

**Appendix C****University of Toronto, Faculty of Pharmacy  
Pharmacotherapy Course Content – Required<sup>1</sup>****PHM 150H - Introduction to Applied Pharmaceutical Sciences**

This course will provide an overview of key topics in applied pharmaceutical sciences, including drug nomenclature, classification and categorization, structure-function relationships, principles of drug absorption, distribution, metabolism, and excretion, and the drug discovery process. Students will apply this knowledge to discussion of current topics in pharmaceutical sciences, such as substance abuse, hormone replacement therapies, and marketing of medications to the general public.

**Course Goals and Objectives:**

Upon completion of this course, students will be able to:

- Categorize and classify commonly occurring medications in clinical practice
- Describe, in a basic manner, the ways in which medications exert effects in humans
- Describe the drug discovery process
- Comment and offer informed insights into current issues in applied pharmaceutical sciences

**PHM 220H Pharmaceutical Care 1a**

Pharmaceutical Care 1a is the first of four sequential courses dealing with therapeutics. It applies a pharmaceutical care process to the therapeutics of mild and/or self-limiting conditions, and is an exploration of the pharmacist's role in self-medication. Criteria for appropriateness of self-care vs. prescription medications are developed, and fundamental principles of self-care are based on selection and use of non-drug and non-prescription drug alternatives as well as moral, ethical and legal responsibilities. The course is divided into a knowledge component, which is based entirely on self-directed, problem-based learning; and a skills lab component. During the skills lab, individual students chosen at random will apply the content they have prepared to simulated cases by working through a therapeutic thought process, solving and identifying drug related problems and developing a care plan for the patient, as members of a panel discussion. Other course activities include audience response meter questions, peer teaching and role playing. Learning support for the course includes an extensive website, containing archived material, online interactive cases, and conferencing. The minimum pass grade in this course is 60.

**Course Goals and Objectives:**

Upon successful completion of this course, each student will:

1. Be able to identify, prevent and solve drug-related problems related to self-care and nonprescription drugs.
2. Be able to utilize and adapt the pharmaceutical care process as a systematic approach to self care counseling.

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<sup>1</sup> Students are expected to take several elective courses in addition to the required courses to obtain their degree. Because not all students will take the same elective courses, these electives are not included in the "pharmacotherapy course content" list. For more information, visit: <http://pharmacy.utoronto.ca/undergrad/curric/detail.jsp>

3. Using problem-based learning techniques as applied to simulated case studies involving role-playing, be able to:

- establish a relationship with the patient
- collect pertinent data regarding the patient, his family history, his condition and prior treatments
- synthesize and assess the data
- identify drug related problems
- decide to:
  - refer patient to medical professional
  - re-assure patient that further treatment is unnecessary and/or that appropriate steps are being taken
- establish a pharmacy care plan in consultation with the patient in which they:
  - determine desired clinical and pharmacotherapeutic outcomes
  - establish measurable endpoints
  - consider all non-pharmacological and pharmacological alternatives individualize therapy
- counsel the consumer on the use of the product
- develop a monitoring plan resolve or prevent further drug related problems
- follow-up the patient's progress appropriately document the care plan

4. Be able to apply special techniques and appropriate communication skills with patients who may have special needs:

- geriatric, pediatric
- hard of hearing, blind
- illiterate
- embarrassed, shy, talkative, angry
- different language
- culturally diverse

5. Be aware of moral, ethical and legal responsibilities of the practicing pharmacist in the area of self-medication in addition to social issues associated with self-medication. This includes developing a sensitivity to and appreciation of diverse cultural attitudes and behaviours.

6. Be knowledgeable of basic pharmacology and therapeutics, using problem-based learning techniques as applied to simulated case studies. Be able to apply this knowledge to nonprescription products, understanding:

- common-products - similarities and differences
- active ingredients
- non-medicinal ingredients

7. Be aware of self-medication hazards:

- incompatibilities/interactions
- contra-indications
- adverse reactions
- intentional and unintentional inappropriate/dangerous use
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8. Be aware of and able to assess issues in self-medication related to:

- advertising
- consumer perceptions

- packaging
- in-store promotions
- coupons
- availability of self-medication products
- the role of the pharmacist/the role of organizations
- the role of the manufacturer

### **PHM231 - Pharmacology I**

#### Course Description:

Drugs are discussed with respect to their actions at the molecular, cellular and whole body level. Particular emphasis is paid to mechanism of action and pharmacological properties of drugs acting on the endocrine system, anti-neoplastic and anti-microbial agents.

