DEREE COLLEGE SYLLABUS FOR: BI 3336 MOLECULAR BIOLOGY	3/2/4
(Previously: BI 3235 CELL AND MOLECULAR BIOLOGY) (Updated: Spring 2024)	**UK LEVEL: 5** **UK CREDITS: 20**
PREREQUISITES:	BI 1000 Introduction to Biology I BI 1101 Introduction to Biology II BI 2222 Cell Biology
CATALOG DESCRIPTION:	An integrated exploration of the fundamentals of molecular biology as a science, the nature of life, biological chemistry, cell biology, metabolism and genetics.
RATIONALE:	Molecular Biology demonstrates an in depth understanding of the nature of inheritance, how life exists and depends on the ability of the cells to maintain, retrieve, and translate the genetic information stored in genes, which determine the characteristics of specialized cell types and complex multicellular organisms. The illustration of the main concepts of mechanisms in gene replication, mutation, and expression in a wide range of microbial and mammalian systems along with the application of various molecular techniques, will provide a valuable experience and opportunity in handling and manipulating the genetic material in an advanced lab environment.
LEARNING OUTCOMES:	As a result of taking this course, the student should be able to: 1. Acquire knowledge of the basic genetic mechanisms. 2. Demonstrate understanding of the organization and expression of the genetic material in connection to health and disease. 3. Understand the principles of genetic manipulation and molecular techniques. 4. Demonstrate knowledge of the molecular mechanisms of apoptosis and cancer. 5. Demonstrate practical competence in research methods, develop and demonstrate skills for interpreting and retrieving information. 6. Develop laboratory practical skills and teamwork in several advanced methods of cell and molecular biology.
METHOD OF TEACHING AND LEARNING:	In congruence with the teaching and learning strategy of the college, the following tools are used: ○ Class lectures, interactive learning (class discussions, group work) video presentations, tutorials and practical problems solved in class. ○ Exercises and primary source documents are assigned as homework, the solutions of which are reviewed in class. ○ Laboratory work (laboratory reports). ○ Office hours: students are encouraged to make full use of the office hours of their instructor, where they can ask questions, see their exam paper, and/or go over lecture/lab material. ○ Use of a blackboard site, where instructors post lecture notes, assignment instructions, timely announcements, as well as additional resources.

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<tr>
<td>ASSESSMENT:</td>
<td>Summative:
<table>
<tr><td>1st assessment: In-class midterm examination (Multiple choice, short answers, matching, essay questions, combination, problem solving)</td><td>30%</td></tr>
<tr><td>2nd assessment: a) Lab report, 1500-2000 words (10%), b) In-class lab quiz (10%)</td><td>20%</td></tr>
<tr><td>Final assessment: In-class final examination (2-hour)
(Essay questions, short answers, problem solving, multiple choice, matching questions)</td><td>50%</td></tr>
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Formative:
<table>
<tr><td>Multiple "diagnostic on-line" tests, Multiple choice, short answers, essay questions</td><td>0%</td></tr>
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The formative assessments aim to prepare students for the examinations.
Students are expected to submit feedback on their performance.
The lab report tests mainly the learning outcomes 5 & 6.
The midterm examination tests Learning Outcomes 1 & 2.
The final examination tests learning outcomes 1-4.</td>
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<tr>
<td>INDICATIVE READING:</td>
<td>REQUIRED READING:

Alberts, Molecular Biology of the cell, 7th Edition, (2022), Publisher, W. W. Norton & Company.

RECOMMENDED READING:
Fragkos et al, DNA replication origin activation in space and time, Nat Rev Mol Cell Biol. 2015 Jun;16(6):360-74. doi: 10.1038/nrm4002.

Other sources, including journal articles, research papers etc. recommended by the instructor throughout the semester.</td>
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<tr>
<td>INDICATIVE MATERIAL:
(e.g. audiovisual, digital material, etc.)</td>
<td>REQUIRED MATERIAL:
N/A

RECOMMENDED MATERIAL:
N/A</td>
</tr>
<tr>
<td>COMMUNICATION REQUIREMENTS:</td>
<td>Verbal and written skills using academic / professional English</td>
</tr>
<tr>
<td>SOFTWARE REQUIREMENTS:</td>
<td>Microsoft Office & Blackboard CMS</td>
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<tr>
<td>WWW RESOURCES:</td>
<td>https://geneed.nlm.nih.gov/specialty.php?spageID=2#topic16
http://www.dnalc.org/
www.sciam.com.
http://www.cellsalive.com/
http://www.dnaftb.org/dnaftb/
http://www.usd.edu/biol/labs/151/devel51.htm)</td>
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	http://www.learner.org/courses/biology/archive/animations.html https://genographic.nationalgeographic.com/genographic/lan/en/atlas.html http://www.mcb.harvard.edu/BioLinks.html http://www.ornl.gov/sci/techresources/Human_Genome/project/about.shtml http://www.nature.com/index.html
INDICATIVE CONTENT: LECTURE	1. The structure and function of genetic material 2. Chromosomes, chromatin structure, mutations 3. DNA replication, DNA repair and recombination 4. Basic mechanisms of transcription, mRNA processing and translation 5. Control of gene expression 6. Techniques in molecular biology 7. Analysing and manipulating DNA 8. Studying gene function and expression 9. Cell death mechanisms 10. Cancer
INDICATIVE CONTENT: LAB	1. Laboratory Safety Guidelines & Regulations 2. Genomic DNA extraction and purification 3. DNA amplification design in silico and PCR 4. PCR analysis on agarose gel electrophoresis 5. Bacterial culture techniques, plasmid transformation and plasmid digestion 6. Plasmid DNA isolation, agarose gel electrophoresis and restriction enzyme digestion 7. Restriction enzyme digestion analysis and introduction in aseptic techniques in cell culture 8. Microscope use, cell line thawing and expansion 9. Cell line freezing and cryopreservation techniques 10. Genome editing technologies and transgenics in silico