Level IV Course Units
Offered by
The Department of Chemistry and The Faculty of Medicine
For
Special Degree in Pharmacy
[Bachelor of Science honours in Pharmacy – SLQF6]
Level IV

Course Code and Title:  
CH 4001 – Research Project
Credit Value:  
8C
Rationale:  
This course is designed to provide the opportunity for students to plan and execute a research project independently.
Pre-requisites:  
None
Intended Learning Outcomes:  
Upon completion of this course students should be able to:

• carry out a comprehensive literature search under a given research problem.
• design and implement a suitable experimental / theoretical procedure.
• critically analyze any data generated.
• write a comprehensive account of the literature survey, experimental procedure and analysis of results, and discussion.
• effectively communicate any findings and defend the work in a professional manner.

Method/s of Evaluation:

Course Code and Title:  
CH 4002 – Seminar and Essay
Credit Value:  
3C
Rationale:  
This course is designed to provide the opportunity for students to improve their comprehension and writing skills.
Pre-requisites:  
None
Intended Learning Outcomes:  
Upon completion of this course students should be able to:

• read and understand scientific publications.
• critically and carefully analyze the information.
• extract the core essence of published research.
• present the information in a comprehensive and interesting manner to a large and diverse audience.
• effectively answer questions asked.
• explain / answer questions using the knowledge gathered during the programme.
• be up-to-date on current developments in the field of Chemistry.
• write a comprehensive account, elaborating on a current topic in Chemistry.

Method/s of Evaluation:
Course Code and Title:
CH 4070 – Pharmaceutics II
Credit Value:
3C
Rationale:
Pharmaceutics is important to formulate a drug that can be delivered to a patient safely, effectively and conveniently. This course will provide a thorough knowledge on sterile dosage forms, aerosols and their manufacturing processes. This will equip the students with the skills to work in the biomedical and pharmaceutical industry.
Pre-requisites:
None
Intended Learning Outcomes:
Upon completion of this course students should be able to:
• describe the types and properties of microorganism relevant to sterile product manufacture.
• discuss the key principles of pharmaceutical clean room design, validation and operation.
• explain how parenteral and ophthalmic preparations are designed, developed, formulated, produced and tested, taking into account relevant patient-related and drug-related factors.
• explain how controlled-release drug delivery systems are designed, developed, formulated, produced and tested, taking into account relevant patient-related and drug-related factors.
• discuss how physical chemistry can be exploited to optimize the formulation of aerosols, taking into account both patient-related and drug-related factors.
• describe key aspects of chemical kinetics, with a focus on drug dissolution and degradation, and apply mathematical models to determine the kinetics of a process.
• explain the major processes which can cause drug degradation and how the stability of medicines can be measured and predicted.
• discuss the concepts of biopharmaceutics, pharmacokinetics, pharmacodynamics, and mechanisms of drug transport.
• analyse and solve complex problems, demonstrating the ability to critically evaluate datasets and draw sensible conclusions in the absence of complete data.
• work both independently and in a group, showing initiative, innovative thinking, and taking a leadership role where necessary.
• effectively communicate complex information, both orally and in writing.
Course Content:
Sterile Delivery System; Parenteral Preparations; Design of facilities and environmental control; Personnel; Ophthalmic products; Controlled drug delivery; Designing of Drug Delivery Systems; Aerosols; Chemical Kinetics, Drug Stability and Stability Prediction; Biopharmaceutics; Mechanisms of drug transport; Physical Pharmacy: Solubility of drugs, ionization of drugs in solution, diffusion of drugs, drug stability.
**Method/s of Evaluation:**
End of semester examination

**Recommended Readings:**

**Course Code and Title:**
CH 4071 – Pharmacology II

**Credit Value:**
3C

**Rationale:**
Pharmacology II is the continuation of the course unit CH 3074 Pharmacology I. This unit expands student knowledge on Pharmacology which is an essential component in Pharmacy education enabling students to practice as competent Pharmacist.

**Pre-requisites:**
CH 3074

**Intended Learning Outcomes:**
Upon completion of this course students should be able to:

- explain the clinical pharmacology (mechanism of action, pharmacokinetics, indications, cautions, contra-indications, side effects, dose, dosage forms, other relevant information) of the common drugs acting on different systems of the body including the gastrointestinal tract, respiratory system and nervous system.
- demonstrate that the student is able to acquire information about the doses, dosage forms, administration details, other technical information about drugs.
- demonstrate that the student is able to acquire information about drugs and give appropriate advice to patients and caregivers about their use.
- be aware of the cost of medicines.
- develop a foundation on which the student can build enabling him/her to be a competent professional in the future and be capable of continued education in the field.