### **PHM 320H - Pharmaceutical Care 1b**

Pharmaceutical Care 1b is the second of four sequential courses dealing with therapeutics. It continues to explore the pharmacist's role in self-medication for mild and/or self-limiting conditions. Criteria for appropriateness of self-care vs prescription medications are developed, and fundamental principles of self-care are based on selection and use of non-drug and non-prescription drug alternatives as well as moral, ethical and legal responsibilities. The course is divided into a knowledge component, which is based entirely on self-directed, problem-based learning; and a skills lab component. During the skills lab, individual students chosen at random will apply the content they have prepared to simulated cases by working through a therapeutic thought process, solving and identifying drug-related problems and developing a care plan for the patient, as members of a panel discussion. Other course activities include audience response meter questions, peer teaching and role-playing. Learning support for the course includes an extensive website, containing archived material, online interactive cases, and conferencing. The minimum pass grade in this course is 60.

#### Course Goals and Objectives:

Upon successful completion of this course, each student will:

1. Be able to identify, prevent and solve drug-related problems related to self-care and non-prescription drugs.
2. Be able to utilize and adapt the pharmaceutical care process as a systematic approach to self-care counseling.
3. Using problem-based learning techniques as applied to simulated case studies involving role-playing, be able to
  - establish a relationship with the patient
  - collect pertinent data regarding the patient, his family history, his condition and prior treatments
  - synthesize and assess the data
  - identify drug related problems
  - decide to:

- refer patient to medical professional
- re-assure patient that further treatment is unnecessary and/or that appropriate steps are being taken
- establish a pharmacy care plan in consultation with the patient in which they:
- determine desired clinical and pharmacotherapeutic outcomes
- establish measurable endpoints
- consider all non-pharmacological and pharmacological alternatives individualize therapy
- counsel the consumer on the use of the product
- develop a monitoring plan resolve or prevent further drug related problems
- follow-up the patient's progress appropriately document the care plan

4. Be able to apply special techniques and appropriate communication skills with patients who may have special needs:

- geriatric, pediatric
- hard of hearing, blind
- illiterate
- embarrassed, shy, talkative, angry
- different language
- culturally diverse

5. Be aware of moral, ethical and legal responsibilities of the practicing pharmacist in the area of self-medication in addition to social issues associated with self-medication. This includes developing a sensitivity to and appreciation of diverse cultural attitudes and behaviours.

6. Be knowledgeable of basic pharmacology and therapeutics, using problem-based learning techniques as applied to simulated case studies. Be able to apply this knowledge to non-prescription products, understanding:

- common-products - similarities and differences
- active ingredients
- non-medicinal ingredients

7. Be aware of self-medication hazards:

- incompatibilities/interactions
- contra-indications
- adverse reactions
- intentional and unintentional inappropriate/dangerous use

8. Be aware of and able to assess issues in self-medication related to:

- advertising
- consumer perceptions
- packaging
- in-store promotions
- coupons
- availability of self-medication products
- the role of the pharmacist/the role of organizations

