4006A

Essay questions (1-3 out of three) in Practice of Pharmacy Paper 1 (20-60% of Paper 1 grade)
8-24% of overall grade
(depending on student's choice of examination questions)

Unit PH4006B

[1]Examination – Pharmacy Law (Practice of Pharmacy Paper 2) (3 hrs) Section A - 3 essay questions. Section B - 80 MCQs). All questions are compulsory and students must independently pass both Section A and Section B.	30% of overall grade
Dispensing examination (3 hrs). All questions are compulsory. Six dispensing problems (60 marks) Two dispensing problems with dispensed product (25 marks)	85% of practical mark[2]
Dispensing practical reports	15% of practical mark[2]
PH4006 proportion of final Practice of Pharmacy total	38-54% of overall grade

SUMMARY OF HOURS

Lectures	Practicals / workshops	Seminars	Total contact	Guided study	TOTAL	ECTS
39	15	4	58	62	120	5

[1] Students who fail to satisfy in the Pharmacy Law examination (Practice of Pharmacy Paper 2) will be ungraded and will be required to take a supplemental examination, because of the importance accorded to this aspect of the course by the PSI who accredit the degree.

[2] Senior Sophister students are required to attain an overall standard of 60% in the practical component of the module (dispensing exam + dispensing practical coursework). However, the marks obtained do not contribute towards the overall Practice of Pharmacy grade for the year.

The pass mark for examinations and assessments is 40% except where otherwise indicated. Students should note that College penalties for plagiarism apply to both examinations and continuous assessment.

A specific requirement of the course is that continuous assessment exercises must be presented for evaluation by the specified date(s). They must be presented to a designated member of staff and signed in on the form for this purpose. Work submitted late will not be assessed unless a valid reason is provided.

Examination marks may be withheld and/or a student may be refused permission to rise with their class until they have satisfied the examiners in the continuous assessment components of the course.

NB: Professional Dress Code
Students are required to dress appropriately and behave in a professional manner for elements of the course entailing attendance at external facilities (professional experience in pharmacies, case review in hospitals, health service facilities, etc.)

SUMMARY OF PRACTICE OF PHARMACY ASSESSMENT IN SENIOR SOPHISTER:

(1) Theory evaluation *(for subject grade)*

Paper 1 [3h], 4 questions from 6 in Section A (core material) plus 1 question from 1 in Section B *or* C *or* D (elective)	Section A: PH4006A (3 questions), PH4007A (3 questions) Section B: PH4010A (1 question) Section C: PH4010B (1 question) Section D: PH4010C (1 question)	40%
Paper 2 [3h], Section A (3 essays) and Section B (80 MCQs), all compulsory. Pharmacy law and codes of practice. Students must pass both Section A and Section B independently.	PH1006A (law, ethics and codes of practice), PH2006C, PH2011 (law), PH3006B, PH4006B, PH4008.	30%
Dissertation (topic based on elective)	PH4010D	30%
		100%

(2) Dispensing evaluation *(must attain 60% standard but no contribution to subject grade)*

Dispensing examination [3h], 8 dispensing problems (including two with dispensed product), all compulsory.	All modules, all years	85%
Dispensing laboratory reports	PH4006B	15%
		100%

(3) Other coursework *(satisfactory/unsatisfactory)*

Communication Skills – role play	PH4007A
Group presentation in *Pharmaceutical Care and Therapeutics*	PH4007B
OSCE in *Clinical Skills*	PH4007B
Case presentation in *Clinical Skills Attachment*	PH4007B

PRACTICE OF PHARMACY IV-2
Year 4 (Senior Sophister) **Course Code: PH4007**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Dr. M Henman (MH); Ms S Ryder (SR);
Teacher-Practitioners: Ms Bradley (CB); K Sheridan (KS); Ms E Deasy (ED); Ms N McMahon (NMcM)
External contributors: S Kennedy (SK); Aware; Diabetes Federation of Ireland (DFI); Irish Chronic Pain Association (ICPA)

Coordinators: Dr. M Henman/Ms S Ryder

This module is divided into 2 main units.

