

Module Code	Pre-requisite Module codes	Co-Requisite Modules code(s)	ISCED Code	Subject Code	ECTS Credits	NFQ Level (CPD)#
CMPU 4015					5	8
Module Title	Bioinformatics					

Bioinformatics

School Responsible:	School of Computing
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Module Overview:

Rapid improvements in genome sequencing and amino acid sequencing have led to an explosion in the volume and availability of such data that requires analysis, to derive valuable biological information for improving our understanding of normal and pathological biological process. This analysis can only readily be achieved via the use of computer and computer technology. This course introduces the student Bioinformatics, a discipline that utilises computational algorithms to analyse biological data from bioinformatics databases to further our understanding of the fields of biology, molecular and evolutionary biology and genetics.

In the bioinformatics 1 module will introduce the student to the basic biological process associated with genetic and protein data; the basic computational techniques required to elicit basic biological information, such as similarity of sequences and a basic introduction to the type of biological data currently available and how to obtain it. Furthermore the module will teach them to develop basic bioinformatics tools using current bioinformatics programming languages.

Learning Outcomes (LO):

On Completion of this module, the learner will be able to

1	Discuss the process involved in gene regulation and its impact on evolution of the genome
2	Discuss the importance of gene and protein sequences in furthering our understanding of biological and pathological processes.
3	Discuss basic computational techniques used to analyse this data to be able to determine the fundamental location of genes and fundamental structure of proteins
4	Discuss the how to analyse DNA and protein sequences to determine their potential functionality.
5	Describe the main sources of bioinformatics data and how to obtain and understand the information located in these sources.
6	Provide skills to develop basic bioinformatics applications using current bioinformatics programming languages

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Indicative Syllabus:

The basics of cellular and molecular biology

The structure of DNA and Proteins and sequences related to their important characteristics.

The translation of genetic material into proteins and its regulatory process.

Differences in regulation between different classifications of cells.

The impact of regulatory differences on finding core sequences and its implications for computational analysis.

Coverage of the essential areas, such as dynamic arrays, hash tables and pattern matching, of the bioinformatics programming language: Perl.

Development of applications using Perl to find basic regulatory sequences in genetic data.

The basic of pair wise alignment techniques; such as DOT PLOT matrices

An introduction to the evaluation of the similarity of these areas of alignment and its implication for gene and protein functionality.

Learning and Teaching Methods:

The course delivery involves a combination of lectures and labs which may incorporate the use of blended learning techniques as appropriate throughout the delivery.

Total Teaching Contact Hours	39
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Total Self-Directed Learning Hours	61
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Module Delivery Duration:

This module is delivered over one semester

Assessment

Assessment Type	Weighting (%)	LO Assessment (No.)
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Final Exam	60	1 to 6
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In Class Assessment	40	1 to 6
Module Specific Assessment Arrangements (if applicable)		
(a) Derogations from General Assessment Regulations		
(b) Module Assessment Thresholds		
(c) Special Repeat Assessment Arrangements		

<p>Essential Reading: (author, date, title, publisher)</p> <p>Klug, W. et al 2010 Essentials of Genetics 7ed International Edition, Benjamin Cummins, Pearson.</p> <p>Zvelebil, M. and O Baum, J. 2007, <i>Understanding Bioinformatics</i>, Garland Science, ISBN: 9780815340249</p> <p>Lesk, A.M., 2008 <i>Introduction to Bioinformatics</i> 3ed Oxford University Press</p> <p>Baxevanis, A and Ouellette, F. 2005 <i>A practical guide to the analysis of genes and proteins</i> 3rd edition Wiley</p> <p>Tisdall, J.D. 2001. <i>Beginning Perl for bioinformatics</i>. O Reilly : ISBN 978-0-596-0080-6</p> <p>Supplemental Reading: (author, date, title, publisher)</p> <p>Bioinformatics database website: ,</p> <p>Bioinformatics Perl website:</p>

Version No:		Amended By	
Commencement Date		Associated Programme Codes	

Modules that are to be offered as Stand-Alone CPD Programmes must have an NFQ level assigned

*Details of the assessment schedule should be contained in the student handbook for the programme stage.

Date of Academic Council approval

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