- the role of the manufacturer

### **PHARMACY 321 – Pharmaceutical Care II (Therapeutics I)**

The primary goal of Pharmacy 321, Therapeutics I, is to provide students with an opportunity to acquire knowledge and further develop their skills in identifying, solving and preventing drug therapy problems in patients who have common diseases that are not self-limiting. Individual simulated paper patient cases will be utilized as a learning tool for identification and resolution of drug therapy problems. This will require students to integrate knowledge learned in previous and concurrent courses such as microbiology, clinical biochemistry and pathophysiology, pharmaceuticals, pharmacology, and pharmacokinetics, as well as, learn new information about pharmacotherapeutics. In order for students to problem-solve, or more specifically, identify, solve and prevent drug therapy problems, it is necessary to develop a decision-making framework or process which ensures that students are complete in their assessment of the patient. Pharmacy 321 provides students with the opportunity to utilize a structured decision-making process. Once students have identified the patient's drug therapy problems, they will then develop a pharmacy care plan for the patient. This will include identification of goals of therapy, development of a pharmacotherapy plan, monitor for effectiveness and safety, and a follow-up evaluation with the patient. A practicing pharmacist works as part of a team and is responsible for communication of information to the patient, medical and non-medical personnel, both verbally and in writing. Therefore, Pharmacy 321 will include assessment of written and verbal communication, and group participation skills.

#### Course Goals and Objectives

After completion of this course students will be able to:

- read, interpret and evaluate general therapeutics literature
- integrate and apply general therapeutics information to simulated patient cases
- identify drug therapy problems for a paper patient using a specific decision-making process
- design a pharmacy care plan for individual patients, including goals of therapy, pharmacotherapy plan and a monitoring plan, in order to solve and prevent drug therapy problems
- document a drug therapy problem and pharmacotherapy plan on patient charts and profiles
- communicate, both verbally and in writing, the rationale for the identification and resolution of the drug therapy problem and the pharmacy care plan
- understand the concept of evidence-based medicine and use such in justifying therapeutic intervention
- develop self-learning skills that will promote life-long learning
- work effectively in a self-directed group

### **PHM323H – Applications of Pharmaceutical Analysis**

This course is designed to provide an appreciation of the applications of pharmaceutical analysis in the practice of pharmacy and medicine. The applications discussed in detail include analyses in pharmacy practice, therapeutic drug

monitoring, clinical toxicology, biotechnology, nuclear medicine and drug overdose/abuse. The development of analyses for innovative drugs of the future is also introduced.

Course Goals and Objectives:

1. To introduce students to the methods of analysis for biotechnology-based drugs to assure their quality and safety for administration to humans.
2. To provide a detailed appreciation of how analytical techniques are utilized to monitor the concentrations of drugs in plasma/blood for which there is a narrow therapeutic/toxic range necessitating pharmacist intervention to adjust the patient dose.
3. To introduce analytical procedures employed to evaluate clinical biochemistry, hematology, pathology or microbiology parameters in patients to assure optimal pharmaceutical care.
4. To describe methods and applications for analysis of drugs in biological samples important for pharmacists to appreciate the concentrations of drugs/substances seen in overdoses as well as substance abuse/toxicity.

Rationale for Inclusion in the Curriculum: Biotechnology-based drugs are becoming more prevalent in therapeutics. Also, radiopharmaceuticals represent a class of diagnostic drugs. Pharmacists need to understand the methods used to assure the quality and safety of these agents for human administration. In addition, pharmacists need to know the types of analyses that are performed to monitor the concentrations of therapeutic drugs in plasma/blood as well as associated clinical biochemistry, hematological, microbiological and pathological tests used to provide optimal pharmaceutical care. Pharmacists need an understanding of the types of analyses that may be used to investigate drug overdose or substance abuse. In addition to the lectures in this course, to enhance the learning experience, students will participate in a laboratory to evaluate the purity of a biotechnology-based drug as well as attend a symposium on clinical biochemistry, microbiology, pathology and hematology to learn first-hand about the laboratory methods, equipment and procedures employed. They will also attend a tutorial in which selected applications of pharmaceutical analysis will be discussed in more detail.

**PHM 324Y - Pharmacokinetics**

This course examines how the fate of drugs in the body is influenced by physiologic and biochemical processes. Discussions feature a mathematical description of the events that transpire following drug administration. The fundamental principles and quantitative relationships will be used to evaluate biological data, determine approaches in designing dosage regimens, and evaluate pharmacologic response. The resulting theory will form the basis for selecting a particular route of drug administration, evaluating different manufactured products of a drug, and identifying patient factors which require a modification of normal drug dosing regimen.

