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| **Module code** | SB-4342 | | |
| **Module Title** | Advanced Genetic Analysis | | |
| **Degree/Diploma** | Bachelor of Science (Biology) | | |
| **Type of Module** | Major Option | | |
| **Modular Credits** | 4 | **Total student workload** | 8 hours/week |
| | | **Contact hours** | 7 hours/week |
| **Prerequisite** | SB-2211 Genetics | | |
| **Anti-requisite** | None | | |

**Aims**

This module is designed for students to apply the combined power of classical and molecular genetics in investigating a wide range of biological questions. A variety of model organism commonly used will be introduced, and their use for studying a specific trait, disease, or phenomenon will be discussed. The students will also engage in discussion based on the primary literature to conceptualise a plan for studying key biological questions at the molecular level. The development of high throughput sequencing technologies have dramatically transformed the field of genetic research, and therefore this course will be ideal for those interested in pursuing the field of genomics.

**Learning Outcomes:**

*On successful completion of this module, a student will be expected to be able to*:

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| Lower order : | 40% | - Describe the definition of a gene<br>- Describe gene organisation and chromosome structure<br>- Describe the advantages and potential limitations of various model organism.<br>- Understand the general principles of mutant analysis.<br>- Identify mutation.<br>- Discuss the various tools in reverse genetics.<br>- Explain the concept and purpose of genome-wide mutant screens. |
| Middle order : | 40% | - Characterise the phenotype of a mutation.<br>- Associate mutant phenotype to DNA sequence.<br>- Classify mutation defects on the basis of its effect on the function.<br>- Determine functionally related genes on the basis of their interaction and/or infer a logical order in which genes function in a pathway. |
| Higher order: | 20% | - Participate in tutorial discussion of selected topics in genetic analysis.<br>- Conduct a presentation on non-conventional model organisms used in research and discuss their limitations<br>- Work effectively in groups to develop a plan for investigating a key biological question. |

**Module Contents**

- The basis for genetic analysis
- Genomes, chromosomes and epigenetics
- Model organisms and their genomes
- Identifying and classifying mutants
- Connecting phenotypes with DNA sequences
- Mutant phenotypes and gene activity
- Reverse genetics
- Genome editing
- Genome-wide mutant screens
- Gene interactions: suppressors and enhancers
- Epistasis and genetic pathways
- Pathways, networks and phenotypes

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| **Assessment** | Formative assessment | Module assessment will be based on tutorial assignments, short test, presentation, problem-based discussion, and written reports. |
| | Summative assessment | Examination: 60% |
| | | Coursework: 40%<br>- Two (2) individual assignments (10%)<br>- One (1) individual presentation (10%)<br>- One (1) individual laboratory report (10%)<br>- One (1) class test (10%) |