SCHOOL OF PHARMACY AND HEALTH SCIENCES

SEMESTER:
COURSE: **BCM 2346: MOLECULAR BIOLOGY**
LECTURER :
CLASS DAYS/TIME:
CLASS VENUE:
CREDIT UNIT: *3*
CONTACTS:

Course Description.
To teach the student the composition and life processes of cells at the molecular level, including the genetic organization of organisms and how genes control organisms and their populations.

Link to University Mission and Program Learning Outcomes:

1 *LINK TO UNIVERSITY MISSION AND PROGRAM LEARNING OUTCOMES:*

1. **High order thinking:** The ability to collect, analyze and evaluate information and formulate conclusions. Students develop and demonstrate the ability to think critically, analytically and creatively.
2. **Literacy:** Competence in oral, written, quantitative, and technological skills. Students develop and demonstrate competency in oral and written communication as well as demonstrate scientific, quantitative and technological literacy.
3. **Global understanding and multicultural perspective:** Awareness, knowledge and appreciation of both the diversity and commodity of cultures. Students acquire these perspectives through formal study of languages, history, literature and the arts and through working, studying and living cooperatively in a radically, ethnically, and culturally diverse environment. Further, students acquire an understanding of economic, historical, political, geographic and environmental relationships on a global basis.
4. **Preparedness for career:** Mastery of a field of knowledge and its multi-cultural and multinational application. Such mastery is accomplished through both formal study and various experienced forms of learning such as internships and field experiences.

5. **Community service and development***:* A sense of being part of a community and a desire to be of service to it. Students are given opportunities to participate in community service, citizenship, or social action projects or activities.
6. **Leadership and ethics***:* As part of their growth and development, students formulate and articulate the ethical standards which will guide their professional and personal lives.

Program learning outcomes

By the end of their training the graduates should be able to:

1. Plan, organize and control the manufacturing, compounding, packaging and quality of pharmaceutical products.
2. Plan, organize and manage the procurement, storage and distribution of pharmaceutical materials and products.
3. Interpret and uphold the laws, regulations and ethics that govern the practice of pharmacy.
4. Provide pharmacist-initiated care to patients and ensure the rational use of medicines.
5. Provide information, advice and education on disease, health, community health and medicines-related issues.
6. Participate in pharmaceutical and medical research and evaluate critically new therapies and current advances in formulation and modes of drug action to ensure the optimal selection and use of medicines.

Course Learning Outcomes:

At the end of the course, the student should be able to:

1. Describe the general principles of gene organization, replication and expression in both prokaryotic and eukaryotic organisms.
2. Describe the various mechanisms of DNA damage and their repair.
3. Explain various levels of gene regulation and protein function including signal transduction and cell cycle control.
4. Describe the laws that govern inheritance of genetic information.
5. Relate properties of cancerous cells to mutational changes in gene function.
6. Relate the principle of gene organization to the diversity of populations and individuals within the same population.
7. Distinguish between different molecular biology techniques that are used to isolate, separate, and probe for specific proteins, nucleic acids, and their interactions. And to state the limitations of these techniques.

COURSE CONTENT

week	Topic	Activity and learning outcome	Reading

Week 1	**Introduction to molecular biology:** - DNA Structure - DNA Replication in Prokaryotes	**(outcomes 1)** Lecture **Assignment 1 (DNA replication)**	Cox Molecular Biology: Principles and Practice
Week 2	**Gene Expression:** - DNA replication in eukaryotes - Transcription - Genetic Code - Translation	**(outcomes 1)** Lecture and class discussion	Cox Molecular Biology: Principles and Practice
Week 3	**Control of Gene Regulation:** - Recap of gene expresion - Control of gene expression in eucaryotes - Control of gene expression in prokaryotes	**(outcome 1,2, 3)** Lecture and class discussion	Cox Molecular Biology: Principles and Practice
Week 4	**Tumor Biology:** - Cell cycle and Cancer - Mechanisms of cancer development - Carcinogens	Lecture and class discussion **(outcome 1,2, 3)** Video on factors affecting cell cycle control	Cox Molecular Biology: Principles and Practice
Week 5	**Inheritance:** - Mendelian Laws - Mendels Experiments - Inheritance patterns- monogenic, polygenic and complex	**(outcomes 2,3)** Lecture and class discussion **Quiz 1: Covering wk. 1, 2 and 3 work**	Cox Molecular Biology: Principles and Practice
Week 6	**Inheritance**: - Autosomal traits - Sex-linked traits - Inborn Errors of Metabolism	**(outcomes 2,4)** Lecture and class discussion and a video on sex-linked traits	Cox Molecular Biology: Principles and Practice
Week 7		Mid Term Exam	Cox Molecular Biology: Principles and Practice
Week 8	**Genetic Polymorphism:** - Types of genetic polymorphism - Causes of genetic polymorphism	**(outcomes 2,4,5)** Lectures, class discussion	Genetics Analysis and Principles, Robert J. Brooker
Week 9	**Population Genetics:** - Principles of population genetics - Hardy – Weinberg equilibrium - Factors that violate the H-W equilibrium	**(outcomes 2,4,5)** Lectures, class discussion **Assignment 2 due**	Genetics Analysis and Principles, Robert J. Brooker
Week 10	**Evolution:** - Introduction to modern evolutionary biology Genetic and ecological bases of evolutionary changes	**Quiz 2 due** Lecture and class discussion. Video on evolution and extinction of species **(outcomes 2,4,5,6)**	Genetics Analysis and Principles, Robert J. Brooker
Week 11	**Molecular Biology Techniques:** - Protein isolation and purification - Proteins analysis methods	Lectures, Class discussions and Presentations. Videos on protein isolation and purification **(outcomes 2,4,6)**	Cox Molecular Biology: Principles and Practice

