Title (Units): **COMP7420 Decision Analysis and Support in Healthcare Systems (3,2,1)**

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

Prerequisite: Postgraduate Student Standing

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 requirements, methodology and techniques of computer-based clinical decision making
2	Describe the structure, functions and components of clinical decision support systems
	Professional Skill
3	Identify appropriate methodology and models to effective health information management
4	Apply suitable methods and models to describe the clinical decision making process
5	Design suitable structure and components for clinical decision support systems
	Attitude
6	Reflect on the value and importance of clinical decision support systems and their application in the health care industry

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

Teaching and Learning Activities (TLAs):

CILOs	Type of TLA
1-2	Students will learn the methodology, techniques, and working mechanisms of clinical decision support via lectures, tutorials, and assignments.
3-5	Students will discuss scenarios and case studies to identify and apply appropriate methods and models for clinical decision support
1-2,4-6	Students will work on a mini-project to gain hands-on experiences of using some of the useful resources and tools

Assessment:

No.	Assessment Methods	Weighting	CILOs to be addressed	Description of Assessment Tasks
1	Continuous Assessment	40%	1-6	Written and laboratory assignments, quiz, and mini-project are designed to evaluate the students' understanding of the structure, functions and components of clinical decision support systems, as well as the techniques and models of health informatics, clinical knowledge management and clinical decision support
2	Examination	60%	1-5	Final examination questions are designed to assess students understanding of the development methodology, characteristics, functions, techniques, and architectural design of public health and clinical decision support systems

Assessment Rubrics:

Excellent (A)	• Achieves all the first five LOs, with strong evidence of having achieved the last LO, demonstrating a good mastery of both the theoretical and practical aspects of the knowledge and skills associated with public health and clinical decision support 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 public health and clinical decision support systems concepts, algorithms, and methodologies • Able to draw on a variety of techniques and relevant knowledge and appropriately apply them to new public health and clinical decision support situations and problems
Good (B)	• Achieves all the first five LOs, with evidence of having achieved the last LO, 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 public health and clinical decision support 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 first four LOs, 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 public health and clinical decision support systems • Ability to make use of some techniques and knowledge and apply them to familiar situations
Fail (F)	• Achieves less than three of the LOs, with little understanding of the associated concepts and underlying methodologies • Unable to provide solutions to simple problems • Knowledge of public health and clinical decision support 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	Characteristics of Clinical Decision Support Systems	1
II	Quantitative Techniques for Clinical Decision Making	3,4
III	Decision Analysis and Cost-Effectiveness Analysis in Health	1,3,4
IV	e-Health and Medical Informatics Standards	3,5
V	Clinical Knowledge Expression and Intelligent Modelling Techniques	3,4,5
VI	Expert Systems and Healthcare Information Systems	2,4,6
VII	Case Studies and Applications	4,6

References:

- E. S. Berner (Editor), Clinical Decision Support Systems: Theory and Practice, 3rd ed., Springer International Publishing, 2016
- R.A. Greenes. Clinical Decision Support: The Road to Broad Adoption, Second Edition, Elsevier, 2014
- J.A. Osheroff et al. Improving Outcomes with Clinical Decision Support:An Implementer's Guide, Second Edition, HIMSS, 2012
- M. Katz. Evaluating Clinical and Public Health Interventions, Cambridge University Press, 2010

Course Content:

<u>Topic</u>

I. Characteristics of Clinical Decision Support Systems
   A. Features of Computer-Based Clinical Decision
   B. Structure of Decision Support Systems
   C. Diagnostic Decision Support Systems

II. Quantitative Techniques for Clinical Decision Making
   A. Bayesian Networks
   B. Logistic Regression
   C. ROC Analysis
   D. Evaluating Clinical and Health Interventions

III. Decision Analysis and Cost-Effectiveness Analysis in Health
   A. The Cost-Effectiveness Ratio
   B. Decision Analysis Models
   C. HRQL Scores
   D. Quality Adjusted Life Year (QALY)
   E. 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
   E. Continuity of Care Record (CCR)

V. Clinical Knowledge Expression and Intelligent Modelling Techniques
   A. Rule-Based Knowledge
   B. Protocol-Based Knowledge
   C. Case-Based Knowledge
   D. Model-based Knowledge
   E. Neural Networks and Support Vector Machine

VI. Expert Systems and Healthcare Information Systems
   A. Conflict Resolution
   B. Forward and Backward Chaining
   C. Rule Matching
   D. Hospital Informatics System (HIS)
   E. Clinical Management System (CMS)

VII. Case Studies and Applications