



Mahidol University
Wisdom of the Land

Outcome-Based Education in Radiological Technology



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Department of Radiological Technology

Faculty of Medical Technology

Mahidol University



OBE Overview



(Inter)national
Requirements/Benchmarking

- NQF, VMV
- **RT Professional Body**
- Market Needs
- Global Transformation

ELOs

*Backward
Curriculum Design*

Program Structure
and **Curriculum
Mapping**

**Core
contents/courses**

CLOs

T&L
Activities

Student Assessment
Methods and Scheme*
(formative & summative)

Course syllabus, course spec.

Woranut.lam

Feedback

ELOs
Achievement*
(Formative & summative)

Program
Evaluation
(Stakeholders)

Course
Evaluation



Bachelor of Science in Radiologic Sciences,
School of Health Related Professions,
University of Mississippi Medical Center

- **Mission:** To provide an educational experience in a scholarly environment to help **students reach their highest potential in technical knowledge and clinical competency in radiologic sciences.**
- The curriculum for the Radiologic Sciences traditional degree program includes the professional curriculum outlined by **the Standards and Guidelines of an Accredited Educational Program for the Radiographer established by the Joint Review Committee on Education in Radiologic Technology (JRCERT)**



The Joint Review Committee on Education in Radiologic Technology (JRCERT)



<https://www.jrcert.org/>

- The JRCERT **requires programs to have a goal for clinical competence, communication and critical thinking.**
- Programs are welcomed to add an additional goal or two to assess other areas, but remember to not make the assessment plan too large and cumbersome.
- **A minimum of two student learning outcomes** need to be developed for each goal statement. So at a minimum, three goals and six student learning outcomes will need to be developed.



Bachelor of Science in Radiologic Sciences,
School of Health Related Professions,
University of Mississippi Medical Center

Goal 1: The students will **exhibit a high level of clinical performance and competence.**

Student learning outcomes:

- **Demonstrate** procedural skill development to competently perform diagnostic imaging procedures.
- **Demonstrate** the knowledge of radiation protection to provide a safe imaging environment for the patient, themselves, and other healthcare professionals.

<https://www.umc.edu/shrp/Radiologic%20Sciences/Traditional-Program/Goals%20and%20Student%20Learning%20Outcomes.html>



Bachelor of Science in Radiologic Sciences,
School of Health Related Professions,
University of Mississippi Medical Center

Goal 2: The students will **demonstrate critical thinking and problem solving skills.**

Student learning outcomes:

- **Determine** the need to modify standard procedures and technical factors to accommodate patient conditions and other variables.
- **Perform** non-routine examinations on trauma patients.

<https://www.umc.edu/shrp/Radiologic%20Sciences/Traditional-Program/Goals%20and%20Student%20Learning%20Outcomes.html>



Bachelor of Science in Radiologic Sciences,
School of Health Related Professions,
University of Mississippi Medical Center

Goal 3: The students will **practice effective communication skills**.

Student learning outcomes:

- **Communicate** scientific research effectively.
- **Communicate** effectively with patients and healthcare.

Goal 4: The students will exhibit professional growth and development.

Student learning outcomes:

- **Demonstrate** responsibility and attentiveness in clinical rotations.
- **Demonstrate** further research and knowledge of professional opportunities.

<https://www.umc.edu/shrp/Radiologic%20Sciences/Traditional-Program/Goals%20and%20Student%20Learning%20Outcomes.html>

Bachelor of Science in Radiologic Sciences,
School of Health Related Professions,
University of Mississippi Medical Center

Goal 5: The program will maintain effectiveness.

Student learning outcomes:

- The program will retain/graduate students accepted into the program.
- Graduates will pass the ARRT exam on the first attempt.
- Graduates will become employed within a reasonable time following graduation.
- Employers surveyed will indicate satisfaction with the effectiveness of graduates as entry-level imaging professionals.
- Graduates will indicate the educational experience received adequately prepared them for employment as entry-level imaging professionals.

<https://www.umc.edu/shrp/Radiologic%20Sciences/Traditional-Program/Goals%20and%20Student%20Learning%20Outcomes.html>



Bachelor of Science in Radiologic Sciences, East Coast Polytechnic Institute

- Program is designed **to provide registered radiographers**. The knowledge needed **to advance in the radiology profession in the roles of leader, educator, and/or administrator**.
- The program presents **higher advanced skills** of Radiologic Sciences **for optimum patient care in advanced modalities and effective leadership in administrative positions**.
- Based on **the American Society of Radiologic Technologists B.S.R.S. core curriculum**, this program expands on areas found in entry-level radiography curriculum, such as **critical thinking, human diversity, research methodology, leadership, and communication skills**.

<https://www.ecpi.edu/programs/radiologic-sciences-bachelor-degree>



Continuing
Education

News, Research
and Publications

Standards and
Regulations

Career Center

About
ASRT

ASRT Curricula

Home > Educators > Curricula

The first ASRT Radiography Curriculum was written in 1952. Today, ASRT produces the following curricula for the radiologic science profession:

- Bone Densitometry
- Cardiac-Interventional and Vascular-Interventional
- Computed Tomography
- Limited X-ray Machine Operator
- Magnetic Resonance
- Mammography
- Radiation Therapy
- Radiography
- Radiologist Assistant
- B.S.R.S. Core Curriculum

