New Course Outline

Course Number: PHM141H1

Course Title: Pharmaceutics

Outline Version Code:

Course Description:

Achieving effective treatment of a disease while minimizing adverse effects of a drug requires rational selection, formulation and administration of an appropriate dosage form. This course teaches the scientific background and technical aspects important in dosage form design, basic dosage forms and their therapeutic applications. This course will focus on the biopharmaceutical considerations and physicochemical foundation of various dosage forms. Discussion will include preformulation factors (melting point, solubility, viscosity, dissolution, particle and solid state properties), rheology, pharmaceutical solutions, colloids and dispersions, complexation, chelation, and protein binding.

Semester: ☒ Winter

Course Type: ☒ Mandatory

1. Course Learning Objectives:
Upon completion of this course, students will have achieved the following level of learning objectives:
Introductory = knowledge and comprehension of concepts, definitions
Intermediate = application of concepts to simple situations
Advanced = application of concepts to more complex situations with ability to synthesize and evaluate
Knowledge
Introductory Level:

1) Define pharmaceutics and pharmaceutical dosage forms (i.e., medications used by patients).
2) List different routes for administration of medications.
3) Discuss types of dosage forms and administration routes in relation with therapeutic outcomes.
4) Explain physicochemical principles relevant to pharmaceutical dosage forms.
5) Describe biopharmaceutic considerations in the pharmaceutical dosage form design and discuss how this consideration is applied to the selection of different dosage forms, design and composition of pharmaceuticals.

Intermediate Level:

1) Apply physicochemical and biopharmaceutic concepts to interpret dosage form design.
2) Choose appropriate formulations to achieve target properties of given medications.
3) Select proper methods for preparation of pharmaceuticals.

Advanced Level:

1) Recommend most appropriate medication formulations for patients to achieve best therapeutic effects while minimizing the adverse effects.

Skills
Introductory Level:

1) Learning skills - able to read and understand instructors' lecture notes and pharmaceutics and biopharmaceutics text books; 2) quantitative skills - able to calculate and find correct answers to given simple problems using calculators; 3) communication skills - able to understand questions and describe the ideas and solutions to questions in problem sets, quizzes and examinations effectively and accurately.

Intermediate Level:

1) Analytical skills - able to analyze and comprehend information in the literature; 2) quantitative skills - able to calculate and find correct answers to more complex problems using computer software; 3) communication
skills - able to find relevant literature information from various sources outside classroom and extract useful information to fulfill tasks of course assignments.

Advanced Level:

1) Critical reasoning skills - able to analyze cases and literature critically, identify the errors, pros and cons, and to propose new ideas; 2) quantitative skills - able to describe complex problems with quantitative approach by applying appropriate mathematical equations, identify suitable variable values, and to obtain correct numerical solutions; 3) communication skills - able to present the results in a professional way (e.g. the graphs with the quality equivalent to that in published papers).

**Attitudes/Values:**

Introductory Level:

Intermediate Level:

Advanced Level:

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2. Rationale for Inclusion in the Curriculum:

Pharmaceutics is an essential component of pharmacy education. It forms a foundation of therapeutics because no drug can be administered to patients without an appropriate dosage form and different dosage forms can result in different therapeutic outcomes and pharmacokinetics. This course will equip pharmacy students with fundamental knowledge of pharmaceutical dosage forms that will be useful in the co-requisite courses, pharmacotherapeutics and pharmacokinetics.

3. Pre-requisites:
4. Co-requisites:

Pharmacokinetics; Pharmacotherapeutics (PCT 1: MTM 1)

5. Course Contact Hours and Teaching Methodologies:

<table>
<thead>
<tr>
<th>Didactic (lecture)</th>
<th>Hours: 39</th>
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</thead>
<tbody>
<tr>
<td>Large group problem-based/ case-based learning  (group size: 240)</td>
<td>Hours:</td>
</tr>
<tr>
<td>Laboratory or Simulation</td>
<td>Hours:</td>
</tr>
<tr>
<td>Tutorial/Seminar/Workshop/Small Group  (group size: 120-240)</td>
<td>Hours: 6</td>
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<tr>
<td>Experiential</td>
<td>Hours:</td>
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<tr>
<td>On-line - answering emailed questions to instructors &amp; TAs</td>
<td>Hours:</td>
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<tr>
<td>Other (please specify): individual Q &amp; A at office hours &amp; meeting with instructors</td>
<td>Hours:</td>
</tr>
<tr>
<td><strong>Total Course Contact Hours</strong></td>
<td>Hours: 39</td>
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</table>

6. Estimate and description of student’s weekly out-of-class preparation time excluding exam preparation:

In general students will need 2-3 hour out-of-class preparation time per week. In addition, the students will need 10-15 hours for preparation of mid-term and final exams.

