BIOL09041
Applied Diagnostics and Immunotechnologies

Full Title	Applied Diagnostics and Immunotechnologies		
Status	Uploaded to Banner	**Start Term**	2020
NFQ Level	09	**ECTS Credits**	10
Module Code	BIOL09041	**Duration**	26 Weeks - (26 Weeks)
Grading Mode	Numeric	**Department**	Physical & Life Sciences
Module Author	Teresa Kenirons		
Co Authors	Karen Finn		

Module Description

This module will address the key principles at the forefront of the fields of immunotechnology, molecular diagnostics and rapid microbiological testing. A comprehensive overview of the current and emerging technologies used in the analyses of pharmaceutical and biological samples will be covered.

	Learning Outcomes ***On completion of this module the learner will/should be able to:***
1.	Develop a systematic understanding of knowledge at the forefront of the field of immuno- and molecular diagnostics and rapid microbiological testing.
2.	Critically comment on the technical range of standard and specialised research tools and techniques of enquiry including immunoassays, polymerase chain reaction (PCR) and next generation sequencing (NGS).
3.	Articulate the key considerations of assay validation methods and sensitivity and specificity determinations.
4.	Develop new skills to a high level, including novel and emerging techniques such as antibody purification for use in the development of immunodiagnostic assays.

Indicative Syllabus

1. Molecular Diagnostics

Nucleic acids and proteins; Gene expression and epigenetics; Nucleic acid extraction methods; Resolution and detection of nucleic acids; Analysis and characterisation of nucleic acids and proteins; Nucleic acid amplification; Chromosomal structure and chromosomal mutations; Gene mutations; DNA sequencing; DNA polymorphisms; Molecular Detection of inherited disease; Molecular Oncology; DNA-based tissue typing; Quality assurance and quality control in the molecular diagnostics laboratory.

2. Rapid Microbiological Method

Detection and Identification of microorganisms; Rapid methods of detection and enumeration of bacterial indicator organisms.

Nature of Bacterial Endotoxin. Review of LAL Gel Clot Procedure for Endotoxin testing. Advanced Methods of Endotoxin Testing: Kinetic Chromogenic and Kinetic Turbidimetric LAL methods; PyroGene using Recombinant Factor C. Regulatory aspects of Endotoxin testing.

Rapid Bacterial Identification using the Biolog System

3. Immunodiagnostics

Immunoassay configurations; Immunoassay components; Related techniques-IHC and ICC; Immunoassay development; Immunoassay implementation; Product technology; Clinincal applications

Teaching and Learning Strategy

Teaching and learning strategies include lectures and laboratory workshops. Lectures will be supported by PowerPoint slides and Technology-enhanced learning tools that will be made available to the students *via* Moodle. In the laboratory workshop students will develop a new skill of antibody purification for use in the development of immuno-diagnostic assays. Students will gain tacit knowledge of the processes involved in the down-stream purification of antibodies. Antibody concentration and purity will be assessed, and functionality of the antibody product will be tested by application to an Enzyme linked immunosorbent assay (ELISA). Troubleshooting scenarios will be introduced at each level of the process to ensure that students have gained an in-depth knowledge and understanding of the method.

Assessment Strategy
Continuous assessment (CA) and laboratory workshops. CA will consist of a Moodle-based examination that assesses student knowledge of theory. Practical evaluation will consist of scientific report writing and data handling exercises that encourage student exploration/discovery of more in-depth knowledge of antibody purification and the underlying theory.

Repeat Assessment Strategies
Repeat module components as dictated based on student performance and the programme board.

Indicative Coursework and Continuous Assessment:		**100 %**		
Form	***Title***	***Percent***	***Week (Indicative)***	***Learning Outcomes***
Assignment	Immunodiagnostics	40 %	OnGoing	1,2,3,4
Assessment	Molecular Diagnostics	30 %	OnGoing	1,2,3
Assessment	Rapid Microbiological Methods	30 %	OnGoing	1,2

Blended Delivery Mode Average Weekly Workload:			**4.85 Hours**		
Type	***Description***	***Location***	***Hours***	***Frequency***	***Weekly Avg***
Online Learning	Theory	Not Specified	3	Weekly	3.00
Practical	Practical	Laboratory	24	Once Per Semester	1.85

Required Reading Book List
Buckingham, L., (2019). *Molecular Diagnostics*. ISBN 0803668295 ISBN-13 9780803668294
Wild, D., (2013). *The Immunoassay Handbook*. Elsevier Science. ISBN 0080970370 ISBN-13 9780080970370

Online Resources
www.lonza.com
www.criver.com
www.idexx.com
www.biolog.com

Other Resources
Laboratory Manuals

Programme Membership
GA_SADVG_O09 202000 Postgraduate Diploma in Science in Advanced Biopharmaceutical Science