Course Specifications

General Information

Course name	Medical Molecular Biology
Course number	AMSL4335
Faculty	
Department	
Course type	Major Needs
Course level	4
Credit hours (theoretical)	3
Credit hours (practical)	0
Course Prerequisites	

Course Objectives

1 - Introduce the students to the basic concepts of molecular biology
2 - Studying nacromolecules and nucleic acid structure
3 - Understanding the DNA replication, mutation and repair system
4 - Learning all techniques of gene manipulation and its applications
5 - Application of molecular biology in medicine
6 - Molecular biology of cancer

Intended Learning Outcomes

Knowledge and Understanding	* Basic knowledge about modern concepts of molecular biology
	* Molecular biology application in medicine and biotechnology
Intellectual Skills	* Using molecular biological techniques to treat cancer
	* How can molecular biology used in agriculture and industry?
Professional Skills	* Learning cloning techniques and sequencing
	* Learning conventional and real time PCR techniques
General Skill	* Ability to apply molecular biology in medicine, agriculture and industry

Course Contents

1 - Introduction to molecular biology, cells and macromolecules
2 - Properties of nucleic acids
3 - Prokaryotic and eukaryotic chromosome structure
4 - DNA replication
5 - DNA damage, repair and recombination
6 - Gene manipulation
7 - Cloning vectors
8 - Gene libraries and screening
9 - Analysis and uses of cloned DNA
10 - Transcription in prokaryotes
11 - Regulation of transcription in prokaryotes
12 - Transcription in eukaryotes
13 - Translation in prokaryotes and eukaryotes
14 - Functional genomics and new technologies

Teaching and Learning Methods

1 - Lectures
2 - Discussion and Seminars
3 - Case reports

Teaching and Learning Methods for the Disabled Students

1 - None

Students Assessment

Assessment Method	TIME	MARKS
First Midterm Exam	Week 6	20%
Second Midterm Exam	Week 12	20%
Attendance and Quises	Over the semester	10%
Final Exam	Week 16	50%

Books and References

Course note	PowerPoint Presentations
Essential books	Instant notes of molecular biology, by McLennan; 2007, by Taylor & Francis Group
Recommended books	Genes VII, By Benjamin Lewin, 2000
	Molecular biology in medicine, by Cox and Sinclair, 2010
Other References (Periodical, web sites, ... etc.)	http://www.macmillanhighered.com/catalog/static/whf/lodish4e/

Knowledge and Skills Matrix

Main Course Contents	Study Week	Knowledge and Understanding	Intellectual Skills	Professional Skills	General Skill
Introduction to molecular biology, cells and macromolecules	1	Student should understand perfectly the cellular classification, subcellular organelles and macromolecules	Ability to understand the role of macromolecules and micromolecules in cell cycle		Get appropriate basic concepts of cell structure and cellular classificatio n
Properties of nucleic acids	2	Understanding the nucleic acid structure Knowledge about chemical and physical properties of nucleic acids	Ability to understand the spectroscopic and thermal properties of nucleic acids	Using spectroscopy to estimate the purity and concentration of nucleic acids	Structure of DNA and RNA, their physical and chemical properties
Prokaryotic and eukaryotic chromosome structure	3	Prokaryotic chromosome structure Chromatin structure Eukaryotic chromosome structure	Searching and imagine genome complexity	Have the basis of the flow of genetic information in the cell nucleus	Chromosom e structure of both prokaryptes and eukaryotes
DNA replication	4	Understanding the DNA replication in Bacteria (Prokaryote)n Understanding the DNA replication in Human (Eukaryote)n	DNA replication during the cell cycle		Comprehen sive information on both prokaryotic and eukaryotic DNA replication stratigies
DNA damage, repair and recombination	5	Understanding the basis of Mutagenesis Knowledge about the physical and chemical agents that damage DNA Understanding the mechanisms of DNA repair system	The role of mutations in cancer How our body correct and get rid from those mutations in DNA		Have good information about recombinati on in DNA, its damage and repair

Gene manipulation	7	Overview on gene cloning Preparation of plasmid DNA Understanding the power of genetic engineering	How to use different restriction enzymes and electrophoresis techniques in DNA manipulation	Ability to perform ligation, transformation and analysis of recombinants	All basis of gene cloning and its applications
Cloning vectors	8	Design of plasmid vectors Knowledge of bacteriophage vectors		Construct of plasmid vector by using mini-, medi- and maxi-preparation kits	Knowing the basic steps of vectors constructio n , mainly plasmid, cosmid and bacteriopha ge vectors
Gene libraries and screening	9	Understanding the Genomic libraries Understanding the cDNA libraries	Differences and main applications of DNA libraries versus cDNA libraries	Construction and using different screening procedures of genomic libraries	
Analysis and uses of cloned DNA	10	Understanding the characterization of clones Knowledge about the polymerase chain reaction Understanding the basis of nucleic acid sequencing	Ability to organize newly cloned genes	Performing different types of polymerase chain reaction including both conventional and real time. As well as sequencing techniques	Application s of cloning in life
Transcription in prokaryotes	11	Understanding the basic principles of transcription in Bacteria	Role of Escherichia coli RNA polymerase and its sigma□70 promoter		Get good knowledge on Transcriptio n, including its three steps: initiation, elongation and termination
Regulation of transcription in prokaryotes	13	Understanding the lac operon Understanding the trp operon	How and when E. coli can up-regulate or down-regulate the transcription of lac and trp operons		Student should be able to differentiate between activation and regulation of transcriptio n in prokaryotes

Transcription in eukaryotes	14	Understand the role of the three RNA polymerases in Eukaryotic transcription process	General transcription factors and RNA Pol II initiation		Student should be able to track the differences in transcriptio n between eukaryotes and prokaryotes
Translation and Protein synthesis	15	Understanding the the genetic code Knowledge about the role of t-RNA in translation and its structure	Translational control and post-translational events		Student should have good knowledge and information about mechanism of protein synthesis