<https://www.asrt.org/educators/asrt-curricula>



- The goal of this document has been **to outline a common body of knowledge** that is essential for entry-level radiographers.
- The ASRT Radiography Curriculum serves as a blueprint for educators to follow in designing their programs and in **ensuring that their programs match the standards of the profession.**
- In the medical imaging and radiologic sciences, students must learn **the essential clinical skills that employers expect of graduates,** while educators must ensure that students are afforded **the opportunity to prepare for the certification examinations offered by the ARRT.**
- The curriculum also offers a foundation for a transition to baccalaureate studies and, more importantly, for **individual lifelong learning.**

<https://www.asrt.org/educators/asrt-curricula>



- Introduction to Medical Imaging and Radiologic Sciences and Health Care
- Ethics and Law in Medical Imaging and Radiologic Sciences
- Patient Care and Services in the Medical Imaging and Radiologic Human Anatomy and Physiology
- **Radiographic Procedures**
- Radiographic Pathology
- Radiation Physics and Instrumentation
- Image Production
- Image Analysis
- Radiation Biology and Health Physics Clinical Practice

<https://www.asrt.org/educators/asrt-curricula>



Radiographic Procedures

Objectives:

- Discuss radiographic technique using anatomic, positioning, and projection terminology.
- Evaluate radiographic orders and preparation for procedures.
- Describe patient communication techniques and planning.
- Apply patient positioning techniques for common exams.
- Conduct contrast studies, including patient preparation and positioning.
- Recognize special concerns and techniques for mobile and surgical radiography.

<https://www.asrt.org/educators/asrt-curricula>



Radiographic Procedures

Content

I. Positioning and Projection Terminology

A. Standard terms

1. Radiographic position
2. Radiographic projection
3. Radiographic view
4. Radiographic method

B. Positioning terminology

1. Recumbent
2. Supine

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<https://www.asrt.org/educators/asrt-curricula>



ASRT Core Curriculum: Bachelor of Science in Radiologic Sciences



- The B.S.R.S. curriculum is designed to build on the entry-level radiography curriculum and expands on areas such as critical thinking, patient centered care, research and communication skills.
- Core contents:
 - Advanced Patient Care
 - Advanced Sectional Anatomy
 - Communication
 - Diversity and Cultural Competence
 - Health Care Delivery
 - Health Care Ethics and Law
 - Leadership and Teambuilding
 - Pathophysiology
 - Health Care Compliance and Accreditation
 - Pharmacology
 - Quality Management
 - Research Methods and Information Literacy

<https://www.asrt.org/educators/asrt-curricula/bsrs-core-curriculum/bsrs-curriculum>



Quality Management

Objectives

1. Differentiate between quality management (QM), quality assurance (QA) and quality control (QC).
2. Apply QM principles to a given scenario.
3. Analyze collected QM data and make appropriate recommendations.
4. Analyze the benefits of a QM program to the patient and to the department.
5. Develop a QM plan to collect data for digital imaging equipment



Quality Management

Content

I. Definitions

- A. Quality management (QM)
- B. Quality assurance (QA)
- C. Quality control (QC)

II. Concepts and Principles of QM

- A. Philosophical basis
- B. QM problem-solving strategies
- C. Tools for problem identification and analysis

III. Collection and Analysis of QA Data

- A. Development of indicators
- B. Data collection methods
- C. Assessment of outcomes
- D. Standards for quality

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- As part of the **requirements for ARRT certification and registration**, candidates and R.T.s need to **complete an ARRT-approved educational program and an academic degree** (associate's or higher) to determine the quality of educational institutions.
- List of the ARRT recognized accreditation agencies (mechanisms)

ARRT – Recognized Accreditation Mechanisms	Academic Degree*	Professional Education
PROGRAMMATIC (SPECIALIZED) ACCREDITING AGENCIES		
Joint Review Committee on Education in Radiologic Technology		1969
Joint Review Committee on Educational Programs in Nuclear Medicine Technology		2011
Commission on Accreditation of Allied Health Education Programs (CAAHEP)**		
REGIONAL ACCREDITING AGENCIES		
Commission on Higher Education of the Middle States Association of Colleges and Schools	June 1, 1995	June 1, 1995
Commission on Elementary and Secondary Schools of the Middle States Association of College and Schools	June 1, 1995	June 1, 1995
New England Association of Schools and Colleges	June 1, 1995	June 1, 1995
New England Commission of Higher Education	July 1, 2016	July 1, 2016

<https://www.arrt.org/pages/earn-arrt-credentials/initial-requirements/primaryrequirements/education-requirements-primary/arrt-recognized-accreditation-agencies>



- The Joint Review Committee on Education in Radiologic Technology (JRCERT) Standards for an **Accredited Educational Program in Radiography** are designed to promote academic excellence, patient safety, and quality healthcare.



- The Standards require a program to articulate its purposes;
to demonstrate that it has adequate human, physical, and financial resources effectively organized for the accomplishment of its purposes;
to document its effectiveness in accomplishing these purposes;
and to provide assurance that it can continue to meet accreditation standards.



Six Standards for An Accredited Educational Program in Radiography



<https://www.jrcert.org/>

- **Standard One:** Accountability, Fair Practices, and Public Information
- **Standard Two:** Institutional Commitment and Resources
- **Standard Three:** Faculty and Staff
- **Standard Four:** Curriculum and Academic Practices

The program's curriculum and academic practices prepare students for professional practice.

- **Standard Five:** Health and Safety
- **Standard Six:** Programmatic Effectiveness and Assessment: Using Data for Sustained Improvement

The extent of a program's effectiveness is linked to the ability to meet its mission, goals, and student learning outcomes. A systematic, ongoing assessment process provides credible evidence that enables analysis and critical discussions to foster ongoing program improvement.