AIMS: To bring together key topics in the Practice of Pharmacy and to provide the range of understanding and practical knowledge necessary for the student to practice satisfactorily under present circumstances and to respond to changes in the requirements of the health service and the profession.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Acquire a knowledge of the principles of communication skills and how these may be applied to pharmacy practice situations;
- Be able to supply medicines in accordance with prescriptions and other appropriate documents and identify the communication problems that are presented or may arise during these processes;
- Demonstrate a knowledge of the scope of pharmaceutical care and its relation to evidence-based practice and to the prevention and management of medication errors and the maintenance of patient safety;
- Evaluate and select appropriate non-prescription medicines for the treatment of minor illness;
- Be able to supply prescription and non-prescription medicines and other products and to identify the drug-related problems and disease-related factors that are presented or may arise during these processes;
- Demonstrate a knowledge of the activities of Drugs and Therapeutics Committees and of the methods used to evaluate and control the use of drugs;
- Respond appropriately to patients presenting symptoms;
- Understand the principles of the management of minor illness;
- Appreciate the variety of form and function among patient support groups and their role in Ireland.

PRE-REQUISITES: Completion of Pharmacy Practice III (PH3006)

Unit PH4007A: APPLIED SOCIOLOGY AND PSYCHOLOGY AND HEALTH PROMOTION

	LECTURE OUTLINE	**LECTURER**
1	Introduction to Practice of Pharmacy Course and methods of assessment	MH
2-7	Communications Skills 1-6	MH
8	Communications skills review	MH
9	Sociology and Health Sciences	MH
10	Psychology and Health Psychology	MH
11	Biomedical model of health and illness	MH
12	Biopsychosocial model of health and illness	MH
13	Patient Compliance and Concordance	MH
14	Health Care Professional Compliance	MH
15	Health Behaviour change	MH
16	Motivational Interviewing	CB
17	Health promotion	CB
18	Health education	CB
19	Health promotion, Health education & Health policy	CB
20	Health services & delivery of Health promotion and education	CB
21	Health Outcomes & Quality of life	MH
22	Programme Evaluation & Health Services Research	MH/CB

SEMINARS (2 hours)

Health Promotion	SK (Ext)

PRACTICAL (3 hours)

Communications skills – role play (recorded)	KS

Unit PH4007B: PHARMACEUTICAL CARE AND CLINICAL SKILLS

	LECTURE OUTLINE	**LECTURER**
1	Pharmaceutical care practice	MH
2	Pharmaceutical care – patient aspects	MH
3	Pharmaceutical care – drug aspects	MH
4	Pharmaceutical care – disease aspects	MH
5	Clinical pharmacy	NMcM
6	Drug utilization reviews, outcome monitoring, formulary development and Drugs and Therapeutics Committees	NMcM
7	Evidence-based pharmacy practice	MH

SEMINARS (36 hours)

Pharmaceutical Care & Therapeutics 1 (**3 hours)**	MH
Pharmaceutical Care & Therapeutics 2 (**3 hours)**	MH
Pharmaceutical Care & Therapeutics 3 (**3 hours)**	MH
Pharmaceutical Care & Therapeutics 4 (**3 hours)**	MH
Pharmaceutical Care & Therapeutics 5 (**3 hours)**	MH
Pharmaceutical Care & Therapeutics 6 (**3 hours)**	MH
Pharmaceutical Care – patient support groups 1 (**2 hours)**	Aware (Ext)
Pharmaceutical Care – patient support groups 2 **(2 hours)**	DFI (Ext)
Pharmaceutical Care – patient support groups 3 **(2 hours)**	ICPA (Ext)
Clinical Skills 1 **(3 hours)**	
Clinical Skills 2 **(3 hours)**	
Clinical Skills Attachment **(6 hours)**	

ASSESSMENT

This module is evaluated in conjunction with PH4006 and PH4010. For summary of assessment see page 95.