7. Topics Covered and Lecture Specific Learning Objectives

**Week 1**
**Lecture Topic:** Introduction to Pharmaceutics & Dosage Forms

**Lecture Learning Objectives:**

Biopharmaceutical Considerations/ To understand what Pharmaceutics is about and what dosage form means, and to gain appreciation of Pharmaceutics.


Pre-requisite/Co-requisite knowledge and skills: Physical chemistry, organic chemistry, pharmacokinetics

**Week 2**
**Lecture Topic:** Biopharmaceutical Considerations

**Lecture Learning Objectives:**

Pharmaceutical solutions /To understand the characteristics of various routes of drug administration, the needs for different routes from therapeutic and delivering point of view, and the requirements for dosage forms for different routes.
Week 3
Lecture Topic: Pharmaceutical solutions

Lecture Learning Objectives:

To learn solutions as medicine, the requirements for the formulations, the properties and characterization of the solutions.


Pre-requisite/Co-requisite knowledge and skills: Physical chemistry, organic chemistry, pharmacokinetics

Week 4
Lecture Topic: Pharmaceutical solutions

Lecture Learning Objectives:

Sterilization Theories and Techniques /To learn sterility, sterilization and aseptic technique for handling parenterals; To study the theories and techniques of sterilization used for pharmaceutical preparations such as solutions for injection.


Pre-requisite/Co-requisite knowledge and skills: Physical chemistry, organic chemistry, pharmacokinetics

Week 5
Lecture Topic: Complexation and Solubility Enhancement

Lecture Learning Objectives:

To study various types of molecular interactions and mechanisms of complexation, and their pharmaceutical and biopharmaceutical applications and implications.


Pre-requisite/Co-requisite knowledge and skills: Physical chemistry, organic chemistry
Week 6
Lecture Topic: Preformulation

Lecture Learning Objectives:

To understand the importance of properties of drugs and excipients in relation to quality and efficacy of pharmaceutical products, and the methods for analyzing them prior to the formulation development (preformulation).


Pre-requisite/Co-requisite knowledge and skills: Physical chemistry, organic chemistry

Week 7
Lecture Topic: Preformulation

Lecture Learning Objectives:

To understand the importance of properties of drugs and excipients in relation to quality and efficacy of pharmaceutical products, and the methods for analyzing them prior to the formulation development (preformulation).


Pre-requisite/Co-requisite knowledge and skills: Physical chemistry, organic chemistry

Week 8
Lecture Topic: Colloids and Dispersions

Lecture Learning Objectives:

To learn pharmaceutical colloidal and dispersion formulations, and to understand the basic concepts of colloid and surface chemistry and their application to design of good pharmaceutical products.


Pre-requisite/Co-requisite knowledge and skills: Physical chemistry, organic chemistry

Week 9
Lecture Topic: Colloids and Dispersions

Lecture Learning Objectives:
To learn pharmaceutical colloidal and dispersion formulations, and to understand the basic concepts of colloid and surface chemistry and their application to design of good pharmaceutical products.


Pre-requisite/Co-requisite knowledge and skills: Physical chemistry, organic chemistry

Week 10
Lecture Topic: Colloids and Dispersions

Lecture Learning Objectives:

To learn pharmaceutical colloidal and dispersion formulations, and to understand the basic concepts of colloid and surface chemistry and their application to design of good pharmaceutical products.


Pre-requisite/Co-requisite knowledge and skills: Physical chemistry, organic chemistry

Week 11
Lecture Topic: Colloids and Dispersions

Lecture Learning Objectives:

Powders and Micromeritics I To learn pharmaceutical colloidal and dispersion formulations, and to understand the basic concepts of colloid and surface chemistry and their application to design of good pharmaceutical products; To understand the properties of particles and pharmaceutical powders, their significance in making good pharmaceutical products, and the common methods for characterizing these properties.


