TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

A comprehensive introduction to the major aspects of standard medical imaging systems used today and their applications in therapy including: x-ray imaging, fluoroscopy, mammography, computed tomography (CT), magnetic resonance image (MRI), ultrasound (US) and nuclear medicine. Topics include medical image pipeline, radiation-interaction, radiation damage and risk, image quality. The fundamental physics and engineering underlying each imaging modality are reviewed and performance analysis approach to each system is examined. The class involves significant laboratory work to give the student experience in several different imaging systems available at the Medical Center. Evaluation is based upon tests, labs, as well as assignment review of the available equipment in the hospital.

1. Teaching Institution	Baghdad University / Al Khwarizmi College of engineering
2. University Department/Centre	Biomedical Eng. Dept
3. Course title/code	**Medical Imaging / BME 544**
4. Program(s) to which it contributes	University Requirement
5. Modes of Attendance offered	Full time
6. Semester/Year	Annually
7. Number of hours tuition (total)	**4 hours (3 theoretical / 1 practical)**
8. Date of production/revision of this specification	٢٠٢١
9. Aims of the Course	
The aim of this course is to introduce the students to the world of medical imaging by hands-on experience with tissue and imaging data recorded from the same tissue. The course is taken at the fifth term in the education of Biomedical Engineering.	

Medical imaging not only provides useful information for diagnosis but also serves to assist in planning and monitoring the treatment of different diseases. Students need to learn what physical principles are involved, and what properties of tissues the corresponding medical images show. The module will aim to process the available images and provide enhanced images that help in accurate diagnosis. Four Credit hours (3 theory + 1 app) and 6 Units. Therefore, this course introduces the major aspects of standard medical imaging systems used today and their applications in therapy.

10· Learning Outcomes, Teaching ,Learning and Assessment Method

A- Knowledge and Understanding

A1.√
A2.√
A3.√
A4.√

B. Subject-specific skills

B1.√
B2.
B3.
B4.√
B5.

Teaching and Learning Methods

Wide range of teaching methods that they deem the most appropriate for a particular course. These include:

- Lectures where the students write information presented to them via slide show, overhead or written by the lecturer; √
- Lectures where the students have some printed notes/handouts and may annotate, or expand these during a spoken lecture; √
- Lecture material placed on web-pages or other e-learning environment; √
- Small group and large group tutorial sessions; √
- Question and answer sessions during lectures or staff Office Hours;
- Laboratory sessions.

Assessment methods

- Written examinations (Summative assessment); √
- Oral presentations of individual and group work;
- Individual written project report(s) of both individual and group projects;√
- Homework; √
- Presentation skills through group presentations and poster presentations.

C. Thinking Skills

C1.√

C2.√

C3.

C4.√

Teaching and Learning Methods

- Active learning, where students should be active and involved in the learning process inside the classroom, will be emphasized in the delivery of this course.
- Different active learning methods/approaches such as: Engaged Learning, Project-Based Learning, Cooperative Learning, Problem-based Learning, Structured Problem-solving, will be used.
- The teaching method that will be used in this course will be composed of a series of mini lectures interrupted with frequent discussions and brainstorming exercises. PowerPoint presentations will be prepared for the course materials.
- A typical lecture would start with a short review (~ 5 minutes) using both PowerPoint presentations and the whiteboard. This review will also depend on discussions, which will gauge the students' digestion of the previous material. Then, the students would have a lecture on new materials using PowerPoint presentations and whiteboard. The lecture presentation will be paused every 15 – 20 minutes with brainstorming questions and discussions that will allow the students to reflect and think in more depth about what they learned in that presentation. Then, some example problems will be presented and discussed with the students to illustrate the appropriate problem solving skills that the students should learn. The lecture will be continued for another 15 – 20 minutes, followed by examples and/or a quiz covering the materials taught in the previous two weeks.

Assessment methods

- Individual written project report(s) of both individual and group projects;
- Group written project report(s) of group projects;
- Practical skills will be assessed through laboratory experiments, write-ups, coursework reports, project reports and presentations;
- Experimental, research and design skills will be assessed through laboratory experiments write-ups, coursework reports, project reports and presentations;
- Presentation skills through group presentations.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1.

D2.√

D3.√

D4.

11. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	٤		Introduction to digital image processing • Digital images • Image modalities		
2	٤		Radiography, Film construction		
3	٤		Type of film processing		
4	٤		Intensifying screens		
5	٤		Screen construction & characteristics		
6	٤		Screen-film combination		
7	٤		Quiz		Quiz
8	٤		Image quality		Assignment
9	٤		Automatic & Alternative processing methods		
10	٤		Subject factors improved radiographic quality		
11	٤		Radiographic exposure, KVP, MAS, Exposure time, Distance		
12	٤		Quiz		Quiz
13	٤		Exposure time, Distance		
14	٤		Radiographic technique. Patient factors		Assignment
15	٤		Term exam		Term exam
16	٤		Image quality factors, Automatic exposure techniques		
17	٤		Special X-ray imaging, select plane-film procedure		
18	٤		Tomography, Magnification radiography		
19	٤		Mammography. Introduction X-ray apparatus		Assignment
20	٤		Quiz		Quiz
21	٤		Image receptors, Fluoroscopy		
22	٤		Image intensifying tube		
23	٤		Block diagram, Operation of a fluoroscopic machine		
24	٤		X-ray computed tomography X-ray detectors in CT		
25	٤		Magnetic resonance imaging Signal detection and detector Image quality		
26	٤		Ultrasound imaging Physics of acoustic waves		Assignment
27	٤		Medical image analysis		Quiz
28	٤		Nuclear medicine imaging		
29	٤		Visualization for diagnosis and therapy		Assignment
30	4		Term exam		Term exam

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	Textbook: "Fundamentals of Medical Imaging", Paul Suetens, 2nd edition, Cambridge University Press,2009 , ISBN: 0521519152. Books: ▪ The Essential Physics of Medical Imaging, Bushberg, Lippincott Williams & Wilkins. J. T. & Boone, J. M. 2011. ▪ Introduction to biomedical imaging, Andrew Roy Webb, Wiley, 2003. ISBN: 0471237663, 9780471237662. ▪ Introduction to Medical Imaging: Physics, Engineering and Clinical Applications, Nadine Barrie Smith, Andrew Webb, Cambridge University Press, 2010. ISBN0521190657, 9780521190657. ▪ Medical imaging: signals and systems. J. L. Prince and J. M. Links, Prentice Hall 2006, 2nd edition, ISBN 0-13-065353-5.
Special requirements (include for example workshops, periodicals, IT software, websites)	Software: Matlab
Community-based facilities (include for example, guest Lectures , internship , field studies)	

13. Admissions	
Pre-requisites	Non
Minimum number of students	10
Maximum number of students	30