**Course Content:**
Oral hypoglycaemic drugs, Drugs used in peptic ulcer disease, Solutions for correcting water, electrolyte and acid – base disturbances (Oral rehydration salt (ORS) and Intravenous fluids), Laxatives and anti-diarrhoeals, Antiemetics, Introduction to neuropsychopharmacology, Drugs used in epilepsy, Drugs used in Parkinson disease, Strong analgesics, Local and general anaesthetics, Drugs in migraine, Drugs used in schizophrenia, Drugs used in depression and mania, Psychostimulants, Anxiolytics, sedatives and hypnotics, Drugs used in the treatment of asthma, Skills session on inhalers, Antihistamines and cough remedies, Paracetamol and non-steroidal anti-inflammatory drugs (NSAIDs) including aspirin, Cytotoxic drugs, Disease modifying anti-rheumatic drugs (DMARDs), Vaccines and sera, Drugs in the treatment of anaemia, Vitamins and minerals, Pharmacology of alcohol (ethyl alcohol and methyl alcohol), Systemic antidotes, chelating agents, drugs used in management of poisoning, Drugs in eye and ear disease, Drugs used in skin disease, Prescribing in children, Prescribing during pregnancy,
Prescribing in renal disease, Prescribing in liver disease, Drug Interactions, Drug registration, schedules and post-marketing surveillance, Concept of essential drugs (essential medicines).

**Method/s of Evaluation:**
End of year examination

**Recommended Readings:**

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**Course Code and Title:**
CH 4073 – Advanced Pharmaceutical Chemistry II

**Credit Value:**
2C

**Rationale:**
Pharmaceutical chemistry will provide the students with a broad knowledge in chemistry, biochemistry, causes behind diseases and the mode of action of drugs. This course covers drugs designed for different biological systems in the body and the synthesis of these drugs. Advanced pharmaceutical chemistry II provides the students with the skills to work as a pharmaceutical chemist giving a wide range of employment opportunities such as the pharmaceutical industry, medical and biomedical areas.

**Pre-requisites:**
None

**Intended Learning Outcomes:**
Upon completion of this course students should be able to:

- recognize representative drugs acting on the cardiovascular system, central nervous system, respiratory tract, antiemetic drugs, antithyroid drugs, and vitamins and their respective mechanisms of action.

- explain structure-activity relationships of some selected drugs.

- explain mechanisms to synthesize drugs.

**Course Content:**
Drugs acting on cardiovascular system: Antiarrhythmics, antianginals, antilipidemics, ACE inhibitors, antihypertensives, anticoagulants; Drugs affecting the Central Nervous System: The structure-activity relationships and molecular conformation of CNS transmitter substances, analgesics, antiepileptics, sedatives, hypnotics, antipsychotics, anti-Parkinson agents, antidepressants, stimulants; Drugs acting on the respiratory tract: Aminophylline, Beclametasone, Epinephrine, Salbutomol; Antiemetic drugs: Dexamethasone, haloperidol, metaclopramide, prochlorperazone; Antithyroid drugs: Iodide, levothyroxine, methimazole; Antihistamines: Cimetidine, promethazine, ranitidine, chlorpheniramine, famotidine; Chemistry of vitamins: Vitamin A1, Vitamin B1, B2, B6, B12, folic acid, vitamin C, vitamin K, vitamin D, vitamin E; Stereoisomerism and pharmacological activity.