Unit PH44007A

Essay questions (1-3 out of three) in Practice of Pharmacy Paper 1 (20-60% of Paper 1 grade) 8-24% of overall grade (depending on student's choice of examination questions)

[1]Communication skills – role play satisfactory/unsatisfactory

Unit PH4007B

[1]Group presentation in *Pharmaceutical Care & Therapeutics* satisfactory/unsatisfactory
[1]OSCE (Objective Structured Clinical Examination) in *Clinical Skills* satisfactory/unsatisfactory
[1]Case presentation in *Clinical Skills Attachment* satisfactory/unsatisfactory

SUMMARY OF HOURS

Lectures	Practicals/Tutorials/Seminars	Total contact	Guided study	TOTAL	ECTS
29	41	70	45	115	5

The pass mark for examinations and assessments is 40% except where otherwise indicated. Students should note that College penalties for plagiarism apply to both examinations and continuous assessment.
A specific requirement of the course is that continuous assessment exercises must be presented for evaluation by the specified date(s). They must be presented to a designated member of staff and signed in on the form for this purpose. Work submitted late will not be assessed unless a valid reason is provided.

[1]*Students must satisfy the examiners in all four practical components of Units PH4007A and PH4007B. However, the marks obtained do not contribute towards the overall Practice of Pharmacy grade for the year.*
Examination marks may be withheld and/or a student may be refused permission to rise with their class until they have satisfied the examiners in the continuous assessment components of the course.

NB: Professional Dress Code
Students are required to dress appropriately and behave in a professional manner for elements of the course entailing attendance at external facilities (professional experience in pharmacies, case review in hospitals, health service facilities, etc.)

ADDICTION PHARMACY
Year 4 (Senior Sophister) **Course Code: PH4008**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Dr. F de Sousa Menezes (FSM), Dr. A Harkin (AH), Dr. J Gilmer (JG), S Ryder (SR), Dr M Henman (MH)
External Practitioners: Jonathan Diamond (JD), John Bourke (JB), Sheila O'Connor (S.OC) Cicely Roche (CR), Dennis O'Driscoll (D.OD)

Coordinator: Dr Fabio de Sousa Menezes

AIMS: To provide the student with an understanding of the nature, extent and causes of problem drug-taking in Ireland in order that they can undertake professional activities as pharmacists in the prevention and treatment of drug dependence and other drug-related problems.

LEARNING OUTCOMES:
On successful completion of this module the student will be able to:

- Discuss the complexity of a drug taking problem,
- Describe neurochemical and psycopharmacological aspects of drug abuse,
- Discuss psychosocial aspects of drug abuse,
- Describe the role of the pharmacist in smoking cessation as well techniques available for same,
- Describe the main sources of drugs, and describe the pathophysiology of the major drug types,
- Discuss the National Drug Strategy and the PSI Drug Misuse Policy,
- Recall the misuse drugs acts, regulations and protocols (methadone)

LECTURE OUTLINE:		**LECTURER**
1–8	Pharmaceutical Chemistry of the opioids, related peptides and receptors.	JG
7–8	Neuropharmacology of dependence and inter-relationships between the dopamine, opioid, cannabinoid and GABA systems pharmacotherapies for drug dependency.	AH
9–11	Cannabis, phytocannabinoids and pathophysiology of cannabis.	FSM
12–14	Drug-related problems.	FSM
15-16	Controlled drugs legislation	SR

WORKSHOPS AND SEMINARS (30 hours)

1. Overview of the role of the pharmacist within the National Drug Strategy – **2 hours.**	FSM
2. Role of the Pharmacist in Drug Prevention and the PSI Policy – **2 hours.**	CR
3. Psychosocial aspects of problem drug taking. **4 hours.**	MH& MMcC
4. Role of the pharmacist in Harm Reduction. – **2 hours**	JB
5. Role of the Pharmacist in smoking cessation **– 4 hours**	JD
6. Role of the pharmacist in treatment – **2 hours**	S.OC
7. The Methadone Protocol in Practice-**2 hours**	D.OD
8. Brief interventions – skills development – **6 hours**	MH

LABORATORY CLASSES (3 hours each)
Identification of Drugs of Abuse I-Cannabis
Identification of Drugs of Abuse II-Narcotics
Modern Dispensing
Methadone
Nicotine Replacement

DIRECTED READING
Graham Patrick - *An Introduction to Medicinal Chemistry.* 3rd Edn., Chapter 21, Oxford University Press, 2005.
Wills S. *Drugs of Abuse* 2nd Edn., Pharmaceutical Press, London 2005
Anon. *Facts about Drug Misuse in Ireland*. 4th Edn., 2003, Health Promotion Unit, Dept. of Health and Children through www.drugsinfo.ie
Cathy Stannard, Michael H. Coupe, Anthony Pickering – *Opioids in Non-Cancer pain*. (Oxford Pain Management Library Series), 2008.
Karen Forbes – *Opioids in Cancer pain*. (Oxford Pain Management Library Series), 2008.