Course Goals and Objectives:

The primary aims of this course are to equip the student with fundamental pharmacokinetic principles and to illustrate their application in drug administration.

The goal is to have students be able to understand and interpret the pharmacokinetic/dosing information found in readily available drug information sources like the Compendium of Pharmaceuticals and Specialties (CPS). As a result the student will be able to:

1. Identify the salient pharmacokinetic differences between parenteral and non-parenteral routes of administration.
2. Identify those physiologic and product formulation factors which define the bioavailability of drugs administered by non-intravenous routes.
3. Indicate how infusions or multiple single doses can achieve target concentrations in biological fluids.
4. Recognize the relationship between pharmacokinetics and pharmacodynamics.
5. Understand the technique of dosage design when nonlinear pharmacokinetics is present.
6. Understand how various patient factors may change the normal drug pharmacokinetics and thereby the drug dosages.

Rationale for Inclusion in the Curriculum: Pharmacokinetics is an integral part of the fundamental understanding regarding drugs and also is a vital factor in individualizing drug treatment. Together with information regarding response and toxicity, pharmacokinetics assists in product design and the identification of dosing regimen to be recommended for the average patient. When physiologic differences between patients lead to noteworthy changes in a drug's normal pharmacokinetics, it is possible to furnish a rational quantitative adjustment in order to achieve the desired response.

#### **PHM 325H1 – Toxicology**

Course syllabus not available

#### **PHM 330Y - Pathophysiology and Clinical Biochemistry**

This course is designed to introduce pharmacy students to the basic mechanisms of pathophysiology, laboratory investigation and follow-up associated with diseases.

##### Course Goal:

This course will provide students with a general knowledge of pathophysiology and clinical laboratory investigation of diseases.

##### Course Objective:

The student will acquire a working knowledge of the basic mechanisms of disease in general, an understanding of the pathophysiology and biochemical changes of specific diseases and an understanding of the laboratory investigation occurring in these diseases.

#### **PHM331 - Pharmacology II**

Drugs are discussed with respect to their actions at the molecular, cellular and whole body level. Particular emphasis is paid to mechanism of action and pharmacological properties of drugs acting on the autonomic and central nervous systems and cardiovascular system.

**Course Goals:**

By the end of the course students should be able to:

1. Be familiar with all major classes of drugs and be knowledgeable of important representative drugs from each class.
2. Be knowledgeable about the pharmacokinetic and pharmacodynamic profiles of important drugs and how they determine the indications for drugs.
3. Understand how the pathophysiology of a given condition is treated by pharmaceutical agents at the molecular, cellular and organ levels.

**PHM 421 – Pharmaceutical Care III (Therapeutics II)**

**Goals and Objectives:**

Pharmaceutical Care III is a continuation of the therapeutics course taught in year 3 of the program (PHM 321 - Pharmaceutical Care II). This course will enable students to acquire additional therapeutic knowledge and further develop their skills in identifying, solving and preventing drug therapy problems (DTP). The course will be taught in a modified problem-based format, utilizing the principles of Pharmaceutical Care<sup>1</sup> and self-directed learning. Students will be required to integrate knowledge learned in previous and concurrent courses including, microbiology, clinical biochemistry and pathophysiology, pharmaceuticals, pharmacology, pharmacokinetics and self-medication, and incorporate new pharmacotherapeutic information, in order to identify and resolve drug therapy problems in simulated patients. A systematic decision-making framework or process introduced in previous courses and emphasized in this course, will form the basis of patient case work-ups for each topic. This process will enable students to identify and state the patient's drug therapy problem. Students will be expected to develop a Care Plan to address the identified problems for the patient. The Care Plan will include specific pharmacist recommendations. Documentation of the care provided will be introduced in this course. To prepare graduates to work in team-based practices, this course will require students to work in small groups. Students will be asked to complete both self- and peer-assessments of written and verbal communication, and group participation skills. Class discussions will enable students to verbally debate the pros and cons of selected therapy in specific therapeutic areas.