**Method/s of Evaluation:**
End of semester examination

**Recommended Readings:**
Course Code and Title:
CH 4074 – Quality Control, Statistics and Computer Applications
Credit Value:
3C
Rationale:
This course focuses on three important areas of the pharmaceutical industry which are quality control, statistics and computer applications. Quality control will provide the students with the knowledge of the various processes involved in marketing a safe drug which is therapeutically active that maintains consistent performance. Statistics is a valuable tool in the pharmaceutical industry. This section will equip the students with the understanding in designing experiments to evaluate drug activity and designing and analyzing clinical trials. The computational aspect will develop the skills to apply computer programs to model, predict and analyze the functions of potential drug structures and their interactions with biologically important targets. This course provides sound background and skills to work in the pharmaceutical industry as well as biomedical areas.
Pre-requisites:
None
Intended Learning Outcomes:
Upon completion of this course students should be able to:
• employ quality control concepts in the pharmaceutical industry.
• illustrate the importance of quality assurance in the pharmaceutical industry.
• analyze the steps involved in the quality assurance process.
• design pharmaceutical related experiments using statistical techniques.
• appraise the statistical methods used in different experiments.
• employ computer aided drug design techniques for drug discovery.
• calculate physico-chemical properties of drug compounds through computational methods.
• illustrate how a pharmacophore is derived and how it is used to design new drugs by computational modelling.
• estimate the efficacy of drug molecules using computational docking tool.
Course Content:
Quality assurance of pharmaceuticals: pharmacopoeial monograph, literature collection, data handling and expression of analytical results; Documentation and record keeping; Official, international and national guidelines of testing parameters of pharmaceuticals; sources of quality variation; Development of quality specifications; Statistical methods in pharmacy and quality assurance; Presentation of sample data; measures of central tendency; Probability distributions; Sampling; Estimation; Confidence intervals for the mean for the difference of two means (independent populations). The pairing of samples, confidence intervals of paired data. Confidence intervals for the difference of two populations (independent populations) with
application; Hypothesis testing; Regression theory; Statistical design of experiments and statistical evaluation of data: Clinical trials, planning (protocol design), microbial testing, statistical design of experiments, statistical evaluation of data. Validation of analytical procedures: Standardization of reagents, characteristics of analytical procedures, use of chemical reference substances. In-process control; Quality Control of finished pharmaceutical products; Computer applications: Spread sheet applications, Molecular modeling in drug discovery, Deriving and using pharmacophores, molecular docking, structure based methods to identify lead compounds, quantitative structure activity relationships.

**Method/s of Evaluation:**
End of semester examination

**Recommended Readings:**

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**Course Code and Title:**
CH 4075 – Pharmaceutical Law and Ethics

**Credit Value:**
2C

**Rationale:**
This course will give a broad knowledge about the pharmaceutical law within the country, regulation of cosmetics, devices and drugs and controlled substances. The role of a pharmacist and the requirements needed to practice as a pharmacist are taught in this course which will be beneficial for the student to practice as a pharmacist. This course will provide a range of employment areas in the pharmaceutical industry.

**Pre-requisites:**
None

**Intended Learning Outcomes:**
Upon completion of this course students should be able to:
- explain the role of the pharmacist.
- explain the significance of pharmacy law.
- identify the acts relevant to pharmacy.
- describe the code of ethics.
- explain the laws involved in prescribing, supplying and administering drugs.
- explain the regulations for cosmetics, devices and drugs.
- explain the steps involved in registering a drug.
- explain laws regarding controlled substances.
- explain the laws involved in prescribing, supplying and administering controlled substances.
- explain how controlled substances are stored in a pharmacy.

**Course Content:**
Convention of psychotropic drugs, Other legislation affecting the practice of pharmacy; Miscellaneous Legislation: e.g. Health and Safety Legislation, Consumer Protection Laws Acts on Trade; An awareness of the regional legislation, their relationship to national legislation. Concept of a Profession and their Regulatory Councils, Professional responsibilities: standards of conduct and practice including the “code of ethic” of the profession; World Health Organization Criteria of Ethical Drug Promotion, Sri Lanka Medical Association (SLMA) Ethical criteria for the Promotion of Medicinal Drugs and Devices in Sri Lanka, International Federation of Pharmaceutical Manufacturers Association (IFPMA) Code, Code of Conduct for Medical Representatives put out by the Sri Lanka Chamber of Pharmaceutical Industry; SLMA Declaration on Health, Alma ATA Declaration (WHO), Health for All Vision of the WHO.

**Method/s of Evaluation:**
End of semester examination

**Recommended Readings:**
(i) Cosmetics, devices and drugs Act and regulation thereof, Poison, Opium and dangerous drugs ordinance, Medical ordinance, Medical ethics and practice-A guide for pharmacist –Royal pharmaceutical society of Great Britain.