Standard Four: Curriculum and Academic Practices



Objectives:

<https://www.jrcert.org/>

- 4.1 The program has a mission statement that defines its purpose.
- 4.2 The program **provides a well-structured curriculum that prepares students to practice in the professional discipline.**
- 4.3 All clinical settings must be recognized by the JRCERT.
- 4.4 The program provides timely, equitable, and educationally valid clinical experiences for all students.
- 4.5 The program provides learning opportunities in advanced imaging and/or therapeutic technologies.



Standard Four: Curriculum and Academic Practices (2)



<https://www.jrcert.org/>

Objectives (cont.):

4.6 The program assures an appropriate relationship between program length and the subject matter taught for the terminal award offered.

4.7 The program measures didactic, laboratory, and clinical courses in clock hours and/or credit hours through the use of a consistent formula.

4.8 The program provides timely and supportive academic and clinical advisement to students enrolled in the program.

4.9 The program has procedures for maintaining the integrity of distance education courses.

Standard Four: Curriculum and Academic Practices (3)

4.2 The program **provides a well-structured curriculum that prepares students to practice in the professional discipline.**

- A well-structured curriculum must be comprehensive, current, appropriately sequenced, and provide for evaluation of student achievement.
- This allows for effective student learning by providing a knowledge foundation in didactic and laboratory courses prior to competency achievement. Continual refinement of the competencies achieved is necessary so that students can demonstrate enhanced performance in a variety of situations and patient conditions.

<https://www.jrcert.org/>

Standard Four: Curriculum and Academic Practices (4)

4.2 The program **provides a well-structured curriculum that prepares students to practice in the professional discipline.**

- At a minimum, the curriculum should promote qualities that are necessary for students/graduates to practice competently, make ethical decisions, assess situations, provide appropriate patient care, communicate effectively, and keep abreast of current advancements within the profession. Expansion of the curricular content beyond the minimum is required of programs at the bachelor's degree or higher levels.

<https://www.jrcert.org/>

Goal 1: Students will demonstrate clinical competency.

SLO 1.1: Students will obtain diagnostic radiographs.

SLO 1.2: Students will perform radiation safety practices.

Goal 2: Students will communicate effectively.

SLO 2.1: Students will communicate effectively with other healthcare professionals in the clinical setting.

SLO 2.2: Students will obtain accurate patient histories.

Goal 3: Students will exhibit critical thinking skills.

SLO 3.1: Students will determine the appropriate sequences for multiple exams.

SLO 3.2: Students will adjust exposure variables for unacceptable radiographs.

Program Courses

*Intro to Medical Imaging		I	I	I, D, F (Case scenarios exercise)	JRCERT Curriculum Map Template	
#Clinical I	I	I, D, F (Clinical Affective Evaluation Q10)	I, D, F (Clinical Affective Evaluation Q9)	I		
*Procedures I	I, IN, F (Lab Practical Final)	I	I	I	I, D, F (Case scenarios exercise)	I
*Radiographic Equipment I	I	I				I, D, F (Lab Practical Score)
#Clinical II	R, D, F (Clinical Affective Evaluation Q8)	R	R	R	R	R
*Procedures II	R	R	R	R	R	R
*Radiographic Equipment II						R
#Clinical III	R	R	R	R	R	R
*Procedures III	R, IN, S (Lab Practical Final Score)	R	R	R	R	R
^Radiobiology and Radiation Safety		R/M				
#Clinical IV	R	R	R	R	R	R
^Image Production and Evaluation		M				M, D, S (Lab Practical Score)
^Advanced Medical Imaging Modalities			R	R		
#Clinical V	M, D, S (Clinical Affective Evaluation Q8)	M, D, S (Clinical Affective Evaluation Q10)	M, D, S (Clinical Affective Evaluation Q9)	M, D, S Clinical Affective Evaluation Q2)	M	M, D, S (Clinical Maintenance Form Q7)
^Preparing for the Profession			M	M	M, D, S (Case scenarios exercise administered Procedures I)	M

First Year Courses
Second Year Courses
Clinical Courses

I= Introduced
R= Reinforced
M= Mastery (Competency)

F= Formative Assessment
S= Summative Assessment

D= Direct Measure
IN= Indirect Measure



Outcomes Assessment Plan and Analysis

Goals – The following goals must be identified: Clinical Competence, Critical Thinking, and Communication Skills. It is the program's prerogative to identify other goals as well.

Student Learning Outcomes – 2 student learning outcomes per goal Higher order verbs are recommended, such as in Bloom's Taxonomy.	Measurement Tools – A minimum of 2 measuring tools/assessment methods per student learning outcome is required.	Timeframe – A formative measure used (while students are in the first year of the program), and a summative measure used (when students are close to program completion and/or graduates) is recommended for best practices.	Benchmark – Should be a score above passing. Examples are: A percentage score or a score based on a scale, such as a Likert score (include the scale).	Actual Data Results - Include the number of students evaluated. You may also disaggregate the data for a deeper analysis.	Past 3 – 5 years of Data Results – Identify each year's results separately for comparison purposes.
Outcome #1	M. Tool #1	(Formative)			
	M. Tool #2	(Summative)			
Outcome #2	M. Tool #1	(Formative)			
	M. Tool #2	(Summative)			

Analysis – To include key findings, 3-5 year trending comparisons, steps to take to enhance student learning:

Action Plan based on Analysis:

Results/Improvement(s) noted based on the action plans that were implemented:

Re-evaluation Date:



Example of Outcomes Assessment Plan of Associate Level: Clinical Competency Goal



Goal I: Students will demonstrate clinical competency.