**Objectives:**

After completion of this course students will be able to:

- read, interpret and evaluate general therapeutics literature
- be able to integrate and apply general therapeutics information to patient cases
- identify drug therapy problems for patients with common diseases that are not self-limiting using a systematic decision-making framework or process
- design a pharmacy care plan, including specific end-points and monitoring parameters

- document care provided to a simulated patient (paper case), as it relates to a specific drug therapy problem
- communicate, both verbally and in writing, the rationale for the identification and resolution of drug therapy problems and the related pharmacy care plan
- develop self-learning skills that will promote life-long learning
- work effectively within a self-directed group

### **PHM 432, 433, 434, 435, 436, 437, 438, 439, 440 – Structured Practical Experience Program (SPEP)**

The 'Structured Practical Experience Program – 8 Week Rotation' is designed to provide students with a variety of opportunities to apply the knowledge, skills and professional values/behaviors gained through Faculty-based learning. These opportunities will occur in Faculty - approved, pharmacy practice sites that have a focus on provision of excellent direct patient care. Sites may be community, ambulatory or institutional. Students are assigned to pharmacists, designated as 'Teaching Associates', at these sites; students undertake a number of formalized activities, each designed to lead to the attainment of specific learning objectives. Pharmacists are selected to become Teaching Associates (TAs) based on their interest in, and commitment to, teaching students, and on their involvement in patient-focused care. Their practice site must create a suitable learning environment for the student. These TAs complete a Teaching Associate educational program designed to provide and enhance their ability to serve as role models, facilitators, and assessors of student learning during the rotation. Student rotations are available throughout the province. Site and Teaching Associate 'profiles' are located on the SPEP website and are securely accessible to pharmacy students. Computerized student/site matching procedures enable students to indicate their preferred location(s) and specific practice interests.

#### Course Goals and Objectives:

The primary goal of the SPEP- 8 Week Rotations is to ensure that students are able to effectively demonstrate and use, in real practice situations, the knowledge, skills, and professional values/behaviours acquired through Faculty-based learning. The rotations provide opportunities for students to further develop the skills necessary to deliver safe, efficacious, and economical pharmaceutical care by identifying, preventing, and solving drug-related problems. Students will be required to integrate and apply knowledge of pharmacotherapeutics, pathophysiology, and other pharmaceutical sciences to the drug-related aspects of patient care, and to communicate that knowledge to patients, care-givers, and other health care professionals. Students will develop professional judgment and practise its application in the ethical, moral, and social controversies and dilemmas arising in the care of patients. Students will gain an understanding of, and, to the extent possible and reasonable, assume responsibility for, outcomes of decisions associated with the provision of pharmaceutical care.

Successful attainment of the following learning objectives is required to meet the overall goal(s) of this course. In addition, students are expected to comply with the "Standards of Professional Practice Behaviour for Pharmacy Undergraduate Students." (Approved by Governing Council, August 22, 1996) Attainment of learning objectives and compliance with these standards will be assessed by

Teaching Associates. Upon completion of the SPEP 8 Week Rotation students will be able to:

1. effectively meet patients' drug-related needs; in doing so, the student will:
  - 1.1 develop and maintain a trusting relationship with the patient that enables determination of the patient's needs and desired outcomes regarding drug therapy
  - 1.2 develop an effective, professional relationship with other health care providers involved in the patient's care for the purpose of caring for the patient
  - 1.3 collect relevant patient, drug, and disease information
  - 1.4 apply a systematic process to identify the patient's actual and potential drug-related problems, making full use of available resources
  - 1.5 identify the drug-related problems for which he/she will assume responsibility
  - 1.6 identify, with the patient, their desired outcomes of therapy
  - 1.7 develop therapeutic and monitoring plans to resolve/prevent patient's drug-related problems
  - 1.8 implement the therapeutic and monitoring plans (this includes counseling and educating the patient regarding disease and drug issues ... as required) for the purpose of resolving/preventing the patient's drug-related problems
  - 1.9 follow up with the patient and assess new information as it becomes available for the purpose of identifying and/or preventing new drug-related problems
  - 1.10 document the care provided to patients
2. respond to questions related to drugs, diseases, and related issues, that arise in the provision of care to patients, from patients, and from health care providers.
3. identify, evaluate, and document ethical, moral, and social controversies and dilemmas that arise in practice
4. prepare and deliver presentations related to practice issues and to patient care to health care practitioners, patients, care providers and other appropriate audiences
5. develop and use a learning portfolio as a mechanism for lifelong, self-directed learning
6. effectively communicate and appropriately interact with practice site personnel
7. effectively interact with the inter-professional patient care team and explain the contributions of each member toward enhancement of patient care requirements.
8. achieve site specific, pre-negotiated, student and/or TA-selected, individual learning objectives
9. OPTIONAL: effectively assess and address an issue relating to the development and/or implementation of the pharmaceutical care model in practice
10. OPTIONAL: prepare and lead a 'journal club' to pharmacists and/or other members of the health care team