Kalant H. *Adverse Effects of Cannabis on Health*- An update of Literature since 1996. Progress in Neuropsychpharmacology & Biological Psychiatry, 2004; 28: 849-863 (Available on line)
Joy M & J. *Marijuana as Medicine. The Science beyond the Controversy*. National Academy Press, Washington DC., 2001
Ward J. et al. Role *of maintenance treatment in opioid dependence*. Lancet, 1999; 221-226 (Available on line)

ASSESSMENTS	Weighting
Annual Examination - Essay type questions / MCQs	70% of total marks
Seminar/Workshop Reports	15% of total marks
Lab Class Reports	5% of total marks
Modern Dispensing Evaluations	10% of total marks

NB. Controlled drugs legislation is also examinable in Practice of Pharmacy Paper 2 (XPH4PP2) and the Dispensing Examination.

SUMMARY OF HOURS

Lectures + Seminars/	Practicals	Total contact	Practical write-ups	Guided Study	TOTAL	ECTS
16 + 30	15	61	18	45	124	5

NEUROPHARMACOLOGY
Year 4 (Senior Sophister) **Course Code: PH4009**
Staff of the School of Pharmacy & Pharmaceutical Sciences: Dr. A Harkin (AH)

Coordinator: Dr. A Harkin (AH)

AIMS: To teach the principles of neuropharmacology and drug therapies for disorders of the central nervous system.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Discuss the diagnostic criteria and symptom presentation, biological basis and drug treatment of affective and anxiety disorders, insomnia, schizophrenia, drug dependence, pain, epilepsy, Parkinson's and Alzheimer's disease.
- Describe the mechanisms of action and clinical uses of local and general anaesthetic drugs
- Recall the pharmacokinetic characteristics and adverse effects associated with antidepressant, mood stabilising, anxiolytic, hypnotic, analgesic, anaesthetic, anticonvulsant, anti-Parkinsonian and cognitive enhancing drugs
- Discuss the neurobiological theory of CNS disorders and neurobiological adaptation to psychotropic drugs
- Assess and evaluate recent advances in the drug treatment of CNS disorders and provide an up to date insight into CNS drug development.

PRE-REQUISITES: SF and JS Pharmacology modules

LECTURE OUTLINE and LECTURER (AH)

1 Introduction to neuropharmacology
2-3 Local anaesthetics,
4-5 General anaesthetics
6-8 Pain and narcotic analgesics
9-11 Antidepressants and mood stabilisers
12-14 Anxiolytics and hypnotics
15-17 Antipsychotics
18-20 Anticonvulsants
21-23 Anti-Parkinsonian drugs and drug treatment of Huntington's disease
24-26 Drug treatment of Alzheimer's disease, cognition enhancing and neuroprotective drugs
27-28 Neuroprotection, therapeutic approaches for ischaemic brain damage
29-30 Neuroimmunology, therapeutic approaches for multiple sclerosis

TUTORIALS (3 x 3 hour)

Tutorial 1: Anaesthetics (computer assisted learning session with assignment)
Tutorial 2: Schizophrenia and review of case studies (Computer assisted learning session with assignment)
Tutorial 3: Movement disorders and review of case studies (Computer assisted learning session with assignment)

DIRECTED READING

Rang and Dale's Pharmacology (6th edition) by H.P. Rang, M.Maureen Dale, James M. Ritter , Rod Flower.
Brody's Human Pharmacology: Molecular to Clinical (4th Edition) by Kenneth P. Minneman
The Biochemical Basis of Neuropharmacology (8th Edition) by Jack R. Cooper, Floyd E. Bloom, Robert H. Roth
Molecular Basis of Neuropharmacology: A Foundation for Clinical Neuroscience by Eric J. Nestler, Steven E. Hyman, Robert Malenka
Fundamentals of Psychopharmacology by Brian Leonard

ASSESSMENT

Written Examination: 1.5 hours; to answer 4 out of 6 questions; 100% of marks
one compulsory question based on tutorials and completed assignments.

