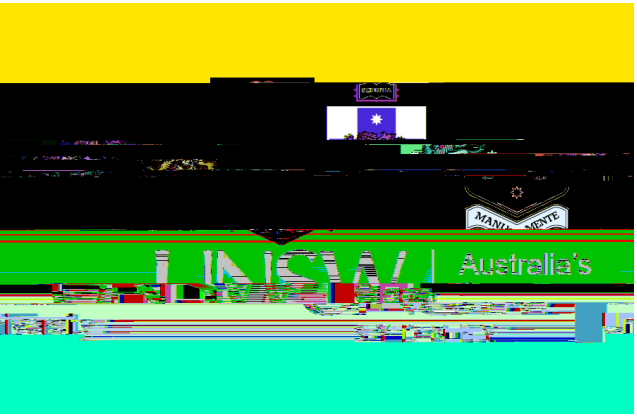

Faculty of Engineering

COURSE DETAILS

Units of Credit	6		
Contact hours	3 hours per week		
Lecture (most weeks)	Tue	05:00PM - 06:30PM	Online
Tutorial /Laboratory	Thu	03:00PM - 04:30PM	Online

Course Coordinator: Hamid Alinejad Rokny
Room 1002, Level 1, E26 Building
Phone 9385 1725; E-mail: h.alinejad@unsw.edu.au

Lecturer: Hamid Alinejad Rokny (HAR)

Guest Lecturers: Amin Beheshti (AB: Macquarie University and Director of AIP Research Centre), Masoud Ehsani (ME: Lead Cloud Architect at Finstro), Elizabeth Antoine (EA: Senior Data Scientist at Microsoft)

Demonstrator : Heba Khamis (HK), h.khamis@unsw.edu.au
Daniel Al Mouiee (DAM), d.almouiee@unsw.edu.au

INFORMATION ABOUT THE COURSE

Background

Welcome to “Medical Informatics”. This course deals primarily with teaching you an appreciation of “Informatics as it applies to health” (information processing and communications applications in medical care). This is an introductory subject. However, in order to cover the material necessary to give you adequate practical database programming and web publishing skills, you will be required to devote significant amounts of time to reading lecture and reference materials, and in performing the prescribed programming tasks.

Accompanying the lecture program is a substantial set of tutorial and laboratory tasks. We will be teaching the **practical component in the ó Green RoomôComputer Laboratories** on the fifth floor of the Samuels building (depend ing on the COVID -19 situation). However, at this stage it is highly unlikely that we will be able to return to face-to-face laboratories and this the classes will run in an on-line mode. Outside of formal class times, it will be possible to access this room for work on tutorials and the major project. There are GSBmE guidelines on computer use that need to be followed.

By the end of week 1, accounts will have been set up for you on our Windows file server. Also a private directory for you to safely store your work will be allocated on the server. The laboratories will be accessible using a swipe card system based on your student card. This access will also be arranged during the first two weeks of semester.

BIOM9450 is a 6 UOC course and it is expected that you will devote a minimum of 8 hours per week to this course. In addition to the 3 hours in class, you should spend 5 hours per week reading lecture and reference materials and working on tutorial problems and assignments. This is pssignment Mvnot(n Mv5(set)-5780ed)osase

body of knowledge and a set of techniques concerning the organizational management of information in support of medical research, education, and patient care. Medical informatics combines medical science with several technologies and disciplines in the information and computer sciences and provides methodologies by which these can contribute to better use of the medical knowledge base and ultimately to better medical care.

TEACHING STRATEGIES

This course consists of integrated lecture and practical work. Problem solving is an essential component of this subject. A Moodle courseware module has been established for this course. Upcoming tutorial tasks, discussion groups and lecture notes and resource materials will be made available on this site during semester. Please look at announcements on Moodle for last minute changes. Assessments and feedback on practical work will be regularly provided to the students.

For the practical component and considering the relatively small number of students enrolled in this elective subject, more effective learning can be achieved by replacing formal lectures on computer applications with self-directed learning tasks. We shall be teaching PHP scripting software along with some basic Javascript and HTML. You will be given a package containing a set of tasks and accompanying resources (including textbooks, on-line help, web references, etc.). To make effective use of the package and your time you must read the lecture notes and relevant references before the corresponding laboratory and decide which areas you are having difficulty in understanding or which areas require further explanation.

Be aware that any computer-based task is a skill that needs time and practice to develop. Even though it is important to read a textbook on databases and web-publishing and to discuss concepts in lectures, there is no substitute for hands -on computing.

RELATIONSHIP TO OTHER COURSES

BIOM9450 is one of the few courses in GSBmE that deals with computing and informatics. In 2019 it had a name change from “Clinical Information Systems” but the course content remains substantially the same. Other courses that deal with more analytical aspects of biomedical computing include BIOM9621 (Biological Signal Analysis) and BIOM9711 (Modelling Organs, Tissues and Devices) that provides a practical overview of computational modelling in bioengineering, focusing on a range of applications including electrical stimulation of neural and cardiac tissues.

EXPECTED LEARNING OUTCOMES

On completion of this course, the student should have gained knowledge, concepts and skills in the following areas. Note that learning outcomes are annotated as Ln and these are cross-referenced in the Assessment schedule.

- L1: Fundamental understanding of the subject matter of biomedical health informatics including an overview of the use of computers and information in health care and a knowledge of common standards.

- L2: Understanding the differences between data, information and knowledge as it applies to medicine and the advantages and applications of different database topologies and network schemes.

- L3: Familiarity and skills in relational database programs, structured query language (SQL), developing and publishing web pages in HTML, dynamic web page creation by linking relational databases with HTML through SQL, and other scripting languages.