LO1.1: Students will apply radiation safety practices.

Goal I– Students will demonstrate clinical competency.			
Student Learning Outcomes –	Measurement Tools – A minimum of 2 measuring tools/assessment methods per student learning outcome is required.	Timeframe – A formative measure used (while students are in the first year of the program), and a summative measure used (when students are close to program completion and/or graduates) is recommended for best practices.	Benchmark – Should be a score above passing. Examples are: A percentage score, A score based on a scale, such as a Likert score (include the scale)
1. Students will apply radiation safety practices.	Lab Practical Form Question #9	Semester 2	Students will receive a ≥ 8.0 (average score) (on a 10-point scale)
https://www.jrcert.org/ program-resources/	Clinical Evaluation Form Question #4	Semester 5	Students will receive a ≥ 9.5 (on a 10-point scale)



Example of Outcomes Assessment Plan of Associate Level: Clinical Competency Goal (2)



Goal I: Students will demonstrate clinical competency.

LO1.2: Students will obtain radiographs of acceptable diagnostic quality.

Student learning outcomes	Measurement Tools	Time Frame	Benchmark
2. Students will obtain radiographs of acceptable diagnostic quality.	Clinical Evaluation Form Question #10 (Internship, field experiences)	Semester 3	Students will receive a ≥ 8.0 (on a 10-point scale)
	Clinical Evaluation Form Question #10	Semester 5	Students will receive a ≥ 9.0 (on a 10-point scale)

<https://www.jrcert.org/program-resources/>



Example of Outcomes Assessment Plan of Bachelor's Level: Communication Goal



Goal I: Students will demonstrate the ability to communicate effectively.

LO1.1: Students will communicate effectively as a part of the healthcare team.

Goal 1– Students will demonstrate the ability to communicate effectively.			
Student Learning Outcomes	Measurement Tools – A minimum of 2 measuring tools/assessment methods per student learning outcome is required.	Timeframe – A formative measure used (while students are in the first year of the program), and a summative measure used (when students are close to program completion and/or graduates) is recommended for best practices.	Benchmark Should be a score above passing. Examples are: A percentage score, A score based on a scale, such as a Likert score (include the scale)
1.1 Students will communicate effectively as a part of the healthcare team.	RADT 225 Clinical Preceptor Evaluation (Question #9 – Patient Communication)	Program Semester 2	100% of students will receive a 4 out of 5
	RADT 333 Interprofessional Lab Simulation Rubric (Question #3)	Program Semester 4	100% of students will receive an 8 out of 10



Example of Outcomes Assessment Plan of Bachelor's Level: Communication Goal (2)



Goal I: Students will demonstrate the ability to communicate effectively.

LO1.1: Students will demonstrate the ability to communicate through written correspondence pertaining to healthcare.

Student learning outcomes	Measurement Tools	Time Frame	Benchmark
1.2 Students will demonstrate the ability to communicate through written correspondence pertaining to healthcare.	RADT 350 Research Paper	Program Semester 3	100% of students will receive a score of 85 or better
	RADT 412 Case Study Management Project	Program Semester 4	100% of students will receive a score of 85 or better



Mission

The California Baptist University radiologic sciences program will prepare students to carry out their mission as **competent radiographers who will serve their purpose as professionals within the healthcare community.** These individuals will **possess the appropriate knowledge and skills necessary to function as imaging professionals within a hospital or ambulatory setting.**

Accreditation

CBU's B.S. in Radiologic Sciences program was evaluated according to the Standards for an Accredited Educational Program in Radiography (2014). The JRCERT awards: ACCREDITATION FOR A PERIOD OF 8 YEARS.

The JRCERT is the only agency recognized by the United States Department of Education (USDE) and the Council for Higher Education Accreditation (CHEA) for the accreditation of traditional and distance delivery educational programs in radiography, radiation therapy, magnetic resonance, and medical dosimetry.

Please visit <https://www.jrcert.org/> for more information.



Program Goal

Goal 1: Students will develop clinical competence.

Goal 2: Students will demonstrate effective communication skills.

Goal 3: Students will demonstrate problem solving and critical thinking skills.

Goal 4: Students will demonstrate professional values, ethical behavior, and strive for continued personal and professional growth.



Student Learning Outcomes (2019-2021)

1. **Demonstrate** proper positioning techniques.
2. **Select** appropriate technical factors (kV, mAs, and SID).
3. **Apply** proper use of radiation safety devices and employ the ALARA principle.
4. **Demonstrate** oral and written communication skills.
5. **Modify** routine imaging parameters based on patient's condition.
6. **Develop and demonstrate** capability of providing compassionate patient care in an increasingly diverse society.
7. **Demonstrate** professionalism upon employment.
8. **Describe** the required stewardship over the security and confidentiality associated with patient medical information.