SUMMARY OF HOURS

Lectures	Tutorials/ Seminars	Total contact	Seminar write-ups	Guided Study	TOTAL	ECTS
30	9	39		81	120	5

PRACTICE OF PHARMACY IV-3: ELECTIVES
Year 4 (Senior Sophister) **Course Code: PH4010**

Staff of the School of Pharmacy & Pharmaceutical Sciences: Dr. M Henman (MH);
Teacher Practitioners: Ms Bradley (CB); Ms E Deasy (ED), Dr. K O'Connor (KO'C)

Coordinators: Dr. M Henman/Ms K Sheridan

AIMS: To bring together key topics in the Practice of Pharmacy and to provide the range of understanding and practical knowledge necessary for the student to practice satisfactorily under present circumstances and to respond to changes in the requirements of the health service and the profession.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Demonstrate the ability to search and retrieve literature of all types, to paraphrase the arguments and evidence retrieved, to evaluate that material in a critical fashion and to argue a personal view based upon a review of the evidence;
- Explore and understand the roles and responsibilities of the pharmacist in one of the three main branches of pharmacy practice – community, hospital or industrial pharmacy.

PRE-REQUISITES: Completion of Pharmacy Practice III (PH3006)

SEMINARS

Unit PH4010A: COMMUNITY PHARMACY ELECTIVE (small group – 9 hours)

Community Pharmacy 1	KS
Community Pharmacy 2	KS
Community Pharmacy 3	KS

Unit PH4010B: HOSPITAL PHARMACY ELECTIVE (small group – 9 hours)

Hospital Pharmacy	ED
Hospital Pharmacy	ED
Hospital Pharmacy	ED

Unit PH4010D: DISSERTATION

Dissertation Seminar: Health Informatics & Evidence-based literature review (3h) MH
Dissertation (5,000 word minimum essay) literature review and critical analysis of topic linked to Elective choice i.e. Community, Hospital or Industrial Pharmacy.
Timetable allocation 54h

ASSESSMENT

This module is evaluated in conjunction with PH4006 and PH4007. For summary of assessment see page 87.
Elective Seminars: 1 compulsory essay question in Practice of Pharmacy Paper 1 (20% of Paper 1) 8% of overall grade
[1]Dissertation 30% of overall grade

PH4007 proportion of final Practice of Pharmacy total 38% of overall grade

SUMMARY OF HOURS

Lectures	Practicals/Tutorials/Seminars	Total contact	Guided study	TOTAL	ECTS
3	9	12+54	45	111	5

The pass mark for examinations and assessments is 40% except where otherwise indicated. Students should note that College penalties for plagiarism apply to both examinations and continuous assessment.

A specific requirement of the course is that continuous assessment exercises must be presented for evaluation by the specified date(s). They must be presented to a designated member of staff and signed in on the form for this purpose. Work submitted late will not be assessed unless a valid reason is provided

[1]Students must satisfy the examiners in the Dissertation component of the module.
Examination marks may be withheld and/or a student may be refused permission to rise with their class until they have satisfied the examiners in the continuous assessment components of the course.

NB. Professional Dress Code
Students are required to dress appropriately and behave in a professional manner for elements of the course entailing attendance at external facilities (professional experience in pharmacies, case review in hospitals, health service facilities, etc.)

MALIGNANT DISEASE, IMMUNOPHARMACOLOGY & PHARMACOLOGY OF THE EYE
Year 4 (Senior Sophister) Course Code: PH4011

Staff of the School of Pharmacy & Pharmaceutical Sciences: Dr C Medina (CM), Dr L O'Driscoll (LOD), Prof. M Radomski, (MR), Dr M Henman (MH), Dr Neil Franckish (NF)

Coordinator: Dr. Carlos Medina

AIMS: The student will acquire knowledge of the health sciences relevant to the use of drugs and medicines in the treatment of malignancy, and immunological disorders. The student will acquire knowledge of the pharmacological factors relevant to the pharmaceutical care of patients with selected conditions.

