Course Outline and Syllabus for Students

Course coordinator: Miranda So

Name: Introduction to Antimicrobial Stewardship

Course Number: PHM 383H

Course Title: Introduction to Antimicrobial Stewardship

Course Description: (*to be used as calendar entry)

Antimicrobial Stewardship is an inter-disciplinary, multi-faceted approach to optimize antimicrobial use. While the ultimate goal of Antimicrobial Stewardship is to improve patient outcome, appropriate and effective use of antimicrobials is an important component to control antimicrobial resistance, minimize unintended consequences such as C. difficile infections, and to contain health care costs. As of 2013, presence of an active Antimicrobial Stewardship Program has been made a Required Operating Practice for acute care hospitals and long-term care facilities by Accreditation Canada. This course expands and deepens knowledge gained from the Year 2 Infectious Diseases Pharmacotherapy and Microbiology Courses, with an emphasis on clinical application within the antimicrobial stewardship context. It will introduce students to the principles of antimicrobial stewardship to facilitate rational selection of antimicrobial regimens; stewardship interventions; quality improvement methods; as well as program development, implementation and evaluation. The course culminates to a team proposal presentation for an antimicrobial stewardship based on a fictitious institution’s profile. Each team is tasked with convincing a panel of judges, who in practice are antimicrobial stewardship clinicians or program executives, to support their proposed program.

Required:

Elective: ✓

1. Course Learning Objectives: (*to be used as a student guide for preparation and study: use same verbs in assessment questions (item 14, assessment methods). Please see the Appendix for guidelines for selecting appropriate behavioural language to measure the correct outcome level: Bloom’s Taxonomy; Miller’s Taxonomy or the Solo Taxonomy.

Upon completion of this course, students will have achieved the following level of learning objectives:

Introductory level:

- Knowledge and comprehension of concepts, definitions
- Application of concepts to simple situations

Intermediate level:

- Application of concepts to more complex situations with ability to synthesize and evaluate

Introductory Level:

1. Describe the rationale of antimicrobial stewardship, including emerging multi-drug resistant pathogens; lack of new agents available from research and development; adverse events and collateral damage due to suboptimal antimicrobial use such as C. difficile infections.

2. Describe the objectives of antimicrobial stewardship and its role in our healthcare system: to improve patient safety; clinical outcome; and maintaining cost-effectiveness of therapy.
3. Describe the roles and functions of the core members of an ASP clinical team:
   a. Pharmacist: To encourage the optimal use of antimicrobial agents by promoting interdisciplinary collaboration within the hospital and auditing and guiding (feedback) the selection, dosing, timing, de-escalation, and discontinuation of antimicrobial therapy. Also involved in reporting consumption of antimicrobials (see also metrics objective #11).
   b. Physician: To educate prescribers and promote optimal use of antimicrobials, be involved in auditing and guiding (feedback) antimicrobial regimens selection, in the development and implementation of measures based on the best evidence.

4. Identify the role of these clinical partnerships that are necessary for the success of an ASP
   a. Microbiology lab:
   b. Infection Prevention and Control (IPAC)
   c. Infectious diseases specialist physicians and pharmacist

5. Identify how Information Technology is an essential component of ASP by facilitating
   a. A steward’s day-to-day practice
   b. ASP’s accountability towards stakeholders through reporting of antimicrobial consumption and costs.

6. Describe the supporting infrastructure and administrative support required for a successful ASP.

7. Identify, describe and critique different stewardship interventions that have been reported in the literature, including prospective audit and feedback; educational outreach; formulary restriction; clinical guidelines and pathways; de-escalation of therapy; dose optimization; parenteral to oral conversion.

8. Identify innovative or creative interventions to conduct antimicrobial stewardship programs, including the use of clinical decision support, incorporation of biomarkers; and sharing of resources amongst small, community hospitals.

