



Course Syllabus - MBBCh

1. Course title: Molecular Biology Module		Code: MOB21
2. Contact hours: 43 hr		
3. Number of weeks	5 weeks	
4. Level/year at which this course is offered:		Year 2 semester 1
5. Pre-requisites for this course: MBBS – YEAR -1		

Course Description:

The Course will be taught to year 2 students in semester 1 and is designed to offer an integrated approach to the learning of different levels of structure of human genome, At the end of this module the student should be able to have a better understanding of the molecular biology of healthy humans, and pathological states, from the molecular to the cellular level. The 2 week module integrates the disciplines of molecular biology in biochemistry, anatomy, pathology, pharmacology, parasitology, microbiology, physiology, and clinical practice. In this manner, students study the biomolecular structure of nucleic acids, learn about their role in molecular biology and genetics, and observe their functions inside the whole cell or within the cellular domain.

Course Learning Outcomes

CLOs		Aligned-PLOs
1	Knowledge Outcome	
K.1	Comprehend the basic concept related to the roles of DNA and RNA in protein synthesis in the cells.	A1
K.2	Apply the concepts of Molecular biology, to explain the effects of antibiotics and selected toxins on DNA and RNA.	A1
K.3	Identify the different stages of pathogenesis of neoplasia.	A1
K.4	Explain the key concepts in the genetic basis of cancer development.	A2
K.5	Describe the methods of cell-to-cell interaction and the effects of growth factors.	A1
K.6	Identify Bacterial chromosome, plasmids, transposons and bacteriophages	A1
K.7	Discuss microbial genetics in drug resistance	A1
K.8	Comprehend the uses PCR for diagnosis of infectious diseases	A2
K.9	Describe recombinant DNA vaccines against Microbes	A2
K.10	Explain the applications of molecular biological advances for clinical diagnosis.	A1
K.11	Describe different types of cell division and related abnormalities	A1
K.12	Explains causes, types, and effects of DNA mutation, repair systems and related disorders.	A2
K.13	List numerical and structural chromosomal aberrations	A1
K.14	Comprehend post-transcriptional and post-translational modifications and how they are targeted by different antibiotics and how it is linked to the tremendous variation in eukaryotic organisms in spite of relatively limited number of genes.	A2
K.15	Explain genetics of blood grouping.	A2
K.16	Distinguish the applications of molecular Techniques in parasitology	A1
K.17	Describe regulation of gene expression and its role in health and disease.	A2
K.18	Recognize drug preparation by DNA recombinant technology	A1
2	Skills	
S.1	Identify different methods of vaccine preparation by DNA recombinant technology.	B2

CLOs		Aligned-PLOs
S.2	Differentiate the microscopic characteristic features of the chromosomal abnormalities.	B1
S.3	Describes the steps of polymerase chain reaction and recombinant DNA technology.	B1
3	Attitudes:	
A.1	Identify the ethical concerns of gene cloning.	C4
A.2	Appreciate the importance of accuracy and confidentiality in paternity testing and DNA diagnostic testing.	C4

Course Delivery Plan:

Code	List of Topics	Contact Hours	Teaching Methods	Department	Week
211	Types, causes, and mechanism of Chromosomal abnormalities	1hr	L	Anatomy	3
212	Cell Division - mitosis and its abnormalities	1hr	SGD	Histology	
213	Miosis and its abnormalities ,Spermatogenesis,Oogenesis	1hr	L	Histology	
214	Structure of DNA	1hr	L	Biochemistry	
215	Oraganization of Eukaryotic DNA	1hr	L	Biochemistry	
216	Intercellular communication: vasoactivefactors	1hr	SGD	physiology	
217	Dermatographics/pedigree chart	1hr	L	Anatomy	4
218	microscopic structure of chromosmes	1hr	SGD	Histology	
219	karyotyping and its importance	1hr	SP	Histology	
2210	Intercellular communication: growth factors	1hr	SGD	physiology	
2211	cell cycle and steps in Prokaryotic DNA Synthesis	1hr	CAL	Biochemistry	
2212	DNA mutation	1hr	CAL	Biochemistry	
2213	DNA Repair1	1hr	CAL	Biochemistry	5