LEARNING OUTCOMES: On successful completion of this module the student will be able to:

- Demonstrate the ability to recognise cancer symptoms
- Discuss the prevention of most frequent types of cancer in Ireland
- Discuss the principles of the chemotherapy of cancer and the approaches used to maximise efficacy
- Explain how side effects of cytotoxic drugs may be minimised
- Apply principles of palliative care when appropriate
- Explain the abnormal functioning of the immune system
- Describe the actions and uses of immunomodulators
- Describe the basic anatomy and physiology of skin and eyes
- Demonstrate the ability to recognise skin and ocular symptoms
- Differentiate eczema and psoriasis
- Describe the mechanism of action of the different drugs used for the treatment of skin and ocular disorders
- Advise and counsel patients with skin and ocular symptoms and make appropriate responses to presented symptoms

PRE-REQUISITES: SF and JS Pharmacology modules

The module is comprised of two Units:

Unit PH4011A: Treatment of Malignant Disease

LECTURE OUTLINE (14 hours)

1.	Cancer Pathogenesis	LOD
2.	Types of cancer: Solids and non-solids	CM
3.	Main type of solid cancers in Ireland	CM
4.	Gral Principles of action of cytotoxic drugs	CM
5.	Alkylating agents	LOD
6.	Anti-tumour antibiotics	LOD
7.	Antimetabolites	LOD
8.	Plant derivatives I	LOD
9.	Plant derivatives II	LOD
10.	Hormone therapy	CM
11.	Biological response modifiers	CM
12.	Treatment of Side effects of Chemotherapy	CM
13.	Palliative Care	CM
14.	Cancer Research	CM

SEMINARS/TUTORIALS
Mechanisms of action and of resistance in cancer chemotherapy Clinical + CM

Unit PH4011B: Immunopharmacology

LECTURE OUTLINE (16 hours)

1.	Drug hypersensitivity	MR
2.	Treatment of drug hypersesntitvity	MR
3.	Immunosuppression	MR
4.	Immunotolerance	MR

5. Immunostimulation MR
6. Dermatopharmacology I MH
7. Dermatopharmacology II MH
8. Eczema MH
9. Psoriasis MH
10. Ocular Pharmacology I MH
11. Ocular Pharmacology II MH
12. Ocular Pharmacology III MH
13. Drug interactions I NF
14. Drug interactions II NF
15. Drug interactions III NF
16. Course assessment and review CM

SEMINARS/TUTORIALS

Mechanisms and adverse effects of Immunomodulators in transplantation MR + Clinical
Combination drug treatment in eczema and psoriasis MH

ASSESSMENT

Examination Component of Annual Pharmacology Examination in SS

SUMMARY OF HOURS

Lectures	Seminars/ Tutorials	Total contact	Guided study	TOTAL	ECTS
30	6	36	73	109	5

7. PROJECT

4th Year (Senior Sophister)

Unit PH4012 (10 ECTS)

The project will run over a four week period at the start of the Michaelmas Term.

Students will be expected to present the results of their project in written format and as a Powerpoint presentation.

8. PRIZES

Gold Medals :

The Board of Trinity College may award Gold Medals to candidates who show exceptional merit at the degree examination.

Other Prizes :

(i) **Leo Pharma Prize**
This is awarded to the candidate who achieves the highest mark in Pharmaceutics & Pharmaceutical Technology at the degree examination.

(ii) **Pfizer Consumer Healthcare**
(a) SS prize is awarded to the candidate who achieves the highest mark in Pharmacology in the degree examination.
(b) JF prize is awarded for the best overall performance at the Junior Freshman Annual Examination.

(iii) **Paul Higgins Memorial Medal**
This prize is awarded annually by Cahill May Roberts Ltd to the candidate who receives the highest mark in Pharmaceutical Chemistry, B.Sc. (Pharm.) degree examination.

(iv) **Glaxo-Smith-Kline Prize**
This is awarded to the candidate who achieves the highest mark in Pharmacognosy in the degree examination.