**Course Code and Title:**
CH 4076 – Pharmaceutical Management and Administration

**Credit Value:**
3C

**Rationale:**
Pharmaceutical management and administration focuses on the corporate and managerial aspects in the pharmacy profession. This course will equip students with skills required to successfully manage and administrate pharmacy related sectors. This will provide professionalism to the students to work as managers or administrators in the health care system.

**Pre-requisites:**
None

**Intended Learning Outcomes:**
Upon completion of this course students should be able to:
- define the concept of management.
- describe the role of a manager.
- describe the principals involved in successfully managing employees.
- explain inventory control procedures and how to successfully manage them.
- describe strategies to improve patient care.
- explain the drug procurement process.
- describe basic accounting principles.
- describe payment and pricing policies.

**Course Content:**
The administration and organization of drug supply and pharmacy services in State sector and private pharmacies. Principles of storage: Refrigerated Cold chain monitors; Policy and legal framework; Drug management cycle viz., Selection, Procurement, Distribution, Use; Management support systems viz., Organization and Management, Financing and sustainability,
Information Management Human Resources Management; Basic principles of industrial and business management; Basic accounts, financial and cost accountancy as related to pharmaceutical trade, industry and trial pharmacies, import and export procedures; Basic aspects of marketing and advertising with special reference to the pharmaceutical trade; Pharmaceutical Manufacturing and Local Pharmaceutical Industry.

**Method/s of Evaluation:**
End of semester examination

**Recommended Readings:**

**Course Code and Title:**
CH 4077 – Pharmacy Practice

**Credit Value:**
2C

**Rationale:**
This practical course will equip the students with hands on experience in analysis of different dosage forms and formulation of different dosage forms. This course will also provide the students with the knowledge of patient centered care, manage patient health care needs. These skills will be beneficial for the students to work in a range of employment areas and provide opportunities to work in the pharmaceutical industry and the health care system.

**Pre-requisites:**
CH 3075 Practical Pharmacy

**Intended Learning Outcomes:**
Upon completion of this course students should be able to:
- evaluate patient orders of patients.
- dispense drug products according to legal requirements.
- select proper packaging for different drug products.
- evaluate physicochemical properties of raw materials as well as various dosage forms.
- analyze active ingredient content in different dosage forms.
- identify problems, explore potential strategies in designing, implementing and evaluating viable solutions.

**Course Content:**
Pharmaceutics, Pharmaceutical chemistry, Pharmaceutical Analysis and clinical pharmacy.

**Method/s of Evaluation:**
End of semester examination

**Recommended Readings:**
(i) Practical pharmaceutical chemistry part 1 and part 2 (Backett and Stenlake) (ii) Jenkins’ Quantitative pharmaceutical chemistry (Knevil and Digangi) (iii) Pharmaceutical chemistry volume 2 (drug analysis) (Roth, Eager and Troschutz) (iv) The British Pharmacopoeia, The United States Pharmacopoeia (iv) Handouts issued in the laboratory.

**Course Code and Title:**
CH 4078 – Pharmacognosy in pharmacy
Credit Value:
2C

Rationale:
This course focuses on potential drugs or drug substances from natural origin. Pharmacognosy in pharmacy will provide the students the knowledge of chemical, biochemical and biological properties of drugs derived from natural sources. The course will equip the students with the skills to work as a natural product scientist in the pharmaceutical industry.

Pre-requisites:
None

Intended Learning Outcomes:
Upon completion of this course students should be able to:

• discuss the history of drugs discovered from natural sources.
• explain how medicinal compounds are extracted from natural sources.
• explain how natural products are screened to identify potential drug compounds.
• to explain what a lead compound is.
• discuss how a lead compound contributes to the design of new more effective and safe drugs.
• explain the importance of biotechnology in industrial production of natural drugs.

Course Content:
Introduction to and brief history of pharmacognosy; herbal systems of medicine. Pharmaceuticals, cosmeceuticals, and lead compounds of natural origin; crude preparations of natural product extracts as drugs; isolation, characterisation, and screening of natural products. Classification by biosynthetic pathway, chemical structure, and condition treated; major drugs from carbohydrates & glycosides, lipids, terpenoids, steroids, phenylpropanoids, polyketides, alkaloids, peptides, and miscellaneous antibiotics; Pharmaceutical biotechnology; plant breeding and tissue culture, genetic modification of organisms, industrial production of natural products by cell culture. Case studies (Taxol, Penicillin).

Method/s of Evaluation:
End of semester examination

Recommended Readings: