ZSCI H4101: Molecular Genetics and Immunology 1

Module Title:	Molecular Genetics and Immunology 1
Language of Instruction:	English

Credits:	5

NFQ Level:	8

Module Delivered In	1 programme(s)

Teaching & Learning Strategies:	This module will be taught in three theory classes, of one hour each, per week. Timetabling will also accommodate tutorial classes during the year, totaling 1 hr per week. Relevant class notes, diagrams and self assessment tools will be available at the Institute's student common drive. Class will be subjected to regular informal testing and peer teaching and learning during class time. Emphasis will be given to case studies linking concepts to realistic situations. Students will be required to review and summarise key published papers on certain topics.

Module Aim:	The aim of this module is to give students a functional competency in the theoretical knowledge and the methods of molecular genetics, biotechnology and immunology.

Learning Outcomes	
On successful completion of this module the learner should be able to:	
LO1	Describe and discuss the basic techniques and applications of genetic engineering, molecular diagnostics and recombinant DNA technology and relate these to biotechnology research and development.
LO2	Outline fundamental principles of eukaryotic genetics at the molecular level, with special emphasis to human disease.
LO3	Discuss the role of safety in creation, handling, storage and disposal of genetically engineered microorganisms with respects to the legislation governing this sector.

Pre-requisite learning
Module Recommendations *This is prior learning (or a practical skill) that is recommended before enrolment in this module.*
No recommendations listed
Incompatible Modules *These are modules which have learning outcomes that are too similar to the learning outcomes of this module.*
No incompatible modules listed
Co-requisite Modules
No Co-requisite modules listed
Requirements *This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.*
No requirements listed

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Module Content & Assessment

Indicative Content
Molecular Genetics Nucleic Acid Technologies and Diagnostics: Gene Cloning Recombinant DNA technology. PCR. Cloning vectors. cDNA libraries. DNA sequencing. Clone identification using nucleic acid hybridization and gene probes. Southern blotting. DNA microarrays. Real time PCR. Protein engineering and biotechnology applications. Genomics: Structural genomics: Gene characterization. Genomics projects. Genome sequencing using mapping and direct shotgun approaches. Genetic markers; SNPs and Haplotypes. Functional genomics: Identifying genes in DNA sequences. Homology searches to assign gene function. Describing patterns of gene expression. Assigning Gene Function Experimentally; Gene knockout/knock down, Microarrays and RNA interference. Comparative genomics: case study genes as appropriate: HAR-1 gene, FOXP2 gene , ASPM gene, human frataxin, the globin gene family. Representaional oligonucleoide microarray analysis (ROMA). Genomics projects. The Human Genome Project. Bioethics and the Human Genome Project. Genes and Disease: Detection of genetic disorders using molecular diagnostics, Chromosomal aberrations. Genetically based enzyme deficiencies. Gene control of protein structure: sickle cell anaemia. Trinucleotide repeat expansions and human disease. Genes and cancer. Detection and isolation of genes causing disease, case study: the cystic fibrosis gene. Safety and the genetic manipulation of organisms: Categorisation and containment: naturally – occurring organisms and GMOs. Biohazard waste disposal. Genetically engineered products. Possible hazards from GMOs. Genetic traceability. Regulatory bodies and legislation.
Practical Practical's will be delivered as tutorials focusing on problem solving and assisting the student in the interpretation and analysis of molecular data generated through modern molecular techniques including; qPCR, Microarray analysis, Southern hybridization analysis, Eliza, Restriction digests, Primer/probe design and optimization, Manipulation of raw sequence data via bioinformatic tools, Sequencing and DNA fingerprinting. Above techniques will be adopted and substituted as appropriate. In addition to the tutorials students will be asked to review, summarise and present key research papers and current developments in topics encountered during the course of study. Material and presentations generated will be assessed on an ongoing basis.

Assessment Breakdown	%
Continuous Assessment	40.00%
Practical	60.00%

Special Regulation
Learners are required to achieve a minimum grade (35%) in both CA and Practical.

Continuous Assessment

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Multiple Choice Questions	n/a	1,2	20.00	n/a
Examination	n/a	1,2	20.00	n/a

No Project

Practical

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Practical/Skills Evaluation	Practical work sheets and paper reviews	1,2,3	60.00	n/a

No End of Module Formal Examination

SETU Carlow Campus reserves the right to alter the nature and timings of assessment

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Module Workload

Workload: Full Time		
Workload Type	*Frequency*	*Average Weekly Learner Workload*
Lecture	12 Weeks per Stage	3.00
Laboratory	12 Weeks per Stage	1.00
Estimated Learner Hours	12 Weeks per Stage	6.42
	Total Hours	125.00

Module Delivered In

Programme Code	Programme	Semester	Delivery
CW_SABTP_B	Bachelor of Science (Honours) in Biosciences with Biopharmaceuticals	7	Mandatory