(v) **McNeil Ltd. Prize**
For first place in Practice of Pharmacy in the B.Sc.(Pharm.) Senior Sophister Examination.

(vi) **Sam McCauley Prize**
(a) SF Prize is awarded to the candidate who achieves the best overall mark in the Practice of Pharmacy.
(b) JS Prize is awarded to the candidate who achieves the best overall mark in the Practice of Pharmacy.

Before the Exam:

Before filling in a multiple choice sheet, you should read the following:

The sheets are not corrected by hand. They are processed through a machine called an *optical mark reader*. All it recognizes are marks, so there's no point in writing comments; this could invalidate an answer sheet.

As it is a machine that processes the forms, the marks you enter must be good — see a good mark below. If you enter a bad mark, then humans may realize the intended answer but the optical mark reader won't. A good mark is a **dark**, horizontal stroke, filling *most / all* of the box.

GOOD BAD BAD BAD BAD

In light this, the following points are vital:

- **Always use a good sharpened pencil**.
- **Never use a biro.** A blue or black biro will produce marks that will be picked up, but they can't be erased. Red marks will not be picked up at all.
- **Have a good clean eraser.** Mistakes should be rubbed out completely. Don't leave smudges as a smudge may still be determined as a mark.
- **Have an extra pencil and/or a sharpener.** Maybe the examiner could have some extra pencils and a sharpener.
- **Ensure that only machine recognizable marks are entered.**
- **You cannot enter more than one mark for a particular question**. If you do, the optical mark reader will reject it and will enter a blank mark for that question.
- **Always enter your name, subject and student number** (legibly) where asked at the top of the sheet – although the exam sheet calls this 'EXAMINATION NUMBER', what is required is your Student Number. If you are using a T/F (true/false) form, and both sides of the form are being used, your student number must be entered on both sides. As you student number and name are the only means of identification please ensure that your number and name are correct.

Remember: **a bad mark will be rejected;**
an answer sheet without a Student Number will be rejected.

GUIDELINES FOR STUDENTS AT EXAMINATIONS

General	1. The onus lies on each student to establish the dates, times and venues of their own examinations. No timetable or reminder will be sent to individual students by any office[1]. 2. You are expected to familiarise yourself with the location of every examination venue to which you have been assigned. 3. Students must follow the instructions given by the invigilators at all times.
Before entering an examination venue	4. Find your seat number on the seating list displayed outside and read the accompanying notices. 5. Leave your coats and bags at the designated place, or at the back of the venue. 6. You will not be admitted to the examination after the first half-hour, and will not be allowed to leave during the last half-hour. If you arrive after the first half-hour, contact your College Tutor or his/her replacement as a matter of urgency. If your tutor is not available, contact the Senior Tutor's Office.
While in an examination venue	7. Once you have entered a venue, complete **SILENCE** must be maintained at all times. 8. Each student must be in possession of their student ID card for each examination session. You should place your student ID card on the right-hand side of your desk for the duration of each examination. 9. A 'Clean Desk' policy applies for all formal examinations. In addition to pens, pencils, rulers, student ID card, etc. only materials permitted for an examination may be placed on the desk. Invigilators will be instructed to request students to remove any non-permitted items from their desk. Pencil cases and calculator covers are not permitted. 10. Your attention is drawn to the 'CONDUCT OF EXAMINATIONS' which is reproduced overleaf and appears at http://www.tcd.ie/Senior Lecturer/teo/teopdf/notexam.pdf.
During an examination session	11. You should check the title of the paper on your desk to ensure that it is the correct examination paper for your course, and read carefully all the instructions given. 12. You are not allowed start your examination until instructed to do so by the invigilators. Please use any spare time at the start to fill in your answerbook cover(s), remembering to complete the section at the bottom right-hand corner as requested before sealing the flap on every anonymous booklet used. Write legibly in ink – pencils are only allowed for OMR forms 13. You will be advised of the time ten minutes before the end of the examination. 14. If you wish to leave the examination venue at any stage during the examination you **must** be escorted by an Invigilator. If necessary you will be accompanied to a bathroom by an Invigilator. 15. If you wish to leave before the end of the examination you must hand your booklet(s) to an Invigilator. 16. If you are taken ill just before an examination and are unable to sit it, immediately contact your tutor or his/her replacement. If your tutor is unavailable, contact the Senior Tutor's Office. If you feel unwell during your examination, please inform an Invigilator - you will be asked if you wish to go to the Student Health Centre and will be accompanied by an Invigilator. 17. Smoking breaks are not allowed during examination sessions. 18. Dictionaries and Programmable calculators are not permitted at examinations. 19. Mobile phones, or other electronic devices, are not permitted in examination venues - if a phone rings or an alarm on a phone is heard, it will be confiscated. Confiscated materials may be retrieved from the Junior Dean's Office, East Theatre (Monday to Friday, 9.00am - 11.30am) on payment of a €35 fine per item.
On completion of an examination session	20. You will be advised that: • it is your responsibility to hand in everything you wish to have marked by ensuring all materials are fastened securely with a treasury tag; • you should ensure that all of your answerbooks are labelled correctly with your examination number (where appropriate), seat number and all other required information; • you must immediately stop writing and hand up your booklets when instructed to do so by an Invigilator; • you must remain in your seat until all scripts have been collected; • you must not remove from the examination venue answer books, rough work, or other materials supplied.