9. Outline how change management strategies can be utilized to achieve organizational change and empower ASP.

10. Metrics:
    a. Describe and calculate different metrics used in antimicrobial stewardship (days of therapy; defined daily dose; length of therapy) (Intermediate level)
    b. Select and present metrics in the way that it best suits a particular patient population (Introductory level)
    c. Analyze metrics in determining the direction of an ASP, such as in needs assessment, ongoing evaluation, maintenance or expansion of a program. (Introductory level)

11. List and describe components of a report of accountability to stakeholders of an ASP.

12. Compare and contrast different models of antimicrobial stewardship programs, depending on needs or resource limitations.

13. Evaluate and select appropriate stewardship interventions based on resources, patient population and clinical setting (community/primary care vs. institutional).

14. Describe the role of Accreditation Canada in ASP:
    a. Describe the role of Accreditation Canada for Canadian institutions: to improve quality of health care services through accreditation process
    b. Define a Required Operating Practice (ROP): evidence-based practices that mitigate risk and contribute to improving the quality and safety of health services.
    c. List and interpret the ROP for ASP (as of 2013) for acute care hospitals and identify how each test of compliance may be operationalized:
       i. The organization implements an ASP.
       ii. The program includes lines of accountability for implementation.
       iii. The program is inter-disciplinary.
iv. The program includes interventions to optimize antimicrobial use that may include audit and feedback; a formulary of targeted antimicrobials and approved indications; order forms; clinical guidelines/pathways; education; strategies to streamline or de-escalate therapy; dose optimization and IV-to-PO conversion where appropriate.

v. The organization establishes mechanisms to evaluate the program on an ongoing basis, and shares results with stakeholders in the organization.

Intermediate Level:

15. Utilize ID and microbiology knowledge learned in Year 2 (PHM 203 Infectious Diseases, PHM 242 Microbiology of Infectious Disease) to recommend appropriate drug therapy for common infectious syndromes (bacteremia; upper and lower respiratory tract infections; skin and soft tissue infections; urinary tract infections; and intra-abdominal infections) in community or institutional healthcare settings (General Internal Medicine, General Surgery, Primary Care).

16. Apply principles of antimicrobial stewardship in conjunction with ID/microbiology knowledge for a given patient scenario with infectious syndromes listed above, and articulate the rationale for a specific recommendation in the GIM /General Surgery and primary care/community patient population (intermediate level) and specialized patient populations (introductory level) such as paediatrics, long term care residents, immunocompromised host (febrile neutropenic episode in oncology patients) and the critically ill.

17. Recognize selection of “optimal” antimicrobial therapy requires relating knowledge of Infectious Diseases and Microbiology with antimicrobial pharmacology, dose, duration of therapy and patient characteristics (Intermediate level).

Advanced Level: n/a

Skills

Introductory Level:

1. Communicate to the health care team recommendations and articulate the rationale as an antimicrobial steward in written and/or verbal format.

2. Demonstrate communication skills through articulating the rationale of antimicrobial stewardship to the leadership team of an institution, or a community-based practice.

3. Integrate metrics as part of the accountability reporting to stakeholders of the ASP, including leadership of patient care team, and executive sponsors.

4. Create and defend a basic antimicrobial stewardship program to meet the needs of Accreditation Canada ROP for an institutional setting.

Intermediate Level:

5. Demonstrate ability to critically appraise literature that may provide guidance on
   a. Specific clinical situation or infectious syndromes
   b. Specific models or metrics about ASP

6. Demonstrate skills of knowledge translation in making stewardship recommendations, through critical appraisal of literature.

7. Apply the Pharmacotherapy Workup in managing common infectious syndromes in specialized populations—paediatrics.
Advanced Level:

8. Apply the Pharmacotherapy Workup in managing common infectious syndromes in the general internal medicine and primary care populations (with whom students may be more familiar through ID PTC PHM 203H)

Attitudes/Values

Introductory Level: n/a
Intermediate Level:
1. Exemplify professional attitude, behaviour and willingness towards inter-professional collaboration/education.
2. Exemplify respect and team work towards student peers.
3. Realize that antimicrobial stewardship shares common goals and objectives in improving patient care and safety with the clinical teams, programs and consultants.
4. Realize that antimicrobial stewardship does not intend to be policing the use of antimicrobials, but rather through knowledge translation serves to optimize antimicrobial use at the patient level and in the health care system, and reducing societal costs incurred by infections from multi-drug resistant organisms and other collateral damage.