Student Learning Outcome Curriculum Map

Program / Major / Department: School of Health Science -- Bachelor of Science in Radiologic Sciences

Legend: I = Introduced; P = Practiced; D = Demonstrated

(2019-2021)

Courses	Goal 1 Clinical Competence	Goal 1 Clinical Competence	Goal 1 Clinical Competence	Goal 2 Communication Skills	Goal 3 Critical Thinking	Goal 4 Professionalism	Goal 4 Professionalism	Goal 4 Professionalism
	SLO #1	SLO #2	SLO #3	SLO #4	SLO #5	SLO #6	SLO #7	SLO #8
USO Associations >>	3,4,5,	1,2,3,5,6	1,2,3,5,6	1,2,3,5,6	3,4,5,6	2,3,5,6	3,4,6	3,4,6
RAD210	I	I	I, P	I, P, D Exams	I	I	I	I
RAD220	I	I, P	I	I, P, D Project	I	I, P	I	I
RAD320	I				P	Patient Care in Radiologic Sciences		
RAD325	I, P	I, P	I, P	I, P	I, P	P	P	P
RAD335	I, P	P	P, D Rubric	P, D Rubric	P	P	P	P
						Principles of Imaging		
						Radiographic Procedures with Lab		
						Radiologic Procedures II with Lab		

<https://calbaptist.edu/programs/bachelor-of-science-radiologic-sciences/>



(2019-2021)

Student Learning Outcome Curriculum Map

Program / Major / Department: School of Health Science -- Bachelor of Science in Radiologic Sciences

Legend: I = Introduced; P = Practiced; D = Demonstrated

Courses	Goal 1 Clinical Competence	Goal 1 Clinical Competence	Goal 1 Clinical Competence	Goal 2 Communication Skills	Goal 3 Critical Thinking	Goal 4 Professionalism	Goal 4 Professionalism	Goal 4 Professionalism
	SLO #1	SLO #2	SLO #3	SLO #4	SLO #5	SLO #6	SLO #7	SLO #8
RAD345 Radiologic Procedures III with Lab	P, D Rubric	P	P, D Rubric	P, D Rubric	P	P	P	P
RAD350 Clinical Practice I	I, P	I, P	I, P	I, P	I, P	P	P	P
RAD355 Clinical Practice II	P	P	P, D Rubric	P, D Rubric	P	P	P	P
RAD410 Image Analysis					P, D Exams		D Research Projects	D Research Projects



Student Learning Outcome Curriculum Map

(2019-2021)

Program / Major / Department: School of Health Science -- Bachelor of Science in Radiologic Sciences

Legend: I = Introduced; P = Practiced; D = Demonstrated

Courses	Goal 1 Clinical Competence	Goal 1 Clinical Competence	Goal 1 Clinical Competence	Goal 2 Communication Skills	Goal 3 Critical Thinking	Goal 4 Professionalism	Goal 4 Professionalism	Goal 4 Professionalism
	SLO #1	SLO #2	SLO #3	SLO #4	SLO #5	SLO #6	SLO #7	SLO #8
RAD 415		P	P	P	P	P	I, P	I, P
RAD420			P	P			P	P
RAD440	P				P		P	
RAD450 Clinical Practice III	P, D Rubric	P, D Rubric	P, D Rubric	P, D Rubric	P, D Rubric	P	P	P
RAD455 Clinical Practice IV	P, D Rubric	P, D Rubric	P, D Rubric	P, D Rubric	P, D Rubric	P	P, D Research Projects	P, D Research Projects
RAD495 Radiologic Sciences Capstone	D Rubric	D Rubric	D Rubric	D Rubric	D Rubric	D Rubric	I, P	D Rubric
RAD496 Comprehensive Review	D Exam	D Exam	D Exam	D Exam	D Exam	D Exam	D Exam	D Exam



- RAD495 Radiologic Sciences Capstone

In this course, students will reflect on their classroom, lab, and clinical experiences, culminating in a portfolio of their academic experience. In addition, students will begin preparing to take licensure and certification examinations that will qualify them to practice as professional radiographers. Prerequisite: RAD 450. (1 unit; Spring)

- RAD496 Comprehensive Review

This course is designed to prepare students for the American Registry of Radiologic Technologists (ARRT) exam in Radiography. This course will provide a comprehensive review that will prepare students to successfully pass their ARRT board exam. This course will include a mock board review exam. Prerequisite: Radiologic Science major. (3 units; Spring)

<https://calbaptist.edu/programs/bachelor-of-science-radiologic-sciences/>



Legend: I = Introduced; P = Practiced; D = Demonstrated

Courses	Goal 1 Clinical Competence	Goal 1 Clinical Competence	Goal 1 Clinical Competence	Col
	SLO #1	SLO #2	SLO #3	
USO Associations >>	3,4,5,	1,2,3,5,6	1,2,3,5,6	
RAD210	I	I	I, P	I, P, Exa
RAD220	I	I, P	I	I, P, Proj
RAD320	I			
RAD325	I, P	I, P	I, P	I, P
RAD335	I, P	P	P, D	P, D Rub

Patient Care in Radiologic Sciences

Principles of Imaging

Radiologic Procedures II with Lab

SLO1: Demonstrate proper positioning techniques.

SLO2: Select appropriate technical factors (kV, mAs, and SID).

SLO3: Apply proper use of radiation safety devices and employ the ALARA principle.

SLO5: Modify routine imaging parameters based on patient's condition.

RAD320 Principles of Imaging (example)

CLO: **Discuss** factors affecting radiographic image production. (SLO1)

RAD325 Radiographic Procedures with Lab (example)

CLO1: **Perform** positioning techniques in standard imaging procedures regarding to patient's condition. (SLO1, SLO5)

CLO2: **Select** proper technical factors to produce optimal image quality and patient dose. (SLO2, SLO3)

<https://calbaptist.edu/programs/bachelor-of-science-radiologic-sciences/>



JCERT Goals --Goal 1: Students will develop clinical competence.