Week 12	**Molecular Biology Techniques:** - DNA Extraction - Polymerase Chain Reaction - DNA Hybridization	lectures, Class discussions and Presentations **(outcomes 1,2,6)**	Cox Molecular Biology: Principles and Practice
Week 13	**Genetic Engineering:** - Mutagenesis - Cloning	Class discussions and Presentations **(1,2,6)**	Cox Molecular Biology: Principles and Practice
Week 14		End Term Exam	

5. TEACHING APPROACHES

2.12.5 Mode of Delivery;

Lectures, power point presentations, and class discussions: The instructor will give lectures in class to explain to the students various topics in Molecular Biology. The lectures will take a participatory approach where the instructor will involve students by frequently asking them questions that are meant to keep them alert in class and trigger class discussions. The instructor will also be free to answer questions from the students in the course of the lectures. **Video demonstrations and/or CD-Roms** in Molecular Biology will be shown in class when available after the relevant topic has been covered. **Assignment criteria:** Students will be given several individual or group research assignments on relevant topics.

6. KEY INSTITUTIONAL AND ACADEMIC POLICIES

- Seven absences from class will result in an automatic grade F
- All references used to do assignments should be cited correctly
- Assignments should be done and submitted on the due dates shown
- No make ups are given for tests assignments and exams

7 Course Assessment;

Distribution of Marks

Attendance & Participation	10%
Continuous Assessment Tests /Quizzes (at least 2 sit in)	20%
Term Paper/Group Assignment or Individual	15%
Mid-Quarter Exam	25%
Final Exam	30%
Total	**100%**

Grading

90 – 100	A
87 - 89	A^-
84 - 86	B^+
80 - 83	B
77 - 79	B^-
74 - 76	C^+
70 - 73	C
67 - 69	C^-
64 - 66	D+
62 - 63	D
60 - 61	D-
00 - 59	F

8 Core Reading Materials for the Course;

1. Cox, M. M., Doudna, J., O'Donnell, M. (2015). Molecular Biology: Principles and Practice. 2nd Edition. W. H. Freeman and Company, New York
2. Lodish, H., Berk, A., Kaiser, C. A., Krieger, M., Scott, M. P., Bretscher, A., Ploegh, H., Matsudaira, P. (2013). Molecular Cell Biology. 7th Edition. W. H. Freeman and Company, New York.
3. Brookker J. B. (2015), Genetics: Analysis and Principles. 5th Edition. McGraw- Hill International

9 Recommended Reference Materials;

4. Cammack, R., Attwood, T., Campbell, P., Parish, H., Smith, A., Vella, F., and Stirling, J. (Eds). (2006). Oxford Dictionary of Biochemistry and Molecular Biology. 3rd Edition. Oxford University Press, London
5. Chatterjea, M. N., Rana, S. (2012). Textbook of medical Biochemistry. 8th Edition. Jaypee Brothers Medical Publishers (P) Ltd., New Delhi
6. Jeremy, M. B., John L. T. and Lubert, S. (2002). Biochemistry. 5th Edition. W. H. Freeman & Co., New York
7. Meisenberg, G., Simmons, W. H. (2012). Principles of Medical Biochemistry. 3rd Edition. Saunders, Elsevier, Philadelphia
8. Murray, R. K., Granner, D. K., Mayes, P. A., Rodwell, V. W. (2009). Harper's Illustrated Biochemistry. 29th Edition. Lange Medical Books, New York
9. Nelson, D. L. & Cox, M. M. (2012). Lehninger Principles of Biochemistry. 6th Edition. W. H. Freeman & Co., New York
10. Reginald H. Garrett, R. H., Grisham, C. M. (2013). Biochemistry. 5th Edition. Books /Cole Cengage Learning, Belmont, CA
11. Robert, K. M., Daryl K. G., Mayes, P. A., Rodwell, V. W. (2009). Harper's Illustrated Biochemistry. 29th Edition. Lange Medical Books, New York