COURSE SYLLABUS

Degree Program: BS Pharmacy (2018)

Program Learning Outcomes:

PLO 1: Practice pharmacy in a professional, legal and ethical manner with commitment for continuing professional development
PLO 2: Work effectively with inter- and multi-professional teams in various settings to manage medicines-related issues of individuals, communities and health facilities
PLO 3: Communicate medicines information effectively to patients, carers, healthcare providers, community members and other stakeholders
PLO 4: Produce quality pharmaceutical products to achieve optimum health outcomes for patients and communities
PLO 5: Disseminate research findings to improve medication use, pharmacy education and pharmacy service delivery

A. Course Catalogue Description

Course Title: Pharmaceutical Microbiology and Parasitology Laboratory

Course Number: Clin Pharm 114	**Credit Units: 2 units (2 units Laboratory)**	**Number of Hours: 6 hours laboratory per week**	**Year Level offered: 3rd year**	**Semester Offered: 2nd Semester**

Meeting Type/Instructional Format: Laboratory

Course Description: This course allows the students to learn about fundamentals of microbiology and parasitology, with emphasis on microorganisms and parasites of relevance to clinical practice and pharmaceutical sciences. It explains the biology, physiology and pathogenic properties of microorganisms as they relate to disease causation, host responses, modes of transmission, and prevention and treatment of infections. The laboratory provides actual experience in specimen collection, handling and processing for isolation and identification of microorganisms and parasites. This is an updated course based on Pharmaceutical Microbiology from the current

curriculum, where additional laboratory procedures are done to tackle applications of microbiology in the context of pharmaceutical quality control, biotechnology and other related disciplines.

Prerequisites: Pharmacology for Pharmacy 1 (Pharm 125) and Pharmacology for Pharmacy 2 (Pharm 126)

Corequisites: Pharmaceutics 1 (Pharm 130) and Pharmacology for Pharmacy 2 (Pharm 126)

Course Stipulation (if any)

Course Goals:	This course aims to develop practical skills in the cultivation, characterization, and identification of microorganisms and parasites, and to apply microbiological techniques relevant to pharmacy and related disciplines.

B. Relationship of Course Learning Outcomes to Program Learning Outcomes		**Program Learning Outcomes**							
Course Learning Outcomes		**PLO1**	**PLO2**	**PLO3**	**PLO4**	**PLO5**			
CLO1:	Perform microbiological techniques in the cultivation, characterization and identification of microorganisms	D	D	D	D	D			
CLO2:	Perform applied microbiological techniques relevant to pharmacy and other related disciplines	D	D	D	D	D			
CLO3:	Interpret the results of microbiological tests	D	D	D	D	D			

I – Introduced D- Demonstrated R- Reinforced

C. Course Content

Topics	**Number of Hours**
I. Morphological Characterization of Microorganisms	30 hours
II. Cultural and Biochemical Characterization of Bacteria	24 hours

III. Mycology, Virology & Parasitology	6 hours
IV. Control of Microorganisms	12 hours
V. Microbiology in Drug Discovery and Quality Control	30 hours

D. Course Coverage

Week	Learning Outcomes	LLOs with CLOs	Course Topics	Essential or Key Questions	Teaching and Learning Activities	Assessment Methods and Tools	Core Readings/Learning Resources
1	Specific Objectives: • To check lockers and microscopes • To obtain assignments for work areas, and reagents for preparation		I. Orientation A. Checking in of Lockers and Microscopes B. Assignment of Work Areas C. Claiming of Laboratory Manual D. Finding Common Time for Lecture Classes	How should a microbiology laboratory and its reagents and equipment be set up? What is the layout for microbiology laboratory work processes?	• Lecture	Accomplished Laboratory Record Forms	• Orientation powerpoint slides • Laboratory record forms
2	Specific Objectives: • To acquire the skill and learn the significance of proper aseptic techniques in the field		I. Aseptic Techniques	How is tabletop disinfection performed?	• Lecture • Demonstration by faculty	Formative Assessment: Worksheet Quiz	• Benson, H. (2001). *Microbiological applications:*