Student Learning Outcomes (SLOs)	Assessment Method(s)	Where the Outcome is Addressed	Criteria for Success	Assessment Frequency
SLO1: Demonstrate proper positioning techniques.	Rubric: Positioning Skills	RAD 355 Clinical Practice II	100% of students will score 75% or better on the Competency Evaluation Rubric: Positioning skills	2021-2022
		RAD 455 Clinical Practice IV	100% of students will score 80% or better on the Competency Evaluation Rubric: Positioning skills	
SLO2: Select appropriate technical factors (kV, mAs, and SID).	Rubric: Proper Technical Factors	RAD 355	100% of students will score 80% or better on the Competency Evaluation Rubric: Proper technical factors	End of first year (2nd semester)
		RAD 455	100% of students will score 80% or better on the Competency Evaluation Rubric: Proper technical factors	End of second year (4th semester)



JCERT Goals --Goal 1: Students will develop clinical competence.

Student Learning Outcomes (SLOs)	Assessment Method(s)	Where the Outcome is Addressed	Criteria for Success	Assessment Frequency
SLO 3: Apply proper use of radiation safety devices and employ the ALARA principle.	Rubric: Use of Radiation Protection Measures	RAD 355	100% of students will score 80% or better on the Competency Evaluation Rubric: Use of Radiation protection measures	End of first year (2nd semester)
		RAD 455	100% of students will score 80% or better on the Competency Evaluation Rubric: Use of Radiation protection measures	End of second year (4th semester)

<https://calbaptist.edu/programs/bachelor-of-science-radiologic-sciences/>



CRITERIA	0 Unacceptable	1 Below Average	2 Average/Acceptable	3 Above Average/Good	4 Exemplary
<p>1. PERFORM ROUTINE IMAGING</p> <p>RAD 355 Clinical Practice II</p> <p>RAD455 Clinical Practice IV</p>	<p>(1) Demonstrate proper equipment manipulation</p> <p>(2) Demonstrated proper shielding and collimation</p> <p>(3) Correct placement of markers</p> <p>(4) Correct placement of anatomy on IR</p> <p>(5) Imaging review to assure quality of image</p> <p>Missed 4 or more</p>	<p>(1) Demonstrate proper equipment manipulation</p> <p>(2) Demonstrated proper shielding and collimation</p> <p>(3) Correct placement of markers</p> <p>(4) Correct placement of anatomy on IR</p> <p>(5) Imaging review to assure quality of image</p> <p>Missed 3 or more</p>	<p>(1) Demonstrate proper equipment manipulation</p> <p>(2) Demonstrated proper shielding and collimation</p> <p>(3) Correct placement of markers</p> <p>(4) Correct placement of anatomy on IR</p> <p>(5) Imaging review to assure quality of image</p> <p>Missed 2 or more</p>	<p>(1) Demonstrate proper equipment manipulation</p> <p>(2) Demonstrated proper shielding and collimation</p> <p>(3) Correct placement of markers</p> <p>(4) Correct placement of anatomy on IR</p> <p>(5) Imaging review to assure quality of image</p> <p>Missed 1 or more</p>	<p>(1) Demonstrate proper equipment manipulation</p> <p>(2) Demonstrated proper shielding and collimation</p> <p>(3) Correct placement of markers</p> <p>(4) Correct placement of anatomy on IR</p> <p>(5) Imaging review to assure quality of image</p> <p>Covered all 5 Expectations</p>
<p>2. DEMONSTRATE PROPER POSITIONING TECHNIQUES (SLO 1)</p>	<p>Over-all performance level expected at this point is unacceptable. Cannot conduct examination as instructed.</p>	<p>Over-all performance level expected at this point is unacceptable. Shows little development from training. Can only perform part of the examination with at least three noticeable errors.</p>	<p>Over-all performance level expected at this point is acceptable. Shows expected development from training. Needs little to no instruction to carry out functions with 1 to two noticeable errors.</p>	<p>Over-all performance level expected at this point is above average. Shows expected development from training, without any instructions needed to perform the exam and free of errors.</p>	<p>Over-all performance level expected at this point is excellent. Surpasses expectations in performance. Ability to perform procedures without effort and without instruction and/or assistance. No noticeable errors.</p>
<p>3. ANATOMICAL POSITIONING WELL EXPLAINED</p>	<p>No Knowledge of anatomical procedures. Unfamiliar with position of patient and/or position of part. Missed 4 out of 4 questions during the examination</p>	<p>Very little knowledge of anatomical procedures. Unfamiliar with position of patient and/or position of part. Missed 3 out of 4 questions during the examination</p>	<p>Average knowledge of anatomical procedures. Familiar with position of patient and/or position of part. Missed 2 out of 4 questions during the examination</p>	<p>Above average knowledge of anatomical procedures. Familiar with most of the position of patient and/or position of part description. Missed 1 out of 4 questions during the examination</p>	<p>Extremely knowledgeable of anatomical procedures. Familiar with all position of patient and/or position of part description. Answered all questions correctly during the examination.</p>