**University of Waterloo School of Pharmacy  
Pharmacotherapy Course Content – Required<sup>2</sup>**

**PHARM 110 LAB, LEC - Systems Approach to the Study of the Human Body 1**

This integrated anatomy, physiology and histology course and its continuation in PHARM 111 cover all the major human body systems using a systems approach. Major themes are the relationships between structure and function, and homeostasis of the cellular environment.

**PHARM 111 LAB, LEC - Systems Approach to the Study of the Human Body 2**

This integrated anatomy, physiology and histology course and its prerequisite PHARM 110 cover all the major human body systems using a systems approach. Major themes are the relationships between structure and function, and homeostasis of the cellular environment.

**PHARM 124 LAB, LEC, TUT - Pharmaceutics I**

Attaining the correct concentration of a drug at its site of action for a therapeutically useful period is the result of the selection, formulation and administration of an appropriate dosage form. This course, and PHARM 125, consider the scientific and technical aspects important in dosage form design. The lectures and practical laboratory experiences emphasize the role of biopharmaceutics, preformulation and physical pharmacy in the development of safe and effective dosage forms.

**PHARM 125 LAB, LEC, TUT - Pharmaceutics II**

This course is a continuation of PHARM 124.

**PHARM 129 LEC, TUT - Professional Practice 1**

An introduction to pharmacy practice, encompassing medication dispensing (including the language and terminology of medicine), jurisprudence, drug information, patient care, patient safety and human resources. Patient self care therapeutics will involve the preparation of a nonprescription medication treatment algorithm and assessment of appropriateness of self-care, product selection, and patient education and counselling. Traditional didactic instruction will be used, as well as self-directed learning and case-based group learning. [Offered: W]

**PHARM 130 LEC, TUT - Professional Practice 2**

Professional Practice 2 continues to develop knowledge and skills introduced in Professional Practice 1, focusing on pharmaceutical care, collaboration with other health care providers, patient safety and human resources. Students will be

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<sup>2</sup> Students are expected to take several elective courses in addition to the required courses to obtain their degree. Because not all students will take the same elective courses, these electives are not included in the “pharmacotherapy course content” list. For more information on the full curriculum, please visit:

<http://www.ucalendar.uwaterloo.ca/0809/COURSE/course-PHARM.html#PHARM100S>

introduced to business principles and business plan development, as well as the design of tools to use in a collaborative practice.

**PHARM 131 LAB, TUT - Professional Practice Laboratory 1**

The knowledge acquired from PHARM 129 will be applied to simulated pharmacy situations and patient case scenarios. This will provide the opportunity for students to demonstrate their technical skills and clinical knowledge in a practical context.

**PHARM 141 LEC, TUT - Pharmacology / Medicinal Chemistry I**

This first course in systems pharmacology will discuss drugs with respect to their actions, uses and adverse effects. Particular emphasis will be placed on the underlying mechanisms that define drug action. The molecular structural features applicable to this action will be presented and the rationale described for the benefits associated with a particular molecule or class of molecules. The course will be tailored to biological systems and the treatment strategy for each system. This course will be directed primarily to general principles.

