

Course Specification

Institution	King Khalid University
College/Department	College of Medical Applied Sciences / Radiology Department

A Course Identification and General Information

1. Course title and code	Application of Computer in Radiology / RAD 242
2. Credit hours	3h(2+1)
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs)	Bsc in diagnostic technology
4. Name of faculty member responsible for the course	D r. Khalid Ibrahim Hussein
5. Level/year at which this course is offered	Level 4/ second year
6. Pre-requisites for this course (if any)	BMS 217
7. Co-requisites for this course (if any)	None
8. Location if not on main campus	Main campus and Elsamer Girl section

B Objectives

1. Summary of the main learning outcomes for students enrolled in the course.

- Familiarize students with the basic knowledge needed to understand the use of computer in radiologic imaging.
- Develop students knowledge in application of computer in radiological imaging procedures.
- Identify the role of computer in image formation in radiology.
- Discuss the use of Data Acquisition System (DAS) in all imaging modalities.
- Familiar with different types of radiological images.
- Understand the digital image processing and manipulation
- Identify the use of computer in Picture Archiving and Communication System (PACS)
- Identify the use of computer in Computer-Aided- Detection (CAD)

2. Briefly describe any plans for developing and improving the course that are being implemented. (eg increased use of IT or web based reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form to be used for the Bulletin or Handbook should be attached)

1 Topics to be Covered		
Topics	No of Weeks	Contact hours
INTRODUCTION <ul style="list-style-type: none"> • Introduction to Computers • Imaging Application • Computer Systems • Software Concepts 	2	4
STORAGE AND TRANSFER OF DATA IN COMPUTERS <ul style="list-style-type: none"> • Decimal and Binary system; Bits, Bytes and word. • Transfer of data in digital form • Digital Representation of Data 	1	2
USED OF COMPUTER IN MEDICAL FIELD <ul style="list-style-type: none"> • Where the computers used in Medical field. • History of computerized radiography. • How digital imaging used in the radiology nowadays? • Telemedicine 	1	2
COMPUTER IMAGING BASICS: <ul style="list-style-type: none"> • Digital imaging shades of grey. • Formation of the digital image • Image digitalization 	1	2
PIXELS AND VOXELS <ul style="list-style-type: none"> • Gray-scale range and dynamic range. • Image matrix and pixels • Spatial resolution and pixel size • From pixel to voxel 	1	2
Digital/data acquisition system (DAS) in digital radiography, CT, AND MRI	2	4
DIGITAL IMAGE MANIPULATION <ul style="list-style-type: none"> • Window level and window width • Image orientation • Image resize • Magnification • Image annotation 	2	4

DIGITAL IMAGE MANIPULATION <ul style="list-style-type: none"> • Window level and window width • Image orientation • Image resize • Magnification • Image annotation 	3	6
COMPUTER-AIDED DETECTION/DIAGNOSIS (CAD) <ul style="list-style-type: none"> • What is CAD • Effects of CAD • The components of CAD 	1	2
Hospital information system (HIS) and picture archiving and communication system (PACS)		2

1.2 Practicals to be Covered		
List of Topics	No of Weeks	Contact hours
Introduction to <i>ImageJ</i> software	1	2
Import and saving of different type of image format.	1	2
Type of digital images and type conversion.	1	2
Measuring and Counting Objects. <ul style="list-style-type: none"> • Setting Measurement Scale. • Measuring Distance between Points. • Measuring Area. 	1	2
Image manipulation <ul style="list-style-type: none"> • Window level and window width. • Image orientation. • Image resizes. • Magnification. 	2	4
Image processing: <ul style="list-style-type: none"> • Image smoothing. • Contrast enhancement. • Background subtraction. • Math operations. • Effect of noise. • Filters. • Image calculator. 	4	6
CAD and PACS systems	1	2

2 Course components (total contact hours per semester):			
Lecture: 30	Tutorial:	Practical/Fieldwork/Internship: Practical 20	Other:

3. Additional private study/learning hours expected for students per week. (This should be an average :for the semester not a specific requirement in each week)

3 hours weekly as a homework

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

- A brief summary of the knowledge or skill the course is intended to develop;
- A description of the teaching strategies to be used in the course to develop that knowledge or skill;
- The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.

a. Knowledge

(i) Description of the knowledge to be acquired

- Identify the principles of digital image
- Describe the formation of digital image in all radiologic procedure
- Describe how to use computer in PACS and CAD

(ii) Teaching strategies to be used to develop that knowledge

- In class lecture. Or E- learning
- Assignment and homework.