	of pharmaceutical microbiology • To prevent contamination of cultures and media from microorganisms in the environment			What is involved in the process of Inoculation? How do you transfer culture media in a laboratory setting? What steps are involved in preparing microbiologica l slides?		Practice and graded demonstration by students Laboratory Performance <u>Summative Assessment:</u> Unit Evaluation Written Examination Comprehensive Examination	*Laboratory manual in general microbiology* (8th ed.). McGraw-Hill. Higher Education. • Centennial College School of Engineering Technology and Applied Science. (2023). Pharmaceutical Microbiology Course Outline. • Educational microbiology videos from YouTube (2023): Various lecture topics covered in the course. • Manual of Procedures of the National Tuberculosis Control Program (2020) 6th edition. Department of Health, Manila. • Pelczer MJ, Chan ECS, Krieg NR.
	Specific Objectives: • To classify the different forms of culture media • To compute the amount of culture media needed • To prepare culture media for autoclave		I. Culture Media	What are the different types of cultures in microbiology ? How is cultural growth characterize d in laboratory settings?	• Lecture		

				How are techniques commonly used in the cultivation of microorganisms performed?			(2021). Microbiology. United States: Mc. Graw Hill Publishers. • Pommerville, Jeffrey C. (2014). Alcamo's Fundamentals of Microbiology. 10th edition. United States: Jones and Bartlett. • Pommerville, Jeffrey C. (2016). Fundamentals of Microbiology 3rd edition. United States: Jones and Bartlett Learning. • Tortora, G. J., Funke, B. R., & Case, C. L. (2018). Microbiology: An Introduction. 13th edition. United States of America: Pearson Education, Inc.
3	Specific Objectives: • To understand bacteria and its morphological and cultural characteristics • To explain bacterial growth and its phases • To differentiate types of motility		I. Morphological characterization of bacteria A. Bacteriology & Bacterial Motility B. Bacterial growth C. Cultural characteristics	What are the morphological characteristics of bacteria as viewed under a microscope? What are the cultural characteristics of bacteria?	• Lecture	<u>Formative Assessment:</u> Quiz <u>Summative Assessment:</u> Written Examination Comprehensive Examination	
	Specific Objectives: • To differentiate the types of microscopes in terms of features, advantages/disadvantages, and their principal uses • To identify the parts of		I. Microscopy and Micrometry	What are the different parts of a microscope, and how are they labeled?	• Lecture	<u>Formative Assessment:</u> Worksheet Quiz Graded demonstration by students	

	a microscope • To demonstrate the proper use of microscopes and micrometers			How do various types of microscopes differ from each other? What are the proper procedures for using a microscope? How can the appropriate use of microscopes enhance laboratory work and scientific observations?		Laboratory Performance <u>Summative Assessment:</u> Unit Evaluation Written Examination Comprehensive Examination	• USA Food and Drug Administration (2020). Pharmaceutical Microbiology Manual. • Wiley, Joanne, Sandman K., et al. (2022). Prescott's Microbiology 12th edition. United States: McGraw-Hill Publishers. • Cowan, M. K. (2012). *Microbiology: A systems approach* (3rd ed.). McGraw-Hill.
4-5	Unit Evaluation 1						
	Written Examination 1						

	Specific Objectives: • To characterize the morphology of bacteria through simple staining • To differentiate gram positive and gram negative bacteria • To perform gram staining technique		I. Basic Staining Techniques II. Simple Stain III. Gram Stain	How is the morphology of bacteria characterized through simple staining? What are the differences between gram-positive and gram-negative bacteria and how does gram staining aid in differentiating them? What steps are involved in performing the gram staining technique?	• Lecture	<u>Formative Assessment:</u> Worksheet Quiz Graded demonstration by students Laboratory Performance <u>Summative Assessment:</u> Unit Evaluation Written Examination Comprehensive Examination	

