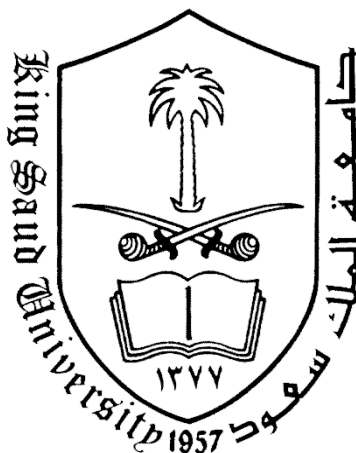


Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment



**COLLEGE OF APPLIED MEDICAL SCIENCES
DEPARTMENT OF RADIOLOGICAL SCIENCES**



COURSE SPECIFICATION

Course Title: **Ultrasound Physics**
Course Code: **RAD 312**

Course Specification

Institution	King Saud University
College/Department	College of Applied Medical Sciences (CAMS), Department of Radiological Sciences.

A Course Identification and General Information

1. Course title and code:	Rad 312 (Ultrasound Physics & Instrumentation)
2. Credit hours	3 (2+1)
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs)	B.Sc Technology Program
4. Name of faculty member responsible for the course	Dr. M.Alsobeil/Dr Lina Hamad
5. Level/year at which this course is offered :	7 (seven)
6. Pre-requisites for this course (if any)	RAD 211
7. Co-requisites for this course (if any)	-
8. Location if not on main campus	CAMS

B Objectives

1. Summary of the main learning outcomes for students enrolled in the course. Upon completion of the course, the students will be able to understand the physical concepts in Ultrasound Physics & its instrumentation and increase their experience in this area.
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) Basic knowledge gained in the course will be developed through an increased use of IT and web-based reference material with special reference to specialists in this area, mainly: New Technology applied in ultrasound imaging

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		
Topic	No of Weeks	Contact hours
Nature of Sound, Classification of Sound Waves, Introduction to Ultrasound equipment	1	5
Basic properties of sound, frequency, intensity, speed, acoustic impedance, units, decibel notation	1	5
Interface layer, reflection, refraction, scattering & absorption, Concept of attenuation, attenuation coefficient, grazing incidence, critical angle, Interference & its types,	1	5
Doppler Effect, Application of Doppler Effect, Continuous and Pulsed Doppler	1	5
Piezoelectric Effect, Single crystal transducer, its parts and their functions, Frequency characteristics, Safety of transducer	1	5
Resolution, axial and lateral resolution, ultrasound beam shape, I-MID TERM EXAMS	1	5
Principle of Pulse echo instrumentation, Block Diagram of various parts	1	5
Ultrasound Scanning, Rapid Scanning (Mechanical scanners), Modes of scanning, (A-mode, B-mode & M-mode)	1	5
B-mode scanning display technology, Analog Scan converters, Digital scan converter, Monitors,	1	5
Real Time Auto-scanners, Limitations, sequential array scanners, Phased array and annular array scanners, II -MID TERM EXAMS	1	5
Ultrasound Image characteristics, Texture, Echo-genicity, Artefacts,	1	5
Ultrasound instrumentation quality assurance, testing equipments	1	5
Ultrasound Bio-effects and safety considerations	1	5
Practical evaluation Examinations (How To perform Various examinations) Its discussion,	1	5

2 Course components (total contact hours per semester):			
Lecture: 30	Tutorial:	Practical/Fieldwork/Internship: 45	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)

<p>4. Development of Learning Outcomes in Domains of Learning</p> <p>For each of the domains of learning shown below indicate:</p> <ul style="list-style-type: none"> • 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.
<p>a. Knowledge</p>
<p>(i) Description of the knowledge to be acquired</p> <p>Course builds on students the basic understanding of ultrasound physics and instrumentation pertaining to basic elements contained in the course.</p>
<p>(ii) Teaching strategies to be used to develop that knowledge</p> <ul style="list-style-type: none"> - Expose learners to cognitive skills by methods of reasoning and problem solving abilities in the clinical situation. - Critical thinking. - Decision making. - Recap vital knowledge. - -
<p>(iii) Methods of assessment of knowledge acquired</p> <ol style="list-style-type: none"> 1. Two written papers (mid-terms mainly short essay questions) 2. Final written paper. (MCQs + short answers + a short essay). 3. Continuous practical assessment. 4. Final practical evaluation.
<p>b. Cognitive Skills</p>
<p>(i) Cognitive skills to be developed</p> <p>Concentration, Perception and awareness, memory (help develop an effective processing system for remembering), logical thinking (encourage students to use reasoning consistently to come to conclusion).</p> <p>Others: Analysis, evaluation, memorization, listening, reading and writing, generate hypothesis if ask provocative questions, selective and sustained attention all language skills, self-reflection if encouraged by lecture, general thinking skills, application, appreciation (recognition of value of learning), executive functions (planning and/or structuring) , exposure to non-traditional info sources, and evaluation/judgment.</p>