2214	DNA Repair2	1hr	L	Biochemistry	
2215	Structure of RNA	1hr	CAL	Biochemistry	
2216	Transcription .	1hr	SP	Biochemistry	
2217	Examples of numerical chromosomal aberrations1	1hr	SP	Histology	
2218	Examples of structural chromosomal aberrations2	1hr	SGD	Histology	
2219	Barr body preparation and its importance	1hr	SP	Histology	
2320	Genetics of blood groups	1hr	CAL	Histology	
2321	Biotechnology1	1hrs	P	Biochemistry	
2322	Post-Transcriptional Modification of RNA.	1hr	CAL	Biochemistry	
2323	Steps in protein synthesis	1hr	CAL	Biochemistry	6
2324	Biotechnology2	1hr	P	Biochemistry	
2325	Post- translational modifications	1hr	L	Biochemistry	
2326	gene expression1	1hr	L	Biochemistry	
2327	Bacteriophages, Plasmids & Transposones	1hr	L	Microbiology	
2328	Bacterial Variations	1hr	SDL	Microbiology	
2329	Transformation & Transduction	1hr	SDL	Microbiology	7
2430	MOLECULAR BASIS OF carcinogenesis-1	1hr	L	Pathology	
2431	Molecular basis of carcinogenesis-2	1hr	L	Pathology	
2432	Introduction to parasites' genomes	1hr	L	Parasitology	
2433	Applications of Molecular Techniques in Parasitology	1hr	L	Parasitology	
2434	Conjugation	1hr	TBL	Microbiology	
2435	Recombinant vaccine (Recombinant DNA technology & PCR) 1	1hr	SBIL	Microbiology	
2436	Recombinant vaccine (Recombinant DNA technology & PCR) 2	1hr	Practical	Microbiology	
2437	Hallmarks of Cancer	1hr	L	Pathology	
2438	Etiology of cancer: carcinogenic agents	1hr	L	Pathology	

2439	Drugs prepared by DNA recombinant technology	1hr	p	pharmacology
2540	DNA extraction	1h	P	Biochemistry
2541	Recombinant technology,PCR.Blotting Technique 1	1h	SP	Biochemistry
2542	Recombinant technology,PCR.Blotting Technique 2	1h		
2543	gene expression2	1hr	L	Biochemistry

Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Course Learning Outcomes	Teaching Strategies	Assessment Methods
Describe all basic concepts related to the roles of DNA and RNA in protein synthesis in the cells.	Oral Presentation Teamwork Problem Solving Skills CAL: computer assessed learning SDL: Student directed Learning; Lecture SP: Students Presentations SGD: small group discussion SBIL: Student based interaction TBL: Team based learning	<ul style="list-style-type: none"> - Comprehensive exam - class sharing - elective projects - clinical skills - End of year 2: OSPE stations to assess laboratory skills - End of year 2: written exam: MCQs and
Explain the applications of PCR.		
Apply the concepts of Molecular biology, to explain the effect of antibiotics and selected toxins on DNA and RNA.		
Identify the different stages of cell division		
Identify the key concepts in the genetic basis of cancer development.		
Elicit different ways of cell interaction and growth factors.		
Explain the principle of DNA electrophoresis.		
Explain the principle of PCR		
Explain the steps of DNA extraction		

Course Learning Outcomes	Teaching Strategies	Assessment Methods
Recognize the microscopic characteristic features of the chromosomal abnormalities.		short essay questions.
Awareness about the drugs formed by recombinant DNA technology		
Awareness to the importance of the regulation of gene expression and its impact on the degree of complexity of different organisms.		
oriented about different methods of vaccine preparation by DNA recombinant technology		
Acquire computing skills to gather, organize and appraise information including the use of information technology where applicable.		

2. Assessment Tasks for Students

#	Assessment task	Week Due	Percentage of Total Assessment Score	Date
1	Continuous Assessment	first semester	16%	
2	Midsemester Exam	first semester	16%	17 October 2022
3	Final Exam	first and second semester	68 %	Jan 2023

Mark Distribution

Subjects	Teaching Hours	Marks	no. of questions	TOTAL Exam Marks of	% of mark
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				semester 1 (15%)	
Anatomy, embryology	2	0.5	2	9	5.6%
Biochemistry	18	2.5	10		
Histology	8	1	4	5	20.0%
Microbiology	6	1	4	12	8.3%
Parasitology	2	0.5	2	10	5.0%
Pathology	4	1	4	18	5.6%
Pharmacology	1	0	0	17	0.0%
Physiology	2	0.5	2	8	6.3%
Name of Assessment	Assessment Method		Marks	% from Total	Time of Assessment
Continuous Assessment	quizzes, assignments, class share, attendance, scientific activity, elective project		7	16.00%	first semester
Midsemester Exam	MCQ		7	16.00%	first semester
Final Exam	MCQ, OSPE, Oral		29	68%	first and second semester
Total			43	100%	