[1] While every effort will be made to give due notice of major changes, the College reserves the right to amend the examination timetable.

UNIVERSITY OF DUBLIN
Trinity College

Conduct of Examinations

Except as provided for below, candidates for examination are forbidden during an examination to do or to attempt to do, any of the following: to have in their possession or consult or use any books, papers, notes, memoranda, mobile phones or written or electronic material of any nature, or to copy from or exchange information with other persons, or in any way to make use of any information improperly obtained.

Where the examination is of such a nature that materials are provided to the candidates, or where the candidates are allowed by the rules of that examination to have materials in their possession, then candidates may of course make use of such materials, *but only of such materials*, and the general prohibition above continues to apply in respect of any and all other materials.

Where candidates have the prior written permission of the examiner(s), of the Senior Lecturer, or of the Disability Officer, to have materials in their possession during an examination, then candidates may of course make use of such materials, *but only of such materials*, and the general prohibition above continues to apply in respect of any and all other materials.

Where candidates are allowed to bring personal belongings into the examination venues upon condition that such belongings are stored in an area – such as the back of the venue – away from the area in which the candidates are sitting their examinations, then candidates may bring personal belongings into the hall, provided that they are placed in the indicated area a*nd are not returned to by the candidates* until they have finished their examinations and are leaving the hall.

Any breach of this regulation is regarded as a major offence for which a student may be expelled from the University.

Students must not leave the hall before the time specified for the examination has elapsed, except by leave of the invigilator.

Examinations or other exercises which are part of continuous assessment are subject to the same rules as other College examinations. Where submitted work is part of a procedure of assessment, plagiarism is similarly regarded as a major offence and is liable to similar penalties.

Senior Lecturer

NOTICE ON EXAMINATIONS

CANDIDATES FOR EXAMINATIONS ARE FORBIDDEN TO BRING BOOKS OR NOTES WITH THEM INTO AN EXAMINATION HALL, TO COPY FROM OR EXCHANGE INFORMATION WITH OTHER CANDIDATES OR IN ANY WAY MAKE USE OF INFORMATION IMPROPERELY OBTAINED.

SUCH ACTIONS ARE REGARDED AS SERIOUS OFFENCES FOR WHICH STUDENTS MAY BE EXPELLED FROM THE UNIVERSITY.

STUDENTS MUST NOT LEAVE THE HALL BEFORE THE TIME SPECIFIED FOR THE EXAMINATION HAS ELAPSED, EXCEPT BY LEAVE OF THE INVIGILATOR.

EXAMINATIONS OR OTHER EXERCISES WHICH ARE PART OF CONTINUOUS ASSESSMENT ARE SUBJECT TO THE SAME RULES AS OTHER COLLEGE EXAMINATIONS.

WHERE SBUMITTED WORK IS PART OF A PROCEDURE OF ASSESSMENT, PLAGIARISM IS SIMILARLY REGARDED AS A SERIOUS OFFENCE AND IS LIABLE TO SIMILAR PENALTIES.

Senior Lecturer