**PHARM 150 LEC - Introduction to Applied Pharmaceutical Sciences**

An introduction will be provided to major themes in applied pharmaceutical sciences with an emphasis on practical application in patient care settings. An overview of key topics in applied pharmaceutical sciences will be provided, including drug nomenclature, classification and categorization, rudimentary elements of structure-function relationships, principles of drug absorption, distribution, metabolism and excretion, and the drug discovery process, with application to current issues in practice such as substance abuse and use of medicines in society.

**PHARM 220 LAB, LEC, TUT - Integrated Patient Focused Care 1**

This is the first of nine sequential courses that are designed to enable students to understand, integrate, and apply concepts from Pharmacology, Medicinal Chemistry, Toxicology, Clinical Pharmacokinetics, Clinical Biochemistry and Pathophysiology, Histology and Applied Microbiology to patient scenarios. Students will not only learn core principles from each of these disciplines, but they will also develop skills in critical appraisal, patient assessment, and clinical problem solving. Ultimately, students will be able to make confident decisions regarding a patient's care plan. The first course will cover core foundational knowledge from each of the disciplines.

**PHARM 221 LAB, LEC, TUT - Integrated Patient Focused Care 2**

This is the second of nine sequential courses. Topics discussed through patient scenarios and assignments will focus on two to three body systems.

**PHARM 224 LEC, TUT - Pharmacokinetics I**

This course and PHARM 225 examine how the fate of drugs in the body is influenced by physiologic and bio-chemical processes. Discussions feature a mathematical description of the events which transpire following drug administration. The fundamental principles and quantitative relationships will be used to evaluate biological data, determine approaches in designing dosage regimens, and evaluate

pharmacologic response. The resulting theory will form the basis for selecting a particular route of drug administration, evaluating different manufactured products of a drug, and identifying patient factors which require a modification of normal drug dosing regimen.

**PHARM 225 LEC, TUT - Pharmacokinetics II**

This course is a continuation of PHARM 224.

**PHARM 228 LEC - Professional Practice III**

Several topics are covered related to patient medication therapy including drug interactions, adverse drug reactions and substance abuse. Critical appraisal of the medical literature is introduced. Students must demonstrate an ability to apply their knowledge in these areas to patient specific situations. This course further develops jurisprudence issues as they pertain to practicing pharmacists.

**PHARM 230 LEC - Clinical Biochemistry / Pathophysiology / Pathology I**

This course and PHARM 231 are designed to introduce pharmacy students to the basic mechanisms of pathophysiology, laboratory investigation and follow-up associated with diseases.

**PHARM 231 LEC - Clinical Biochemistry / Pathophysiology / Pathology II**

This course is a continuation of PHARM 230.

**PHARM 237 LAB, LEC, TUT - Applications of Analyses and Devices in Pharmacy and Medicine**

This course provides an overview of the methods and especially an appreciation of the applications of pharmaceutical analysis in the practice of pharmacy and medicine. Methods of pharmaceutical analysis covered include UV-visible, IR and NMR spectrophotometry, fluorescence, radiometric assays, thin layer and gas chromatography, HPLC, gel electrophoresis/Western blot, microbiological testing, ELISA, amino acid analyses and pharmacopoeial assays and tests. The applications discussed in detail include pharmaceutical analyses in drug development, pharmacy practice, therapeutic drug monitoring, clinical toxicology, biotechnology and drug overdose/abuse. The development of pharmaceutical analyses for innovative drugs of the future is also introduced.

**PHARM 241 LEC, TUT - Pharmacology / Medicinal Chemistry II**

This course is a continuation of PHARM 141 and is focused primarily on drugs directed at the cardiovascular, respiratory, renal, endocrine and immune systems.

**PHARM 242 LEC, TUT - Pharmacology / Medicinal Chemistry III**

This course is a continuation of PHARM 241 and is focused primarily on drugs directed at the central nervous system, endogenous compounds, anti-infectives, and anticancer agents.

**PHARM 320 LEC, TUT - Integrated Patient Focused Care III**

This is the third of five sequential courses dealing with therapeutics. Through discussion of a series of case studies in this course, students will acquire and/or reinforce their skill at determining whether a patient's signs or symptoms are related to drug therapy and, if so, how they are related to drug therapy and what alterations are required in the patient's drug therapy to solve or prevent this problem. The case studies utilized in therapeutics will reinforce relevant pathophysiological and pharmacological concepts required to make these decisions. The specific disease states discussed will be common diseases that are not self-limiting in the areas such as infectious diseases, respirology, rheumatology and endocrine diseases. The minimum pass grade in this course is 60.