4. SELECT APPROPRIATE TECHNICAL FACTORS (SLO 2)	Technical factors (would have) produced suboptimal radiograph(s). Radiographs for the entire study would have been too light or too dark for acceptable standards.	Technical factors (could have) produced suboptimal radiograph(s). Radiographs for the entire study would have been too light or too dark for acceptable standards.	Technical factors on at least one expose (could have) produced radiograph(s) that are in close range with clinical practicum standards.	during the examination Technical factors for the entire exam (could have) produced radiograph(s) that were in close range with clinical practicum standards.	Technical factors (would have) produced optimal radiograph(s) and were in range with clinical practicum standards.
5. APPLY PROPER USE OF RADIATION SAFETY DEVICES AND EMPLOY THE ALARA PRINCIPLES (SLO 3) RAD455 Clinical Practice IV	Did not use appropriate collimation during the examination. Exposure field was excessively open (more than 4") on all projections. Did not use gonadal and/or thyroid shielding during the examination	Used collimation during the examination on at least one projection. Exposure field was open (more than 2") on all projections. Used gonadal and/or thyroid shielding during the examination on at least one projection but did not shield patient correctly.	Used collimation during the examination on all projections. Exposure field was open (more than 2") on all projections. Used appropriate gonadal and/or thyroid shielding during the examination on at least two projections but did not shield patient correctly.	Used collimation during the examination on all projections. Exposure field was open (more than 1") on at least one projection. Used appropriate gonadal and/or thyroid shielding during the examination on all projections but did not shield patient correctly	Used appropriate collimation during the examination on all projections. Exposure field was open (less than 1") on all projections. Used appropriate gonadal and/or thyroid shielding correctly during the entire examination
6. MODIFY ROUTINE IMAGING PARAMETERS BASED ON PATIENT'S CONDITION (SLO 5)	(1) Obtained appropriate patient history to determine imaging parameters (2) Knowledge to adapt parameters based on	(1) Obtained appropriate patient history to determine imaging parameters (2) Knowledge to adapt parameters based on	(1) Obtained appropriate patient history to determine imaging parameters (2) Knowledge to adapt parameters based on	(1) Obtained appropriate patient history to determine imaging parameters (2) Knowledge to adapt parameters based on	(1) Obtained appropriate patient history to determine imaging parameters (2) Knowledge to adapt parameters based on patient's pathology and/or condition

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III. COMPETENCY EVALUATION *** (This process is subject to change based on the ASRT Curriculum Requirements)*******

When the student has performed a procedure at an acceptable level of performance the required number of times and have simulated on the procedure in the lab or clinical site and/or covered it in procedures class, they may request a competency evaluation. During this evaluation the student will demonstrate their skill and competency in that particular examination. If a student fails the competency evaluation, continuation in the clinical participation stage for additional experience on that exam is required.

The steps for performing competencies are

1. Student engages in theory and laboratory classes and begins clinical observation in the clinical education courses.
2. Student assists the technologist in exams and gains knowledge.
3. The student successfully simulates the exam in the laboratory and in some cases in clinical. (i.e. scoliosis).
4. Student performs and appropriately documents the required number of prerequisites under direct supervision. Documentation includes date, identification number, exposure factors, and technologist. Some exams require the patient's age and/or history.
5. The student requests a Competency Evaluation under direct supervision by a designated technologist prior to the start of the exam.
6. The student will complete all aspects of the exam from start to finish including all applicable computer work.
7. Students may not review notes once the competency has been announced. Students may refer to their

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IV. Competency Exams and Prerequisite Numbers

Mandatory Competency Exams

VI. Thorax and Abdomen		
	Routine Chest (PA/Lat)	10
	Stretcher or Wheelchair	3
	Abdomen Supine	5
	Abdomen Erect	3
	Ribs	3
VII. Upper Extremities & Shoulder Girdle (Minimum 2 projections)		
	Finger or thumb	3
	Hand	3
	Wrist	3
	Foreman	3
	Elbow	3
	Humerus	3
	Shoulder	3
	Shoulder (Trauma)	2
	Trauma Upper Extremity	2

<https://calbaptist.edu/programs/bachelor-of-science-radiologic-sciences/>



V. Criteria for Competency Evaluation

- A. Student will evaluate the requisition, complete the required paperwork and
 1. Identify procedures to be performed.
 2. Identify the patient's age and name.
 3. Identify patient location and mode of transportation.
 4. Acknowledge any pathological conditions.
 5. Acquire appropriate clinical history.
- B. Student will prepare the radiographic room and
 1. Provide clean and orderly work area.
 2. Verify that equipment is operational.
 3. Obtain appropriate supplies for examination.
- C. Professionalism and proper patient care skills will be demonstrated by
 1. Selecting the correct patient.
 2. Introducing himself/herself to patient and briefly explaining the procedure.
 3. Requesting last menstrual period (LMP) date of female patients between the ages of 12-60.
 4. Transporting patient to appropriate imaging area.
 5. Verifying if patient is properly prepared for the examination.
 6. Identifying, when appropriate, that there are no contraindications for performing procedure.
 7. Providing safe storage for patient's belongings.
 8. Providing appropriate assistance to the radiographic table based on patient's condition.