Pre-requisite/Co-requisite knowledge and skills: Physical chemistry, organic chemistry

Week 12
Lecture Topic: Powders and Micromeritics

Lecture Learning Objectives:

To understand the properties of particles and pharmaceutical powders, their significance in making good pharmaceutical products, and the common methods for characterizing these properties.


Pre-requisite/Co-requisite knowledge and skills: Physical chemistry, organic chemistry
**Week 13**  
**Lecture Topic:** Powders and Micromeritics; Solid State Properties

**Lecture Learning Objectives:**

To understand the properties of particles and pharmaceutical powders, their significance in making good pharmaceutical products, and the common methods for characterizing these properties; To understand existence and properties of varying solid forms of pharmaceutical solids, in particular drug powders; their properties, pharmaceutical application and biopharmaceutical implications. Preparation/Readings: Aulton's Pharmaceutics: The Design and Manufacture of Medicines 3rd ed., Churchill Livingstone.

**8. Assessment Methodologies Used:**

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Course Learning Objectives Addressed</th>
<th>Assessment Method Used</th>
<th>Percent of Course Grade</th>
<th>For Group Work: Individualized or same mark for all group members</th>
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<tbody>
<tr>
<td>☒ Assignment</td>
<td>All learning objectives to date</td>
<td>Quiz/Problem Set</td>
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<tr>
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<td>☐ Participation</td>
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<td>☐ Final Exam</td>
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<td>☐ Presentation</td>
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<tr>
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<td>☒ Final Exam</td>
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*Expectation for pass grades for all Pharmacy courses is 60%*

**9. Policy and procedure regarding late assignments/examinations/laboratories:**

Students who fail to submit an assignment by the specified due date will receive a deduction of 10% of the mark for the assignment for each day beyond the due date (including weekends/holidays), to a maximum of 50%. Assignments will not be accepted for grading after 5 late days.
10. Policy and procedure regarding missed assignments/examinations/laboratories:

Students who miss a quiz, an examination or a test and who have a valid petition filed with the Registrar's office will be eligible to complete a make-up quiz, examination or test. The format of this quiz, examination or test will be at the discretion of the course coordinator, and may include, for example, an oral examination.

Missed Assignment Policy:

Students who fail to submit an assignment by the specified due date, and who have a valid petition filed with the Registrar's office will be eligible to submit the completed assignment, or an alternative assignment based on course requirements, with no academic penalty.

Supplemental assignments/examinations/laboratories:

Students who have failed the entire course, i.e., received a total mark less than 60% for the course will be eligible to write a supplemental examination if the students meet the minimal GPA requirement for the academic year as per the faculty's policy. The mark of the supplemental examination will replace no more than 50% of the total mark for the course. The format of this examination or test will be at the discretion of the course coordinator and instructors.

11. AFPC Education Outcomes addressed (check all those that apply):
- Refer to AFPC Educational Outcomes for Professional Programs for further information about the role and key competencies.

As Care Providers, pharmacy graduates:

**CP1 – Practice within the pharmacist scope of practice and expertise**

- **☐** CP1.1 Apply knowledge from the foundational sciences to make decisions relevant to the contemporary and evolving scope of pharmacist practice;

- **☐** CP1.2 Integrate AFPC Communicator, Collaborator, Leader-Manager, Health Advocate, Scholar, and Professional roles in their practice of pharmacy;

- **☐** CP1.3 Recognize and respond to the complexity, uncertainty and ambiguity inherent in pharmacy practice;

- **☐** CP1.4 Explain the benefits, risks and rationale associated with pharmacist-provided care as an important step in obtaining and documenting consent to pharmacist care;

- **☐** CP1.5 Recognize and take appropriate action when signs, symptoms and risk factors that relate to medical or health problems that fall into the scope of practice of other health professionals are encountered.

**CP2 – Provide patient-centred care**

- **☐** CP2.1 Collect, interpret, and assess relevant, necessary information about a patient's health-related care needs;
☐ CP2.2 Formulate assessments of actual and potential issues and in collaboration with the patient and other health team members as appropriate, prioritize issues to be addressed in a given patient encounter;

☐ CP2.3 Create and document plans in collaboration with the patient and other health team members as appropriate, and make recommendations to prevent, improve or resolve issues;

☐ CP2.4 Implement plans in collaboration with the patient and other health team members as appropriate, including:
   
   CP2.4.1 obtaining consent
   CP2.4.2 making a referral or consulting others
   CP2.4.3 adapting, initiating, renewing/continuing, discontinuing or administering medication as authorized
   CP2.4.4a dispensing and/or
   CP2.4.4b compounding and/or
   CP2.4.4c delegating/authorizing such tasks to others appropriately
   CP2.4.5 engaging the patient or care-giver through education, empowerment and self-management, and
   CP2.4.6 negotiating the role of pharmacy and non-pharmacy team members in continuity and transitions of care.