(iii) Methods of assessment of knowledge acquired

- Quizzes
- Final exam

b. Cognitive Skills

(i) Cognitive skills to be developed

- Understand and knowledge of the basic principles of digital image.
- Understand and knowledge of types of digital image in radiological procedures
- Understand and knowledge of digital image processing and manipulation

(ii) Teaching strategies to be used to develop these cognitive skills

- 1- Lectures
- 2- Practical sessions

(iii) Methods of assessment of students cognitive skills

- Practical exam

c. Interpersonal Skills and Responsibility

(i) Description of the interpersonal skills and capacity to carry responsibility to be developed

- Careful use of all radiologic imaging modalities.
- Mange resources and time
- Work independently and as a part of a team
- Discuss results of work with others.

(ii) Teaching strategies to be used to develop these skills and abilities

- Practical sessions

(iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility

- Practical exam

d. Communication, Information Technology and Numerical Skills

(i) Description of the skills to be developed in this domain.

- Ability to deal with computer.
- Ability to deal with image archiving and communication

(ii) Teaching strategies to be used to develop these skills

- Practical sessions

(iii) Methods of assessment of students numerical and communication skills

- Practical exam

e. Psychomotor Skills (if applicable)

(i) Description of the psychomotor skills to be developed and the level of performance required

- Ability to have good observation during the practical sessions.

(ii) Teaching strategies to be used to develop these skills

- Practical sessions

(iii) Methods of assessment of students psychomotor skills

- Practical exam

5. Schedule of Assessment Tasks for Students During the Semester

Assessment	Assessment task (eg. essay, test, group project, examination etc.)	Week due	Proportion of Final Assessment
1	Class activities (Ass and homework		10%
2	Quiz 1	6	20%
3	Quiz 2	9	20%
4	Final theory exam	16	35%
5	Final practical exam	16	15%
6			
7			
8			

D. Student Support

1. Arrangements for availability of faculty for individual student consultations and academic advice. (include amount of time faculty are available each week)

- 4 hours /week in my office for academic advice

E Learning Resources

1. Christi E. Carter. Digital radiography and PACS .
2. Essential References <ul style="list-style-type: none"> - Rafael C. Gonzalez, Richard E. Woods. Digital Image Processing, Third Edition, 2008.
3- Recommended Books and Reference Material (Journals, Reports, etc) (Attach List) <ul style="list-style-type: none"> - Journal of ACR
4- Electronic Materials, Web Sites etc <ul style="list-style-type: none"> - Imagej 1.41o, Wayne Rasband, National Institute of Health, USA ,Web : http://rsb.info.nih.gov/ij/docs/pdfs/ImageJ.pdf - Image Processing with ImageJ http://webeye.ophth.uiowa.edu/dept/BIOGRAPH/ABRAMOFF/ImageJ.pdf - Computers in Radiology https://www.ceessentials.net/article11.html
5- Other learning material such as computer-based programs/CD, professional standards/regulations

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Lecture rooms, laboratories, etc.) <ul style="list-style-type: none"> - lecture room with more than 30 seats. - radiology department including (CR-DR- U/S- CT – MRI) - PACS
2. Computing resources <ul style="list-style-type: none"> - Work stations.
3. Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list) None

G Course Evaluation and Improvement Processes

<p>1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching</p> <ul style="list-style-type: none">- questionnaire will be given to the student at the end of the course
<p>2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department</p> <ul style="list-style-type: none">- Departmental council discussion
<p>3 Processes for Improvement of Teaching</p> <ul style="list-style-type: none">- Review of teaching strategies.- monitoring of teaching activities by senior faculty member.
<p>4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution)</p> <ul style="list-style-type: none">- conducting standard exams such as American college of radiology or others
<p>5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.</p> <ul style="list-style-type: none">- The course material and learning outcomes are periodically reviewed and the change are approved in the department.