Advanced Level: n/a

2. Rationale for Inclusion in the Curriculum:

Answering the call that antimicrobial stewardship should be required through regulatory process, Accreditation Canada made ASP an ROP for all acute care hospitals in 2013. ASP is integral part of quality health care for meeting the three criteria of the “Triple Aim of Healthcare” from the Institute of Healthcare Improvement: 1) improving the patient experience of care (including quality and satisfaction; 2) improving the health of populations; and 3) reducing the per capita cost of health care. ASP operates under the auspices of patient safety, such that drug (antimicrobial) therapy is selected in an evidence-informed and appropriate manner to minimize the risk of adverse events and collateral damage such as C. difficile infection. Its goal is to reduce the selection pressure of emergence of multi-drug resistant organisms, thereby preserving the efficacy of antimicrobials in an era of dwindling armamentarium of new antimicrobial agents. ASP may reduce overall drug cost, but more importantly, it decreases the associated costs of misuse of antimicrobials. As ASP expands from the institutional to the community level, pharmacists play an increasingly vital stewardship role in coordinating, measuring and advocating for the optimal use of antimicrobials, in addition to educating prescribers, other health care professionals and the public. This course lays the foundation for students to become future stewards as they take on responsibilities in medication therapy management.

3. Pre-requisites:

PHM 203H - Pharmacotherapy in Infectious Diseases

PHM 242– Microbiology of Infectious Diseases - Immunology

IPE requirements – roles and knowledge of other health care professionals; inter-professional conflict resolution.

(Link to relevant course outlines)
Specify relevant knowledge or skills that are pre-requisite areas of emphasis

4. Statement of agreement from course coordinators of courses for which this course is a pre-requisite:
Coordinator's Name and course name and/or number:

Gary Wong—Pharmacotherapy in Infectious Diseases PHM 203H (reviewed course outline with Miranda So)

Ian Crandall—Microbiology of Infectious Diseases – Immunology PHM 242 (personal communication with Miranda So)
5. Co-requisites: (for the current and subsequent year)
   (Link to relevant course outlines)
   Specify relevant knowledge or skills that are co-requisite areas of emphasis

6. Statement of agreement from coordinators of courses for which this course is a co-requisite:
   Coordinator's Name and course name and/or number:

7. Course Contact Hours and Teaching Methodologies: how will the course be delivered? (group work)

<table>
<thead>
<tr>
<th>Didactic (lecture)</th>
<th>16 hours</th>
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<tbody>
<tr>
<td>Large group problem-based or case-based learning</td>
<td>hours</td>
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<tr>
<td>Large Group Size (eg 30, 60, 120, 240)</td>
<td>persons</td>
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<tr>
<td>Laboratory or Simulation</td>
<td>hours</td>
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<td>Tutorial/Seminar/Workshop/Small Group</td>
<td>10 hours</td>
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<tr>
<td>Small Group Size (eg 5, 10, 15, 20, 25)</td>
<td>10 persons</td>
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<tr>
<td>Experiential</td>
<td>hours</td>
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<tr>
<td>On-line</td>
<td>hours</td>
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<tr>
<td>Other (please specify)*</td>
<td>hours</td>
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* Other specific information:

Total course contact hours 26 hours

Group work: 10% assessment max

Bb: only "recommended" content can be online

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

Preparation time is about 1-2 hours per week. Review assigned pre-readings. For case study seminars, students may be required to discuss with fellow group members as part of the preparation.

9. Course Coordinator and contact information:

Miranda So, BScPhm, PharmD. Pharmacotherapy Specialist--Antimicrobial Stewardship, MSH-UHN Antimicrobial Stewardship Program. Phone: 416-340-4800 ext 14-8758

Email: Miranda.so@uhn.ca

10. Course Instructors and contact information: to be confirmed

11. Required Resources/Textbooks/Readings:

   No required textbook. A list of required readings, available at U of T Library, will be provided to the student at beginning of term.