<p>(ii) Teaching strategies to be used to develop these cognitive skills</p> <ul style="list-style-type: none"> - Analysis (thinking about the type of task that one must confront, the type of material that one has to learn, the personal characteristics that one possesses, and the way in which one's competence will be tested). - Planning (learner then formulates a learning plan by hypothesizing). - Implementation of the plan (Once the learner has formulated this plan, each of its elements must be implemented skilfully). - Monitoring of the process (Once the learning process is under way, the learner must assess how well the chosen strategy and tactics are working). - Modification (If the monitoring assessment is positive, learners may decide that no changes are needed).
<p>(iii) Methods of assessment of students cognitive skills</p> <ul style="list-style-type: none"> - Objective testing (MCQs). - Modified Essay Questions (MEQs) – at end of the course. - Short answers. - Assignments and quizzes.
<p>c. Interpersonal Skills and Responsibility</p>
<p>(i) Description of the interpersonal skills and capacity to carry responsibility to be developed</p> <p>Building group spirit (team-work) to whole class which is successful in assimilation of knowledge. This avoids competitions, divisions, and the favourism.</p>
<p>(ii) Teaching strategies to be used to develop these skills and abilities</p> <ul style="list-style-type: none"> - Build up team works. - Effective communication. - Co-operation. - Negotiation. - Seminars and group discussions.
<p>(iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility</p> <ul style="list-style-type: none"> - When were students challenged to make use of the above four skills. - Did any event takes place when the above four essential skills were (needed) but (not used)! This can be tested through group assignments and presentation.
<p>d. Communication, Information Technology and Numerical Skills</p>
<p>(i) Description of the skills to be developed in this domain.</p> <ul style="list-style-type: none"> - Effective communication involving listening, speaking, and taking turns. - Problem solving and negotiation to help students resolve conflicts and make decisions. - Students self expression.
<p>(ii) Teaching strategies to be used to develop these skills</p> <ul style="list-style-type: none"> - Management of communication. - Encouragement of group spirit (team work) and co-operation. - Encouragement and support of students learn how to think (agree upon goals), weigh alternatives, and make decisions). - Presentations and seminar sessions.

(iii) Methods of assessment of students numerical and communication skills Point-system for presentation, preparation of topics, personal image (look).
e. Psychomotor Skills (if applicable)
(i) Description of the psychomotor skills to be developed and the level of performance required - N/A
(ii) Teaching strategies to be used to develop these skills - N/A
(iii) Methods of assessment of students psychomotor skills - N/A

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	Assignments about ultrasound instrumentation	2	5%
2	First Mid-term Test (MT1)	5	20%
3	Continuous clinical assessment	12	15%
4	Second Mid-term Test (MT2)	13	20%
5	Final Examination.	17	40%

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) 18 hours

E Learning Resources

1. Required Text(s) Textbook of Diagnostic Ultrasonography By Sandra L. Hagen Ansert, Mosby Company, London 1987
2. Essential References Physics of radiology ,Anthony Brinton Wolbarst , Prentice –hall international, Inc 1993

3- Recommended Books and Reference Material (Journals, Reports, etc) (Attach List) Diagnostic Ultrasound Physics, Biology and Instrumentation Stewart. C. Bushong & Benjamin R. Archer Mosby Year Book, St. Louis, USA
4-.Electronic Materials, Web Sites etc <ul style="list-style-type: none"> - Ultrasound imaging, - King Saud University, Radiological Sciences web site “Ultrasound Physics for OBY/GYN course”
5- Other learning material such as computer-based programs/CD, professional standards/regulations Lecture Data shows (slides)

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"> - Classroom (30 seats). - Laboratory (10 students at a time). - Computer access (10 students at a time)
2. Computing resources <ul style="list-style-type: none"> - PC computer. - Internet, data shows.
3. Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list) <ul style="list-style-type: none"> - Ultrasound imaging equipment laboratory for practicals.

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching <ul style="list-style-type: none"> - Connecting theory with practice and applications (analogy, observations, demonstrations .. etc). - Putting a student into the role of a teacher (explain and demonstrate). - Case Studies (bringing real-life scenarios to the classroom). - Guided design projects (introducing practical design experience in the classroom). - Open-ended laboratories (to make students think deeply).
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department <ul style="list-style-type: none"> - Development of a comprehensive evaluation plan, - Using multiple assessment forms to create an effective strategy for improving the teaching process.

<ul style="list-style-type: none"> - - Use multiple sources of data . This makes a foundation of a teaching portfolio as one of the best strategies for teaching improvement. - Mid-semester and Mid-term tests. - Self evaluations.
<p>3 Processes for Improvement of Teaching</p> <ul style="list-style-type: none"> - Lecturing and process mapping. - Small group exercise. - Cooperative learning. - Case study. - Test feed-back. - Videotaping and IT technology. - Continuous assessment process.
<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"> - Check marking by an independent faculty member of a sample of student's work.
<p>5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.</p> <ul style="list-style-type: none"> - Annual surveys of alumni and of currently enrolled students who are asked to evaluate teaching effectiveness. - Periodic checking of application of theory in the practical clinical situation.