CSUN BS, Radiologic Sciences Program
Clinical Competency Assessment for CT
(Use one form per competency)

*The student must pass all sections of this form. In every section, each student must accumulate the minimum points necessary based on their Junior or Senior/Post Grad status. If a licensed RT intervenes during any part of the evaluation, the assessment is discontinued and the student must be re-evaluated on a different exam. The following total points are needed to pass this competency: Juniors **52** and Seniors/Post Grads **59**.*

Name: _____ Procedure: _____

Date of Exam: _____ Tech's Name and Exam Time: _____

Scale: 0=Unacceptable; 1=Needs Improvement; 2=Competent/Acceptable; 3=Above Average; 4=Exceeds Expectations (at RT level)

I. Patient Care & Communication

1.	Verifies correct patient using two patient identifiers, procedure, and clinical diagnosis/indication.	0	1	2	3	4
2.	Communication skills – Student provided clear/complete explanation of procedure to age appropriate patient, surname use, etc.	0	1	2	3	4
3.	Obtains patient assessment, preparation, history, and consent. (Verifies NPO, bowel prep, allergies)	0	1	2	3	4
4.	Insures patient privacy and dignity.	0	1	2	3	4
5.	Knows emergency protocol for Code situations or contrast reactions.	0	1	2	3	4
6.	Insures patient safety and comfort throughout procedure.	0	1	2	3	4
7.	Practice safe patient care methods including falling precautions.	0	1	2	3	4
8.	Completes patient assessment form for iodinated contrast.	0	1	2	3	4
9.	Provides proper breathing instructions; appropriate for exam and patient language.	0	1	2	3	4
10.	Provides post examination instructions.	0	1	2	3	4

Total for Section I: _____

Maximum points = 40 Minimum passing points: Juniors=16 and Seniors/Post Grads=18

<https://www.csun.edu/health-human-development/health-sciences/clinical-competency-assessments>



Clinical Competency Assessments for CT

II. Technical Requirements & Positioning

1. Correctly enters patient information.	0	1	2	3	4
2. Selects appropriate exam protocol or adjusts as necessary.	0	1	2	3	4
3. Properly sets up table/head holder.	0	1	2	3	4
4. Positions patient efficiently and correctly for the examination. (Scout)	0	1	2	3	4
5. Uses proper immobilization devices.	0	1	2	3	4
6. Uses gantry angulations properly.	0	1	2	3	4
7. Knows storage location of necessary supplies. (Catheters, guide wires, etc.)	0	1	2	3	4
8. Examination completed in a timely fashion.	0	1	2	3	4
9. Properly archives images to PACS or prints images.	0	1	2	3	4
10. Properly selects and prepares contrast media.	0	1	2	3	4
11. Correctly operates the automatic power injector.	0	1	2	3	4
12. Uses proper cross-hair alignment for starting point.	0	1	2	3	4
13. Knows how to reset and/or calibrate the scanner.	0	1	2	3	4
14. Properly adjusting technical factors to account for patient body habitus, age, etc.	0	1	2	3	4
15. Properly reconstructs images.	0	1	2	3	4

Total for Section II: _____

Maximum points = 60 Minimum passing points: Juniors=24 and Seniors/Post Grads=27

III. Image Critique

1. Diagnostic image quality (contrast/density), exposure range must meet department protocols.	0	1	2	3	4
2. Patient positioning demonstrates anatomy and pathology properly.	0	1	2	3	4
3. Able to identify which plane the images are demonstrating.	0	1	2	3	4

Total for Section III: _____

Maximum points = 12 Minimum passing points: Juniors=5 and Seniors/Post Grads=6

<https://www.csun.edu/health-human-development/health-sciences/clinical-competency-assessments>



Unit RAD3051 - Medical imaging science and practice 1

Overview

Computed tomography: scientific principles and operational modes. System components and image characteristics. Image reconstruction techniques, summation convolution back-projection. Fourier reconstruction and algebraic and iterative reconstruction methods. Helical/spiral and multislice CT systems. CT artefacts and quality assurance. Principles of CT dosimetry and radiation protection. Clinical CT examinations for the head, chest, abdomen and spine; CT sectional anatomy and imaging pathology. General radiography including contrast, trauma, paediatric and mobile imaging. Digital image processing, computer interfaces, medical image formats, the Dicom standard, image compression and the hospital Picture Archiving and Communication System (PACS).

<https://handbook.monash.edu/current/units/RAD3051>



Unit learning outcomes

1. Explain the scientific principles underpinning computed tomography; ▼
2. Describe and represent the physical configuration of axial, helical and multislice CT systems; ^
3. Explain and distinguish between the various data acquisition and image reconstruction processes used in CT and their characteristics; ^
4. Identify common CT artefacts, explain their cause and suggest methods to correct for them; ^
5. Apply radiation protection and dosimetry principles to the practice of CT; ^
6. Describe the principles underpinning advanced digital image processing, image distribution, data transfer and storage options used in medical imaging (including the DICOM standard and PACS and RIS infrastructure). ^



- ❑ Constructive alignment of PLOs, CLOs, T&L, student assessment methods
(PLO&CLO formulation: SMART, How to measure)
- ❑ Curriculum mapping
- ❑ Clinical competency handbook
- ❑ Student assessment:
 - Formative and summative assessment in course and program levels, Assessment plan.
 - Assessment form (Rubrics, criterion-based assessment), i.e., presentation, practical courses, clinical practice
 - Communication to student
 - Feedback of student assessment
 - How to measure the achievement of PLOs and CLOs.



- PLO formulation
- Curriculum mapping
- CLO formulation (corresponds to PLO, curriculum mapping)
- Revise T&L methods, Assessment methods
- Clinical handbook
- Revise formative and summative assessments in courses level
- Form rubrics assessment, i.e., presentation, practical courses, clinical practice
- Revise formative and summative assessments in program levels: Assessment plan and assessment methods of PLO achievement
- Course evaluation by students
- Satisfaction surveys
- Improvement, action plan



- Wongse-ek C., Panvisavas V., Sivarak O., Krityakiarana W. Develop and properly curriculum revision based on OBE framework and AUN criteria, 2017.
- <https://www.asrt.org>
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- <https://www.jrcert.org>
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