Articles: see lesson plan below for reading assignment

Websites:

- MSH-UHN Antimicrobial Stewardship Program website: [www.antimicrobialstewardship.com](http://www.antimicrobialstewardship.com)
12. Recommended Resources/Textbooks/Readings:
Articles: See reading list per week.

Websites:

- Institute of Healthcare Improvement: http://www.ihi.org/offerings/Initiatives/TripleAim/Pages/default.aspx

Textbook:

- Dipiro. Pharmacotherapy: A Pathophysiologic Approach

13. Topic Outline/Schedule: For each, indicate level of knowledge, skills and attitudes learning objectives

***Order of some topics is subject to guest speakers’ availability. Every effort will be made to ensure coherence and flow of curriculum content.

<table>
<thead>
<tr>
<th>Wk</th>
<th>Learning Objectives</th>
<th>Format</th>
<th>Time</th>
<th>Readings</th>
</tr>
</thead>
</table>
| 1  | Introduction to antimicrobial stewardship:  
  - Rationale, objectives and principles of antimicrobial stewardship  
  - Role and membership of oversight committee and reporting infrastructure of ASP  
  - Membership and role of Antimicrobial Advisory Committee  
  - Membership and function of the ASP team  
  Partnerships and collaboration:  
  - Infectious Diseases Consultant  
  - Microbiology  
Policy Statement on Antimicrobial Stewardship by the Society for Healthcare Epidemiology of America (SHEA), the Infectious Diseases Society of America (IDSA), and the Pediatric Infectious Diseases Society (PIDS). Infect Control Hosp Epidemiol 2012;33(4):122. |
| 2  | Toolkit of ASP in institutional setting and supporting evidence  
  - Core (prospective audit & feedback; education) and supplemental strategies (formulary restriction; order forms; clinical pathways)  
  - Implementation (dose optimization; empiric vs. targeted therapy; de-escalation; IV-PO conversion; duration of therapy; single vs. double coverage; drug allergies)  
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<th>Wk</th>
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<td>Introduction to program development and project management</td>
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<tr>
<td>3</td>
<td>Inter-professional communication, collaboration and education</td>
<td>Lecture, video</td>
<td>1h</td>
<td>Pulcini C and Gyssens IC. How to educate prescribers in antimicrobial</td>
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<tr>
<td>3</td>
<td>Antimicrobial stewardship in the primary care setting</td>
<td>Lecture</td>
<td>1h</td>
<td>Butler et al. Effectiveness of multifaceted educational programme to</td>
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<td></td>
<td>– Interventions and practice change solutions that have been proven to be successful</td>
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<td>reduce antibiotic dispensing in primary care: practice-based randomized</td>
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<td>Hallsworth M et al. Provision of social norm feedback to high prescribers</td>
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<td>of antibiotics in general practice: a pragmatic national randomised</td>
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<td>controlled trial. BMJ Published online February 18, 2016.</td>
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<td>4</td>
<td>“Bread and butter” of Antimicrobial Stewardship—application in commonly encountered</td>
<td>Case study</td>
<td>2h</td>
<td>Additional readings to be identified by facilitator as needed.</td>
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<tr>
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<td>infectious diseases syndromes and identify opportunities of stewardship in General</td>
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<td>Internal Medicine, General Surgery and Paediatrics. Stewardship principles to be</td>
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<td>applied in each case are stated emphasized by the facilitators.</td>
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<td>*Order in which case studies are arranged depends on availability of facilitators,</td>
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<td>and is subject to change.</td>