**PHARM 321 LEC, TUT - Integrated Patient Focused Care IV**

This is the fourth of five sequential courses dealing with therapeutics and includes topics such as cardiology, psychiatry, neurology and renal disease. Through discussion of a series of case studies and use of some real patients, students will acquire and reinforce their skill at determining whether a patient's signs or symptoms are related to drug therapy and, if so, how they are related to drug therapy and what alterations are required in the patient's drug therapy to solve or prevent this problem. The case studies utilized will reinforce relevant pathophysiological and pharmacological concepts required to make these decisions. The specific disease states discussed will be common diseases that are not self-limiting. The minimum pass grade in this course is 60.

**PHARM 322 LEC, TUT - Clinical Application of Pharmaceutical Sciences**

This course presents leading-edge discoveries in the pharmaceutical sciences. Students will be required to define the clinical application of such discoveries by integrating information from multiple disciplines in order to develop strategies to solve fundamental health-care problems.

**PHARM 325 LEC, TUT - Pharmacology / Toxicology**

This course focuses on drug-induced diseases. The systems course provides students with a conceptual framework for understanding the broad spectrum of toxicological problems encountered in clinical practice, in drug development and regulation, and in medical research. Central biochemical mechanisms and the relevance of clinical factors to toxicological expression will be integrated and applied to illustrative models of drug-related diseases in humans.

**PHARM 329 LAB - Professional Practice III Laboratory**

This course applies knowledge of jurisprudence, therapeutics, drug information and pharmaceutical calculations in a variety of situations. Simulated pharmacies provide an environment for students to consolidate their technical skills, while introducing the application of clinical knowledge in a practical context. Small group sessions are employed to develop patient interviewing skills. Emphasis is placed on communication skills and the practical application of clinical knowledge with patient case scenarios while using the pharmaceutical care model to resolve actual or potential drug related problems.

**PHARM 340 LEC, TUT - Alternative Medicines and Care**

This course presents a spectrum of strategies offered in the broad arena of alternative medicines and care. Particular attention will be paid to claims of benefit associated with alternative medicines and the complexities that self-medication by such agents present in customary pharmacotherapy. Students will be required to solve complex cases.

**PHARM 365 LEC, TUT - Individualizing Treatment**

This course will address demographic patient-dependent variables, from pediatrics to geriatrics that influence pharmacotherapy. Strategies to provide individualized treatment will be examined including the value of nomograms and other simplified rules of treatment, individualized formulations needed for special cases, pharmacokinetic strategies in complex therapies, and assessing compliance. Cases will be presented as a learning tool.

**PHARM 411 LEC, TUT - Integrating Patient Care**

A case-based approach will challenge the student to deal with an array of cases encountered in clinical practice. Emphasis will be placed on pharmacotherapeutic interventions in the context of inter-disciplinary practice as found in institutional and family health practices. The cases will include OSCE experiences.

**PHARM 415 LAB, TUT - Clinical Rotation: Integrated Care**

The clinical rotations in this final experiential module will emphasize problem-solving in the everyday milieu of patient care within a setting of integrated inter-disciplinary patient care. The expectation is that the student will be implementing, testing and refining personal clinical skills.

**PHARM 421 LEC, TUT – Integrated Patient Focused Care V**

This is the fifth of five sequential courses dealing with therapeutics and will feature specialized areas of care. Through discussion of a series of case studies and use of some real patients, students will acquire and reinforce their skill at determining whether a patient's signs or symptoms are related to drug therapy and, if so, how they are related to drug therapy and what alterations are required in the patient's drug therapy to solve or prevent this problem. The case studies utilized will reinforce relevant pathophysiological and pharmacological concepts required to make these decisions. The specific disease states discussed will be common diseases that are not self-limiting. The minimum pass grade in this course is 60.