These learning outcomes relate most strongly to the following UNSW graduate outcomes. Scholars who are:

- understanding of their discipline in its interdisciplinary context
- capable of independent and collaborative enquiry
- rigorous in their analysis, critique and reflection
- able to apply their knowledge and skills to solving problems
- information and digitally literate

		of the exam should present no problems to people who have attended and participated in the lectures. Learning outcomes are primarily L1 for the written part and L3 for the computer-based part. Related graduate capabilities include: • understanding of the discipline in its interdisciplinary context. • rigorous in analysis, critique and reflection. • able to apply knowledge and skills to solving problems. • capable of independent and collaborative enquiry.
Project	40%	A major assessment component of this course is a computer-based project that integrates information form the lectures and practicals to produce a workable system that encompasses one aspect of a medical information system. This assessment is a direct test of the degree to which the knowledge-based learning outcomes listed above can be practically applied. Learning outcomes are

- “Handbook of Medical Informatics” J. van Bemmel, M. Mussen (Eds) (1997) (MB610.285/43)
- “Healthcare Data Analytics” J. K. Reddy, M. C. Aggarwal (2015)
- Many web resources on “Medical Informatics” or “Health Informatics”
-

All assessments which you hand in must have a Non Plagiarism Declaration Cover Sheet. This is for both individual and group work. Attach it to your assignment before submitting it to the Course Coordinator or at the School Office.

Plagiarism is the use of another person's work or ideas as if they were your own. When it is necessary or desirable to use other people's material you should adequately acknowledge whose words or ideas they are and where you found them (giving the complete reference details, including page number(s)). The Learning Centre provides further information on what constitutes Plagiarism at: https://student.unsw.edu.au/plagiarism

ACADEMIC ADVICE

UNSW has a wide range of student support services. You can find useful information in the following links:

student conduct policy: https://student.unsw.edu.au/conduct

Academic misconduct procedure:

https://www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Other information:

http://www.student.unsw.edu.au

https://my.unsw.edu.au/student/howdoi/HowDoI_MainPage.html

http://www.counselling.unsw.edu.au

In case, if you need some adjustment in teaching or learning environment you are encouraged to discuss your situation with your course coordinator. For more information look at here: https://student.unsw.edu.au/els

For information about:

- Notes on assessments and plagiarism,
- Special Considerations,
- School Student Ethics Officer, and
- BESS

Refer to the School website available at:

http://www.engineering.unsw.edu.au/biomedical-engineering/

COURSE CONTENT IN DETAILS

Week/subjects	Topics
Week 1: Introduction to Medical Informatics and Database Intro	• What is data science not? • Data science is not machine learning • Data science is not statistics • Data science is not big data • Data science is one of the best jobs • Health data science • Data formats • Interdisciplinary Nature of Biomedical Informatics • Lack of Adoption of Computers and Informatics in Clinical Care • Healthcare Sectors • Uses and advantages of an electronic medical record (EMR) • Databases and database management systems (DBMS) • Data types • Relational database topology • Indexes, keys and referential integrity • Database design • Database normalisation
Week 2: Structured Query Language (SQL)	• Why do we Need Queries? • DBMS Languages • Structured Query Language (SQL) • Data types • Tables in SQL • SQL Operators • SQL Query • Nested Queries • Petstore Database • Sample Questions
Week 3: Hypertext Markup Language (HTML) Forms and Dreamweaver	• Programming in HTML • Hypertext Markup Language • HTML Editor • Hypertext & HTML • Headings, Tags, Nested Tags • Structure of a Web Page • Tags vs. Elements • Structural Elements • Simple HTML Program • HTML Text Tags: Paragraph Tag • HTML Formatting Tags • HTML Horizontal Rule • HTML font, alignment • HTML LIST, Nested Lists • HTML Character Entities • Linking, Anchors • Mailto • Inserting Images • HTML map • Basic Colour Names • Tables • cellpadding

	• Frames • HTML Forms • Password • Checkbox, list box, etc • Submit Button • Dreamweaver
Week 4: Javascript	• Why JavaScript? • What is JavaScript? • Basic JavaScript Syntax • Scripts in HEAD or BODY • Functions in the BODY and HEAD • Functions in external file • Variables • Data Conversion • Arithmetic and Logical Operators • Statements & Loops • Literals • Sample Code • Object Oriented Programming • Class and Object Example • The main JavaScript Objects • Core Objects – Regular Expressions • Browser Objects • HTML Objects • HTML Objects – documents • HTML Objects –

- Clustering
- Classification
- Deep learning
- Example of ML in health data
- Bioinformatics
- What is bioinformatics
- Genomics
- Human genome
- Genome structure
- Components of the human genome
- Data types in bioinformatics
- FASTA
- FASTQ
- BAM
- VCF
- Genomic data
- variants
- SNP (DNA-Seq Somatic Variant Analysis)
- Insertion and deletion
- Copy number variation (Copy Number Variation Analysis)
- GWAS
- Expression
- RNA-Seq (RNA-Seq Gene Expression Analysis)
- Chromatin
- Chromatin Immunoprecipitation Sequencing (ChIP-Seq)
- MACS2
- Genotype or phenotype
- How can we identify genomic variants?
- NGS
- Whole genome sequencing
- Whole exome sequencing
- The pipeline
- Geneious as an example
- Clinical decisions systems

APPENDIX: ENGINEERS AUSTRALIA (EA) PROFESSIONAL ENGINEER COMPETENCY STANDARD

Program Intended Learning Outcomes	