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<td>a) Lower respiratory tract infection seen in institutional setting (community-acquired pneumonia)</td>
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<td>b) Urinary tract infections (community setting)</td>
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<td>5</td>
<td>“Bread and butter” of Antimicrobial Stewardship—application in commonly encountered</td>
<td>Case study</td>
<td>2h</td>
<td>Paeds case: Newland et al. Antimicrobial stewardship in pediatric care:</td>
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<td></td>
<td>Internal Medicine, General Surgery and Paediatrics (continued)</td>
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<td>Canadian Paediatric Society Position Statement: Antimicrobial stewardship</td>
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<td></td>
<td>a) Paediatric infections (upper or lower respiratory tract infections)</td>
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<td>in daily practice: managing an important resource. Available at <a href="http://www.cps.ca">www.cps.ca</a></td>
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<td>b) Skin and soft tissue infection (SSTI)</td>
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<td>Ovetchkine et al. Azithromycin use in paediatrics: A practical overview.</td>
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<td>Paediatr Child Health</td>
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</table>
| 6  | "Bread and butter" of Antimicrobial Stewardship—application in commonly encountered infectious diseases syndromes and identify opportunities of stewardship in General Internal Medicine, General Surgery and Paediatrics (continued)  
   a) C. difficile infection  
| 7  | - Organizational and change management  
   - TRIZ and Positive Deviance methods in affecting practice change in the healthcare setting | Lecture and workshop | 1h+1h | Miclhe S et al. The behaviour change wheel: a new method for characterising and designing behaviour change interventions. Implementation Science 2011, 6:42.  
| 8,9 | Quality improvement methodology  
   - Metrics and performance indicators for a program  
   - Quality improvement toolkit  
Morris AM. Antimicrobial Stewardship Programs: Appropriate Measures and Metrics to Study Their Impact. Current Treatment Options in Infectious Diseases. DOI 10.1007/s40506-014-0015-3 |
<p>| 10 | Coming full circle: integrating concepts and applying them to challenging stewardship scenarios/ complex | Case study | 2h | VAP: to be determined |</p>
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<th>Wk</th>
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<tr>
<td></td>
<td>patients cases</td>
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<td></td>
<td>a) ventilator-associated pneumonia (VAP)</td>
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<td>IDSA Clinical practice guidelines for febrile neutropenia 2012</td>
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</table>
| 11 | Coming full circle: integrating concepts and applying them to challenging stewardship scenarios/ complex patients cases. | Case study | 2h  | IAI: IDSA Guideline 2010  
Toronto Best practices in General Surgery  
Healthcare associated pneumonia (HCAP) in nursing home resident: ATS HAP/HCAP guideline 2005  
|    | a) Intra-abdominal infections (IAI) |        |      |          |
|    | b) Healthcare associate pneumonia (HCAP) |        |      |          |
| 12 | Design, implementation and evaluation of an ASP in an institution to meet Accreditation Canada’s ROP. | Team presentation | 2h  | Business case example from ASP websites |
|    | – ASP proposal presentation |        |      |          |
|    | Implementation, evaluation and feedback to stakeholders |        |      |          |
| 13 | Research in ASP | Lecture | 1h  | To be determined. |
|    | Exam Review | Lecture | 1h  |          |
|    | Total contact hours | Lecture (with in-class activities where appropriate) | 14  |          |
|    | Case study sessions |        | 10  | 10 cases |
|    | Team presentation |        | 2   |          |
|    | Total |        | 26h |          |

