Subject Description Form

Subject Code	HTI5052
Subject Title	Bioinformatics in Health Sciences
Credit Value	3
Level	5
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	This subject is designed for students to gain insight into the public and private data repositories, search algorithms and analysis tools in bioinformatics, and to integrate and apply the learned computational knowledge and techniques to the healthcare applications.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. demonstrate knowledge of the world-renowned biotechnology information repositories, such as NCBI databases, and the proficient use of the search algorithms for genes, proteins, RNA's, peptides, disease biomarkers, compounds and biologics from these repositories; b. apply the bioinformatics analysis tools for DNA sequencing, structure modeling, sequence alignment, microarray analysis and pathway analysis; and c. apply bioinformatics analysis knowledge and techniques to answer scientific questions in the health sciences.
Subject Synopsis/ Indicative Syllabus	Part I: 1 Introduction to bioinformatics 2 Bioinformatics data repositories 2.1 Public databases and search functions 2.2 Genome mapping and Expressed Sequence Tag (EST) 2.3 Comparative genome analysis 3 Bioinformatics analysis tools 3.1 DNA and protein sequence analysis 3.2 Microarray analysis and pathway analysis 4 Search algorithms for sequence alignment, e.g. BLAST and FASTA 5 Biomolecular structure of proteins and nucleic acids 5.1 Structure databases and similarity search 5.2 Modeling, visualization and interaction prediction Part II: 6 Special topics in health sciences 6.1 Bioinformatics in cancer biology 6.2 Computational radiobiology 6.3 Cancer biomarker discovery 6.4 Clinical decision support using bioinformatics 6.5 Genetic engineering: gene modifications and manipulations 7 Global trends and research initiatives of bioinformatics 7.1 Next Generation DNA Sequencing 7.2 World-class bioinformatics centres 7.3 Transcriptomics research 7.4 Organization and evolution of genetic code
Teaching/Learning Methodology	The first half of the teaching sessions (Part I) will be conducted in a mixed mode of one-hour lecture and two-hour practical. The second half (Part II) on special topics and global trends will be conducted in form of lecture. The students will learn the background knowledge and current research topics of bioinformatics in the lectures and their concepts will be reinforced through discussion. The hands-on experience on the use of computational tools and biological information databases in the computer laboratory will facilitate the integration of knowledge and skills and the applications to the healthcare applications.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed					
		a	b	c			
1. Written test	50%	√	√				
2. Project report	50%	√	√	√			
Total	100 %						

Written test allows the students to demonstrate the knowledge of bioinformatics databases and the understanding of the concepts and principles of search algorithms and analysis tools.

Project allows the students to demonstrate their abilities to comprehend and apply the learned computational techniques to healthcare applications.

Student Study Effort Expected

Class contact:	
▪ Lecture	7 Hrs.
▪ Practical	14 Hrs.
▪ Lecture (special topics and global trends)	18 Hrs.
Other student study effort:	
▪ Self-study	30 Hrs.
▪ Project	35 Hrs.
Total student study effort	104 Hrs.

Reading List and References

References:

1. Baxevanis AD, Francis Ouellette BF. Bioinformatics: a practical guide to the analysis of genes and proteins. Hoboken, NJ: Wiley; 2005.
2. Mathura VS, Kangueane P. Bioinformatics: a concept-based introduction. New York: Springer; 2009.
3. Polanski A, Kimmel M. Bioinformatics. New York: Springer; 2007.
4. Samuelsson T. Genomics and Bioinformatics: An Introduction to Programming Tools for Life Scientists. Cambridge University Press; 2012
5. Marcus F. Bioinformatics and systems biology: collaborative research and resources. London: Springer; 2008.
6. Fulekar MH. Bioinformatics: applications in life and environmental sciences. Dordrecht: Springer; New Delhi: Capital Pub. Co.; 2009.
7. Krawetz S. Bioinformatics for systems biology. Totowa, N.J.: Humana; London: Springer, 2009.
8. Sperschneider V. Bioinformatics: problem solving paradigms. London: Springer, 2008.

Journals and proceedings:

1. Bioinformatics
2. BMC Bioinformatics
3. Genomics
4. Nucleic Acids Research
5. Proceedings of the National Academy of Sciences of the United States of America
6. PLoS Medicine / Computational Biology
7. Algorithms for Molecular Biology (AMB)