Subject Description Form

Subject Code	ABCT2102
Subject Title	Molecular Biology
Credit Value	3
Level	2
Pre-requisite	General Biology
Objectives	In this subject, students will learn the molecular processes of the genes, and the importance of these processes in living organisms.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) have an understanding of the structure and behavior of the genetic materials, (b) appreciate and understand the importance of and the mechanism of producing new copies of the genetic material, (c) comprehend the similarities and differences in the gene expression mechanisms in prokaryotes and eukaryotes, (d) have a basic understanding of the gene regulatory mechanisms in prokaryotes and eukaryotes, and the importance of gene regulation.
Subject Synopsis/ Indicative Syllabus	**Mendelian Genetics** **Non-Mendelian Genetics** **The genetic materials and chromatin:** Composition and structure of DNA and RNA, organization of DNA in chromosomes. **Chromosomes:** viral genomes. Bacterial genomes. Eukaryotic chromatin and chromosomes, centromeres, telomeres. **Chromosomal inheritance and chromosomal abnormalities** **DNA replication:** semi-conservative and semi-discontinuous replication of DNA; the replicon, initiation, DNA polymerases, primase, leading strand and lagging strand; Okazaki fragments. **Transcription:** prokaryotic promoters and terminators; RNA polymerase and sigma factors. Eukaryotic promoter elements, promoter proximal elements, enhancers, general transcription factors, activators; 5'-capping, 3'-polyadenylation, splicing of transcript. **Translation:** Initiation, elongation, and termination processes; the ribosome and the rRNAs. **Transposable elements:** transposons, jumping genes and retrotransposons. **Regulation of prokaryotic gene expression:** positive and negative controls, the operon, regulatory RNA (attenuation and termination), phage strategies (lytic vs lysogenic pathways). **Regulation of eukaryotic gene expression:** Different levels of control,

<table>
<tr><td></td><td>transcription factors and transcription regulator proteins; chromatin remodeling; gene silencing by methylation; alternative polyadenylation and alternative splicing.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>The basic concepts of these molecular processes will be explained in lectures with the inclusion of interactive animations to aid the student to understand the more complex molecular events. In tutorials, students will have discussion sessions to enhance their learning while probing questions and exercises will be used to gauge the learning outcomes of the students.

Students should also reinforce their learning through self-learning from the textbook and from the web learning facilities available from the publisher.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="6">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td><td></td><td></td></tr>
<tr><td>1. Attendance</td><td>5%</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2. Test 1</td><td>20%</td><td>✓</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>3. Test 2</td><td>25%</td><td></td><td></td><td>✓</td><td>✓</td><td></td><td></td></tr>
<tr><td>4. Written examination</td><td>50%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="6"></td></tr>
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Students' understanding of the basic concepts and knowledge in the structure of the genetic materials as well as the process in duplicating the genetic materials will be assessed through the first written test.

The expression of genes and how the genes are regulated will be assessed in the second written test.

In the written examination, students will be required to demonstrate their understanding of most of the molecular biology processes inside the cell.

Students are required to attend at least 75% of scheduled sessions for the subject. Students fail to fulfill the attendance requirement will lose the 5% attendance score and not be eligible to register ABCT4108.</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lectures
▪ Tutorials</td><td>22 Hrs.
10 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Self study</td><td>78 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>110 Hrs.</td></tr>
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<tr><td>Reading List and References</td><td>Russell, Peter J. iGenetics – A Molecular Approach Pearson 2014</td></tr>
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