	Specific Objectives: • To characterize the morphology of bacteria through negative staining • To differentiate acid fast from non acid fast organism • To perform capsule and endospore staining technique		I. Negative Stain II. Acid Fast Stain III. Spore Stain IV. Capsule Stain V. Endospore Staining	How is the morphology of bacteria characterized through negative staining? What are the distinguishing features between acid-fast and non-acid-fast organisms? What steps are involved in performing capsule and endospore staining techniques? How do specific staining techniques aid in bacterial			

				identification and classification in laboratory settings?			
6-8	Specific Objectives: ● To prepare pure cultures based on nutritional requirements		I. Pure Culture Techniques II. Anaerobic Culture Methods	How is a pure culture prepared based on the nutritional requirements of micro-organisms?			
	Specific Objectives: ● To describe the eukaryotic characteristics of fungi ● To differentiate the morphological characteristics of yeasts and molds ● To discuss asexual and sexual reproduction of fungi ● To differentiate and give examples of some medically important fungi ● To describe the characteristics of		I. Mycology II. Parasitology III. Virology			<u>Formative Assessment:</u> Quiz <u>Summative Assessment:</u> Written Examination Comprehensive Examination	

	protozoans, helminths, and arthropod parasites • To differentiate the morphological characteristics of protozoans, helminths, and arthropod parasites • To discuss the life cycle of protozoans and helminths • To differentiate and give examples of some medically important protozoans, helminths and arthropod parasites • To describe the characteristics and morphology of viruses • To classify the types of medically important viruses • To discuss the process of viral replication • To identify types of virus-like agents						
	Specific Objectives: • To understand concepts of microbial genetics		I. Microbial Metabolism II. Microbial Genetics III. Control of microorganism	What are the fundamental concepts of microbial genetics?			

	• To enumerate the steps in microbial metabolism • To apply techniques in control of microorganism			What are the steps involved in microbial metabolism? How are techniques applied in the control of micro-organisms in laboratory settings?			
	Specific Objectives: • To understand types of fungi • To prepare fungal cultures		I. Methods of Culturing Fungi	What are the different types of fungi? How are fungal cultures prepared in laboratory settings? What are the methods and consideratio ns involved in the		<u>Formative Assessment:</u> Worksheet Quiz Graded demonstration by students Laboratory Performance <u>Summative Assessment:</u> Unit Evaluation Written Examination Comprehensive Examination	

				preparation of fungal cultures?			
	Specific Objectives: ● To characterize bacteria based on biochemistry ● To perform biochemical test for microorganism		I. Biochemical Characteristics of Bacteria	How are bacteria characterized based on biochemical properties? What biochemical tests are commonly performed for micro-organisms? What are the functions of and procedures involved in conducting biochemical tests for micro-organisms?		<u>Formative Assessment:</u> Worksheet Quiz Graded demonstration by students Reporting Laboratory Performance <u>Summative Assessment:</u> Unit Evaluation Written Examination Comprehensive Examination	

9	Unit Evaluation 2						
10	Written Examination 2						
11-13	Specific Objectives: ● To assess the effect of physical agents on bacterial growth inhibition. ● To conduct a comparative evaluation of antimicrobial agents, exploring their effectiveness in inhibiting bacterial growth. ● To explore the concept of oligodynamic action and its relevance in inhibiting bacterial growth.		I. Effect of Physical Agents on bacteria II. Comparative Evaluation of Antimicrobial Agents III.Oligodynamic Action	How do physical agents impact bacterial growth inhibition? What methods are used to compare the effectiveness of antimicrobial agents in inhibiting bacterial growth? What is oligodynamic action and how does it impact bacterial	● Lecture	<u>Formative Assessment:</u> Worksheet Quiz Graded demonstration by students Laboratory Performance <u>Summative Assessment:</u> Written Examination Comprehensive Examination	

				growth?			
	Specific Objectives: ● To perform disinfection of water ● To perform bacteriological examination of water and milk		I. Disinfection of Drinking Water II. Bacteriological Examination of Water III. Reductase Test	How is disinfection of water performed? What procedures are involved in the bacteriological examination of water and milk?			
14	Specific Objectives: ● To perform antimicrobial activity determination ● To perform USP limit tests for pharmaceutical preparations		I. Antimicrobial Activity Determination II. USP Limit Test for Pharmaceutical Preparation	How is antimicrobial activity determined in pharmaceutical preparations? What are the procedures involved in conducting			

