Title (Units): **COMP4016 Clinical Decision Support and Information Systems (3,2,1)**

Course Aims: After completion of this course, students will learn the methodology, techniques and models of medical information management and decision making, and the architectural design, functions and components of clinical decision support and health care information systems

Prerequisite: COMP2015 Data Structures and Algorithms, COMP2016 Database Management

Course Intended Learning Outcomes (CILOs):
Upon successful completion of this course, students should be able to:

No.	Course Intended Learning Outcomes (CILOs)
	Knowledge
1	Explain the methodology and techniques of computer-based clinical decision making
2	Describe the characteristics and functions of clinical decision support systems and health care information systems
	Professional Skill
3	Determine suitable algorithms for effective clinical decision making
4	Apply suitable models to enhance the clinical decision making process
5	Design suitable structure and components for clinical decision support systems
6	Apply appropriate methodology to the design of health care information systems

Calendar Description: In this course, students will learn the methodology and techniques of medical data information management, and the models and algorithms used in computer-based clinical decision making. They will also learn the architectural design, structure, functions and components of clinical decision support systems and health care information systems.

Teaching and Learning Activities (TLAs):

CILOs	Type of TLA
1, 2	Lectures
3	Lectures, assignments, independent information search and research as required by the mini-project
4	Problem and laboratory classes, exercises and assignments
5, 6	Lectures, problem and laboratory classes, mini-project, independent information search and research

Assessment:

No.	Assessment Methods	Weighting	CILOs to be addressed	Description of Assessment Tasks
1	Continuous Assessment	40%	4, 5, 6	Written and laboratory assignments are designed to evaluate the students understanding of the techniques of computer-assisted clinical decision making and the principles and characteristics of health information and decision support systems. A mini-project is designed to achieve learning outcomes 4, 5, 6, by requiring students to work in a team environment to design and implement creative solutions through the application of the methodologies learned.
2	Examination	60%	1, 2, 3, 4, 5, 6	Final examination questions are designed to assess students understanding of the development methodology, characteristics, functions, techniques, and architectural design of clinical decision support and health information systems.

Assessment Rubrics:

Excellent (A)	• Achieves all the six CILOs, demonstrating a good mastery of both the theoretical and practical aspects of the knowledge and skills associated with clinical decision support and information systems • Able to develop and present sound arguments and correct solutions to problems, accompanied by in-depth analysis and insight • Demonstrates a thorough understanding and solid knowledge of clinical decision support and information systems concepts, algorithms, and methodologies • Able to draw on a variety of techniques and relevant knowledge and appropriately apply them to new clinical decision support situations and problems
Good (B)	• Achieves all the six CILOs, demonstrating a good understanding of the associated concepts and underlying methodologies • Able to develop solutions to problems, accompanied by adequate explanations • Demonstrates a competent level of knowledge of clinical decision support and information systems concepts, algorithms, and methodologies • Ability to make use of appropriate techniques and knowledge and apply them to familiar situations and problems
Satisfactory (C)	• Achieves most of the six CILOs, demonstrating a basic level of understanding of the associated concepts and underlying methodologies • Able to provide acceptable solutions to problems • Demonstrates an adequate level of knowledge of clinical decision support and information systems • Ability to make use of some techniques and knowledge and apply them to familiar situations
Marginal Pass (D)	• Achieves most of the six CILOs, with minimal understanding of the associated concepts and underlying methodologies • Able to provide solutions to simple problems • Demonstrates a basic level of knowledge of clinical decision support and information systems • Ability to apply some techniques and knowledge to a limited number of typical situations
Fail (F)	• Achieves less than four of the six CILOs, with little understanding of the associated concepts and underlying methodologies • Unable to provide solutions to simple problems • Knowledge of clinical decision support and information systems falling below the basic minimum level • Unable to apply techniques or knowledge to situations or problems

Course Content and CILOs Mapping:

Content		**CILO No.**
I	Introduction to Clinical Decision Support Systems	1, 2
II	Basic Techniques for Clinical Decision Making	3, 4
III	Cost-Effectiveness Analysis in Health	1, 3, 4
IV	e-Health and Medical Informatics Standards	4, 5
V	Clinical Knowledge Expression and Intelligent Modeling Techniques	2, 3
VI	Expert Systems and Healthcare Information Systems	1,2, 3,5
VII	Case Studies and Applications	2, 3, 4, 5, 6

References:

- E. S. Berner (Ed.) *Clinical Decision Support Systems: Theory and Practice*, Springer, 2007
- K.A. Wager *et. al. Health Care Information Systems*, 2nd Edition, Wiley, 2009
- M. Katz. *Evaluating Clinical and Public Health Interventions*, Cambridge University Press, 2010

- *R.A. Greenes. Clinical Decision Support: The Road to Broad Adoption*, 2nd Edition, Elsevier, 2014
- J.A. Osheroff *et al.* Improving *Outcomes with Clinical Decision Support: An Implementer's Guide*, 2nd Edition, HIMSS, 2012

Course Content:

Topic

I. Introduction to Clinical Decision Support Systems
   A. Features of Computer-Based Clinical Decision
   B. Structure of Decision Support Systems
   C. Knowledge-Based and Non-Knowledge Based Approaches
   D. Diagnostic Decision Support Systems

II. Basic Techniques for Clinical Decision Making
   A. Bayesian Networks
   B. Logistic Regression
   C. ROC Analysis
   D. Supervised and Unsupervised Learning
   E. Clustering Algorithms
   F. Evaluating Clinical and Health Interventions

III. Cost-Effectiveness Analysis in Health
   A. The Cost-Effectiveness Ratio
   B. HRQL Scores
   C. Quality Adjusted Life Year (QALY)
   D. Calculating Life Expectancy

IV. e-Health and Medical Informatics Standards
   A. Key Functions and Components of EHR
   B. Computerized Physician Order Entry (CPOE)
   C. Clinical Document Architecture (CDA)
   D. Health Level 7 (HL7) Standards

V. Clinical Knowledge Expression and Intelligent Modeling Techniques
   A. Rule-Based Knowledge
   B. Protocol-Based Knowledge
   C. Case-Based Knowledge
   D. Model-based Knowledge

VI. Expert Systems and Healthcare Information Systems
   A. Conflict Resolution
   B. Problem Solving Models
   C. Hospital Informatics System (HIS)
   D. Clinical Management System (CMS)

VII. Case Studies and Applications