Sample Lesson Objectives For Weeks 2 and 3: Toolkit of ASP in Institutional Setting

Week 2: Through this lesson, students will

- Describe various strategies recommended in current literature and clinical practice guidelines including
  - Prospective audit and feedback
  - Education
- Formulary restrictions
- Antibiotic order forms
- Clinical pathways
  - For each strategy, identify its benefits, limitations and examine the evidence supporting or refuting its use
  - For each strategy, determine the clinical setting in which it is appropriate
  - Determine the data collection and clinical/patient assessment that are necessary to make an antimicrobial stewardship recommendation
  - Identify ways to implement antimicrobial stewardship interventions based on pharmacokinetics, pharmacodynamics, pharmacology and patient assessment skills:
    - Dose optimization (extended infusion for beta-lactams; therapeutic drug monitoring for aminoglycosides; weight based dosing)
    - Selection of empiric vs. targeted therapy (and de-escalation) using available clinical parameters and microbiology data.
    - IV to PO conversion
    - Duration of therapy based on patient assessment and critical appraisal of literature
    - Examine the evidence supporting or refuting single vs. dual coverage in specific scenarios

### 14. Assessment Methodologies Used:

<table>
<thead>
<tr>
<th>Learning Objectives Addressed</th>
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<tbody>
<tr>
<td><strong>Assessment 1:</strong> Video assignment: skills objective #1,5-8; knowledge objectives: #16,17</td>
</tr>
<tr>
<td><strong>Assessment 2:</strong> Mid-term: knowledge objectives: #1-9, 16-17; skill objectives: #5-8; attitude objectives: #1-4</td>
</tr>
<tr>
<td><strong>Assessment 3:</strong> Group work: knowledge objectives #10-15; skills #2-4 Final exam: all objectives covered in course.</td>
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<td><strong>Assessment 4:</strong> Final exam: all objectives covered in course.</td>
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<thead>
<tr>
<th>Assessment Method Used</th>
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<tr>
<td><strong>Assessment 1:</strong> Video assignment of a verbal recommendation as a steward to a prescriber. Assessed using a global assessment scale.</td>
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<tr>
<td><strong>Assessment 2:</strong> Mid term: MCQ and short answers</td>
</tr>
<tr>
<td><strong>Assessment 3:</strong> Group presentation for proposal of an antimicrobial stewardship program</td>
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<tr>
<td><strong>Assessment 4:</strong> Final exam: MCQ and short answers</td>
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<tr>
<th>When Administered</th>
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<tr>
<td><strong>Assessment 1:</strong> Video assignment: week 4</td>
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<tr>
<td><strong>Assessment 2:</strong> Mid-term: subject to scheduling by the Registrar’s office</td>
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<tr>
<td><strong>Assessment 3:</strong> Group presentation: week 12</td>
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<tr>
<td><strong>Assessment 4:</strong> Final exam period.</td>
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<tr>
<th>Percentage of Course Grade</th>
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<tr>
<td><strong>Assessment 1:</strong> Video assignment: 10%</td>
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<tr>
<td><strong>Assessment 2:</strong> Mid-term: 30%</td>
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<td><strong>Assessment 3:</strong> Group work (team program proposal presentation): 10%</td>
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<tr>
<td><strong>Assessment 4:</strong> Final exam: 50%</td>
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For Group Work (maximum 10% of course grade) indicate how marks within groups are allocated: Individualized or Same for all Group Members

**Assessment 1:**

**Assessment 2:**

**Assessment 3:** Group work mark will be the same for all members. For the presentation, written proposal will be submitted before presentation day, with contribution from each group member specified. Maximum of two students will be chosen by the group to give a 10-15-minute (exact time to be determined based on enrolment and number of groups) presentation, the intended audience to be the
Examples of Assessment methodologies:
Multiple Choice questions (MCQs)
Short written answers (SAs)
Objective Structured Clinical Examination (OSCE)
Oral exam
Case study seminar discussion
Peer-assessment
Self-assessment
Hand-held Audience Response Meters
Performance-based (e.g. in lab, in experiential)

Expectation for pass grades for all Pharmacy courses is 60%.

You can refer to the Missed Assessments document in the Appendix to help with filling out the following items 15 and 16:

15. Policy and procedure regarding make-up assignments/examinations/laboratories:

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.

Late Assignment Policy:

Students who fail to submit an assignment by the specified due date will receive a deduction of 10% of overall grade (INSTRUCTOR TO SPECIFY) for each day beyond the due date (including weekends/holidays), to a maximum of 30%. Assignments will not be accepted for grading after 3 late days. Specific to the group assignment, students with a valid petition filed with the Registrar’s office will be eligible to complete a make-up assignment. The format of this examination or test will be at the discretion of the course coordinator, and may include, for example, an oral examination.

Missed examination or test:

Students who miss 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 examination or test. The format of this examination or test will be at the discretion of the course coordinator, and may include, for example, an oral examination.

16. Policy and procedure regarding supplemental assignments/examinations/laboratories:

As per Faculty policy.