				USP limit tests for pharmaceutical preparations ?			
15	Specific Objectives: ● To describe different types of bioautography ● To perform pyrogen test ● To perform sterility test		I. Bioautography II. Pyrogen test III. Sterility Test	What are the different types of bioautography techniques used in microbiology and pharmaceutical sciences? How is the pyrogen test performed to ensure pharmaceutical safety? What are the methods used		<u>Formative Assessment:</u> Quiz <u>Summative Assessment:</u> Written Examination Comprehensive Examination	

				for conducting the sterility test in pharmaceutical products?			
15	Written Examination 3						
16	Comprehensive Exam						

E. Course Requirements

1	Quizzes
2	Graded Demonstrations
3	Reporting
4	Worksheets
5	Written Examinations
6	Practical Examinations
7	Laboratory Performance

F. Assessment Plan (formative and summative evaluation)

COURSE ASSESSMENT PLAN				
Assessment Component	**Type of Assessment**	**Course Learning Outcomes**		
		CLO1	CLO2	CLO3
Written Examination 1 (10%)	Summative	MCQ True or False	MCQ True or False	MCQ True or False

		Identification	Identification	Identification
Written Examination 2 (10%)	Summative	MCQ True or False Identification	MCQ True or False Identification	MCQ True or False Identification
Written Examination 3 (10%)	Summative	-	MCQ True or False Identification	MCQ True or False Identification
Unit Evaluation 1 (10%)	Summative	Rating Scale	Rating Scale	Rating Scale
Unit Evaluation 2 (10%)	Summative	Rating Scale	Rating Scale	Rating Scale
Comprehensive Examination (10%)	Summative	MCQ True or False Identification Rating Scale	MCQ True or False Identification Rating Scale	MCQ True or False Identification Rating Scale
Group Activities, Worksheets and Reporting (15%)	Formative	Rubrics Rating Scale	Rubrics Rating Scale	Rubrics Rating Scale
Laboratory Performance (10%)	Formative	Rating Scale	Rating Scale	Rating Scale
Quizzes (10%)	Formative	True or False Identification	True or False Identification	True or False Identification

Course Learning Outcomes	
CLO1:	Perform microbiological techniques in the cultivation, characterization and identification of microorganisms
CLO2:	Perform applied microbiological techniques relevant to pharmacy and other related disciplines
CLO3:	Interpret the results of microbiological tests

G. References

1	Centennial College School of Engineering Technology and Applied Science. (2023). Pharmaceutical Microbiology Course Outline.
2	Educational microbiology videos from YouTube (2023): Various lecture topics covered in the course.
3	Manual of Procedures of the National Tuberculosis Control Program (2020) 6th edition. Department of Health, Manila.

4	Pelczer MJ, Chan ECS, Krieg NR. (2021). Microbiology. United States: Mc. Graw Hill Publishers.
5	Pommerville, Jeffrey C. (2014). Alcamo's Fundamentals of Microbiology. 10th edition. United States: Jones and Bartlett.
6	Pommerville, Jeffrey C. (2016). Fundamentals of Microbiology 3rd edition. United States: Jones and Bartlett Learning.
7	Tortora, G. J., Funke, B. R., & Case, C. L. (2018). Microbiology: An Introduction. 13th edition. United States of America: Pearson Education, Inc.
8	USA Food and Drug Administration (2020). Pharmaceutical Microbiology Manual.
9	Wiley, Joanne, Sandman K., et al. (2022). Prescott's Microbiology 12th edition. United States: McGraw-Hill Publishers.
H. List of Faculty	
1	**Margarita M. Gutierrez, RPh, MHPEd, PhD** Associate Professor 1 Department of Clinical, Social and Administrative Pharmacy
2	**Mac Ardy J. Gloria, RPh, MPH, GDip, PhD** Associate Professor 5 Department of Clinical, Social and Administrative Pharmacy
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7	**Cyro Angelo C. Defensor, RPh** Instructor 4 Department of Clinical, Social and Administrative Pharmacy