☐ CP2.5 Follow-up by monitoring, evaluating progress toward achievement of the patient’s goals of therapy, adjusting plans in collaboration with the patient and health team members across the care continuum.

CP3 – Actively contribute, as an individual and as a member of a team providing care, to the continuous improvement of health care quality and patient safety

☐ CP3.1 Recognize and respond to harm and potential harm from health care delivery, including patient safety incidents;

☒ CP3.2 Adopt strategies that promote patient safety and address human and system factors;

As Communicators, pharmacy graduates:

CM1 – Communicate in a responsible and responsive manner that encourages trust and confidence

☐ CM1.1 Select and use oral, non-verbal and written communication strategies (tools, techniques, technologies, etc.) effectively so that the patient’s best interests are foremost;

☐ CM1.2 Provide timely, clear responses that are tailored to the context and audience;

☐ CM1.3 Express facts, evidence, opinions and positions accurately and effectively, with clarity and confidence;

☐ CM1.4 Listen, actively solicit and respond appropriately to ideas, opinions and feedback from others;
CM1.5  Use language, pace, tone, and non-verbal communication that is suitable for:
   a) the intended outcomes of the communication, and
   b) the complexity, ambiguity, urgency and/or difficulty of a situation, conversation or conflict

CM1.6  Seek and synthesize relevant information from others in a manner that ensures common understanding and where applicable, clarifies and secures agreement and/or consent;

CM1.7  Compose and share oral, written, and electronic information in a manner that optimizes patient safety, dignity, confidentiality, and privacy.

CM2 – Communicate in a manner that supports a team approach to health promotion and health care

CM2.1  Engage in respectful, empathetic, compassionate, non-judgmental, culturally safe, tactful conversations with patients, communities, populations, and health team members;

CM2.2  Demonstrate awareness of the impact of one’s own experience level, professional culture, biases and power and hierarchy within the health team on effective working relationships, communication and conflict resolution with health team members and adapt the approach to the situation appropriately;

CM2.3  Demonstrate accuracy and appropriateness of communication as well as respect for the role of other health team members when disclosing information about harmful or potentially harmful situations;

CM2.4  In word and in action, convey the importance of teamwork in patient-centred care, patient safety, health care quality improvement and health program delivery.

As Collaborators, pharmacy graduates:

CL1 – Work effectively with members of the health team including patients, pharmacy colleagues and individuals from other professions

CL1.1  Establish and maintain positive relationships;

CL1.2  Recognize, respect and negotiate the roles and shared/overlapping responsibilities of team members;

CL1.3  Join with others in respectful, effective shared decision-making.

CL2 – Hand over the care of the patient to other pharmacy team members and non-pharmacy team members to facilitate continuity of safe patient care

CL2.1  Determine when and how care should be handed over to another team member;

CL2.2  Recognize, respect and honour the negotiate shared and overlapping responsibilities of patients, pharmacy team members and other health members when handovers occur;
Demonstrate safe handover of care, using oral, written, and electronic communication, during a patient transition to a different care provider or setting.

As Leader-Managers, pharmacy graduates:

**LM1 – Contribute to optimizing health care delivery and pharmacy services**

☐ LM1.1 Work with others to apply quality improvement strategies and techniques to optimize pharmacy care;

☐ LM1.2 Contribute to a culture of patient safety;

☒ LM1.3 Confirm the quality, safety, and integrity of products;

☒ LM1.4 Use health informatics to improve the quality of care, manage resources and optimize patient safety.

**LM2 – Contribute to the stewardship of resources in health care systems**

☐ LM2.1 Apply evidence and management processes to achieve cost appropriate care;

☐ LM2.2 Allocate health care resources for optimal patient care;

☐ LM2.3 Contribute to the management of finances and health human resources in pharmacy practice settings;

**LM3 – Demonstrate leadership skills**

☐ LM3.1 Demonstrate leadership skills to enhance pharmacy practice and health care.

**LM4 – Demonstrate management skills**

☐ LM4.1 Work with others to apply the principles of effective management and supervision of health human resources and medication use systems;

☐ LM4.2 Use effective strategies to manage and improve their own practice of pharmacy.