Blueprint of Molecular Biology Module

Instructions:

1- Mapping the course topics and activities to the recommended measurement instruments (Course blueprint)

2- L = Lecture, T = Tutorial, S = Seminar, PBL = Problem-based Learning, LPS = Laboratory practical session, CPS = Clinical practical session, ADL = Assessment during learning

No.	Topic	MCQs	SAQs	ADL	Spotter	OSPE	Mini CEX	Logbook	Portfolio
1	Dermatographics /pedigree chart	√							
2	Types, causes, and mechanism of Chromosomal abnormalities	√							
3	Cell Division - mitosis and its abnormalities	√							
4	Genetics of blood groups	√							
5	Meiosis and its abnormalities ,Spermatogenesis, Oogenesis	√							
6	Structure of DNA	√							
7	Organization of Eukaryotic DNA	√							
8	cell cycle and steps in Prokaryotic DNA Synthesis	√							
9	DNA mutation	√							
10	DNA Repair	√							
11	Structure of RNA	√							
12	Post-Transcriptional Modification of RNA.	√							
13	Steps in protein synthesis	√							
14	Post- translational modifications	√							
15	gene expression	√							
16	Transcription.	√							
17	Intercellular communication	√							
18	Molecular basis of carcinogenesis	√							
19	Hallmarks of Cancer	√							
20	Etiology of cancer: carcinogenic agents	√							
21	Introduction to parasites' genomes	√							
22	Applications of Molecular Techniques in Parasitology	√							
23	Drugs prepared by DNA recombinant technology	√							

24	Conjugation	√							
25	Bacteriophages, Plasmids & Transposones	√							
26	microscopic structure of chromosomes	√		√					
27	karyotyping and its importance	√		√					
28	Examples of numerical chromosomal aberrations	√		√					
29	Barr body preparation and its importance	√		√					
30	Biotechnology					√			
31	DNA extraction					√			
32	Recombinant technology, PCR Technique					√			
33	Recombinant vaccine (Recombinant DNA technology & PCR)					√			
34	Bacterial Variations	√							
35	Transformation and Transduction	√							

Learning Resources and Facilities

1. Learning Resources

References Books and other reading resources

Anatomy	<ol style="list-style-type: none"> 1. Arthur, F. D. and Anne, M. R. (2023) <i>Clinically oriented anatomy</i>, 9th ed., Philadelphia: Wolter Kluwer 2. Williams,P.L (1995) <i>Gray's anatomy</i>, 38th ed., Churchill Livingstone 3. Snell, R.S. (2010) <i>Clinical neuroanatomy</i>, 7th ed., Philadelphia: Wolters Kluwer 4. Agur, A.M.R. (2021) <i>Grant's atlas of anatomy</i>, 15th ed., Philadelphia: Woletrs Kluwer
Histology	1- Anthony L. Mescher, (2018). <i>Junqueira's Basic histology text & atlas</i> , 15e. McGraw-Hill Education, New York.
Physiology	Physiology: Hall, J. E., & Hall, M. E. (2020, June 16). <i>Guyton and Hall Textbook of Medical Physiology</i> .
Biochemistry	<ul style="list-style-type: none"> - Murray..., R.K., Granner, D., & Rodwell, V.W. (2003). <i>Harper's Illustrated Biochemistry</i>. - Armutak, E.I. (2021). <i>Lippincott's Illustrated Reviews: Biochemistry 6 th Edition</i>. - Janson, L. W., & Tischler, M. E. (Eds.). (2012). <i>The big picture: medical biochemistry</i>. McGraw-Hill Medical. - Lieberman, M.A., & Ricer, R.E. (2020). <i>Board Review Series: Biochemistry, Molecular Biology, and Genetics, 7e</i>.
Pharmacology	Pharmacology: Tripathi, K. D. (2018, October 31). <i>Essentials of Medical Pharmacology</i> .
Pathology	Pathology: Kumar, V., Abbas, A. K., & Aster, J. C. (2017). <i>Robbins Basic Pathology (10th ed.)</i> . Elsevier - Health Sciences Division.
Electronic Resource	<ul style="list-style-type: none"> • AMBOSS • Access Medicine • UptoDate

2. Facilities Required

Item	Resources
Accommodation	Classrooms, laboratories,

Item	Resources
Technology Resources	Smart Board, LMS course content/ LMS quizzes / LMS dropbox / LMS discussion / MS Office tools / Internet search engines / Demonstration videos
Other Resources	PCR-machine Refrigerated high speed centrifuges. UV Camera Electrophoresis unit.

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