As Health Advocates, pharmacy graduates:

**HA1 – Respond to an individual patient’s health needs by advocating with the patient within and beyond the patient care environment**

☐ HA1.1 Work with patients to address determinants of health that affect them and their access to needed health services or resources;

☐ HA1.2 Work with patients to increase opportunities to adopt healthy behaviours;
HA1.3 Incorporate disease prevention, health promotion and health surveillance into interactions with individual patients.

HA2 – Respond to needs of communities or populations they serve by advocating with them for system-level change in a socially accountable manner

HA2.1 Work with community or population to identify the determinants of health that affect them;

HA2.2 Participate in health promotion and disease prevention programs.

As Scholars, pharmacy graduates:

SC1 – Apply medication therapy expertise to optimize pharmacy care, pharmacy services and health care delivery

SC1.1 Use knowledge and problem-solving to arrive at recommendations and decisions that are appropriate, accurate, and practical;

SC1.2 Use professional experience to solve routine, previously encountered problems;

SC1.3 Use established decision-making frameworks and apply learning required to manage new situations and problems.

SC2 – Integrate best available evidence into pharmacy practice

SC2.1 Generate focused questions related to needs for information, recommendations and decisions in practice;

SC2.2 Use systematic approaches in the search for best available evidence;

SC2.3 Critically appraise health-related research and literature;

SC2.4 Incorporate best available evidence in the decision-making process.

SC3 – Contribute to the creation of knowledge or practices in the field of pharmacy

SC3.1 Apply scientific principles of research and scholarly inquiry;

SC3.2 Apply ethical principles that underlie research and scholarly inquiry.

SC4 – Teach other pharmacy team members, the public and other health care professionals including students

SC4.1 Provide effective education to others;

SC4.2 Employ appropriate teaching roles when teaching others;
☐ SC4.3 Deliver effective feedback in teaching and learning situations;

☐ SC4.4 Use appropriate learning assessment and evaluation strategies when working with patients, team members, students and teachers.

As Professionals, pharmacy graduates:

**PR1 – Committed to apply best practices and adhere to high ethical standards in the delivery of pharmacy care**

☐ PR1.1 Exhibit professional behaviour whether face-to-face, in writing, or via technology-enabled communication. Professional behaviour includes, but is not limited to:

a) demonstrating honesty, integrity, humility, commitment, altruism, compassion, respect for diversity and patient autonomy;
b) being accessible, diligent, timely and reliable in service to others;
c) abiding by the principle of non-abandonment;
d) maintaining appropriate interpersonal boundaries;
e) maintaining professional composure, demeanor, and language even in difficult situations, and;
f) maintaining privacy and confidentiality;

☐ PR1.2 Use ethical frameworks as one component of professional judgment;

☐ PR1.3 Recognize and respond to situations presenting ethical dilemmas, including conflicts of interest;

☐ PR1.4 Engage in activities that:

a) protect the public, and;
b) advance the practice of pharmacy.

**PR2 – Able to recognize and respond to societal expectations of regulated health care professionals**

☒ PR2.1 Take responsibility and accountability for actions and inactions;

☐ PR2.2 Demonstrate a commitment to patient safety and quality improvement;

☐ PR2.3 Honour the laws, ethical codes, and regulatory requirements (by-laws, standards, policies) that govern the self-regulated profession of pharmacy;

☐ PR2.4 Demonstrate an understanding of federal, provincial/territorial, and municipal laws, policies and standards that apply to pharmacy workplaces;

☐ PR2.5 Demonstrate an ability to maintain competence to practice through evaluating areas for improvement and planning, undertaking learning activities to address limitations in competence and/or performance and incorporating learning into practice;
PR2.6 Identify and respond to unprofessional, unethical, and illegal behaviours in pharmacists, other pharmacy team members, and other health professionals.

PR3 – Committed to self-awareness in the management of personal and professional well-being

PR3.1 Set professional and personal goals, priorities, and manage their time to balance patient care, workflow, and practice requirements;

PR3.2 Examine, reflect upon, and manage personal attributes (knowledge, skills, beliefs, biases, motivations, emotions, etc.) that could influence self-development and professional performance;

PR3.3 Adapt their practice of pharmacy to fulfill evolving professional roles;

PR3.4 Recognize and respond to self and colleagues in need.