A POLYTECHNIC INSTITUTION

School of Health Sciences
Program: Medical Radiography
Option:

MRAD 3316
Radiographic Procedures 3

Start Date: January, 2005 **End Date:** April, 2005

Total Hours: 120 **Total Weeks:** 15 **Term/Level:** 3 **Course Credits:** 8
Hours/Week: 8 **Lecture:** 3 **Lab:** 5 **Shop:** **Seminar:** **Other:**

Prerequisites

Course No.	Course Name
MRAD 2216	Radiographic Procedures 2
MRAD 2214	Radiographic Anatomy and Physiology 2
NURS 2180	Patient Care 2

MRAD 3316 is a Prerequisite for:

Course No.	Course Name
MRAD 4400	Level 4 Clinical

v Course Description

Course instruction will cover positioning techniques in combination with appropriate technical factors and imaging theory required to produce non-routine radiographs of the urinary and digestive systems, vertebral column, pelvic girdle, thoracic cage and chest. Routine skull radiography, trauma and pediatric topics will be covered. Students will also learn how to evaluate the diagnostic acceptability of skull radiographs and all the radiographic positions covered in the course. Labs will reinforce the theoretical components.

v Detailed Course Description

The goals of the course are to:

- provide students with knowledge of positioning techniques for radiographs of the skull and additional views of the urinary and digestive systems, vertebral column, pelvic girdle, thoracic cage and chest and pediatric and trauma radiography.
- give students an understanding of the relationships among skull anatomy, beam direction and radiographic anatomy.
- enable students to evaluate the diagnostic acceptability of skull radiographs and the additional views covered.
- understand the differences between the various radiographic contrast media and their possible reactions
- understand radiographic considerations for the geriatric, pediatric and trauma patient.
- understand various tomographic applications
- formulate technique charts and recognize variables of techniques for various exams and the variations of the normal patient.

v Evaluation

Final Examination	30%	Comments: All labs must be satisfactorily completed before a course mark will be given.
Midterm #1	15%	
Midterm #2	15%	
Technique Chart	10%	60% is considered as a pass.
Video	10%	
Junior Video	5%	
Rad Eval Quizzes	5%	
Positioning Lab	5%	
Applied Lab	5%	
TOTAL	100%	

v Course Learning Outcomes/Competencies

Upon successful completion of this course, the student will be able to:

1. list and locate the surface landmarks, localizing lines and planes of the skull.
2. describe the routine and specialized projections for the various aspects of the skull and be able to differentiate between them.
3. describe and discuss beam direction and centering points for the various views/projections of the skull.
4. demonstrate the ability to correctly position the patient for the required projections/views of the skull.
5. define, describe and demonstrate beam directions, centering points and patient positioning relating to the radiography of additional, non-routine views of the:
   spine, urinary system, GI system, biliary system, pelvic girdle, shoulder girdle, thoracic cage
6. describe patient preparation, required projections and contrast media relating to radiographic examinations of the urinary, digestive and biliary systems.
7. describe contrast reactions of various contrast media and the pertinent treatment.
8. describe tomographic considerations for various anatomical structures
9. demonstrate the ability to adapt positioning in order to accommodate patient limitations
10. demonstrate the ability to integrate patient care, communication and organizational skills when positioning for skull and additional views studied.
11. evaluate organization, communication and positioning skills and provide appropriate feedback.
12. evaluate sample radiographs of the studied areas for diagnostic acceptability
13. assess main contributing factors to the overall radiographic quality.
14. propose possible solutions to poor radiographic quality.
15. develop a radiographic technique chart using the DuPont Bit System.
16. outline technique chart adjustments to be made with respect to; body habitus, pathology, age and specific equipment used, ie, generator, film/screen, grid.

CAMRT COMPETENCIES

On successful completion of the above outcomes, you should be prepared to perform the following competencies as defined in the "Competency Profile" for radiographers established by the CAMRT.

RADIOGRAPHIC PROCEDURES 3

Critical Task List

A1 ***Utilize the request for consultation***
A1.1 Verify that examination is ordered by authorized professional
A1.2 Verify the patient's means of transportation
A1.4 Evaluate the correlation between clinical information and the requested examination
A1.5 Prioritize examinations
A1.6 Plan the radiographic imaging procedure

A2 ***Prepare room for radiographic imaging procedures***
A2.1 Maintain a clean/aseptic work environment
A2.5 Obtain accessory imaging apparatus
A2.6 Select/prepare imaging system

A3 ***Prepare the patient***
A3.1 Identify the patient
A3.2 Verify clinical information with the patient or clinical staff, adjusting the examination when necessary
A3.3 Ensure proper patient attire for the procedure
A3.4 Confirm patient preparation
A3.5 Remove all items that would compromise the quality of the image
A3.6 Educate the patient, family and others about the procedure
A3.7 Confirm that patient's consent is obtained before commencing the procedure
A3.8 Take appropriate action if patient refuses procedure
A3.9 Document patient's history of risk factors when using contrast media
A3.10 Record additional clinical information

A4 ***Position the patient***
A4.1 Plan/adapt positioning requirements according to patient condition
A4.2 Demonstrate knowledge of the imaging procedure
A4.3 Inform the patient of the need to touch prior to touching
A4.4 Use touch for guidance, safety and comfort
A4.5 Touch the patient at the required anatomical landmark(s)
A4.6 Position the patient to demonstrate the required anatomical structures
A4.7 Use immobilization and positioning aids as required
A4.8 Direct beam, angling as required, to demonstrate all required anatomical structures.
A4.9 Align the imaging system with the required anatomical structures
A4.10 Collimate to the area of interest to include required anatomical structures
A4.11 Provide the patient with breathing instructions
A4.12 Use proper body mechanics throughout the procedure

A5 ***Operate image equipment***
A5.1 Select and use apparatus and accessory equipment
A5.2 Ensure accuracy of patient demographics in digital imaging systems
A5.3 Select and use examination protocol for digital imaging
A5.4 Select/adjust distance parameters
A5.5 Use appropriate radiographic markers
A5.6 Select the image receptor system
A5.7 Select/modify exposure factors on the basis of technical considerations
A5.8 Select/modify exposure factors on the basis of patient considerations
A5.9 Take/monitor the exposure
A5.10 Select automatic exposure control parameters where applicable

A6 ***Perform image processing tasks***
A6.1 Imprint ID information
A6.2 Manipulate computer data, if applicable
A6.3 Process images
A6.4 Reload the cassette/magazine

A7 ***Critique images and implement corrective measures***
A7.1 Verify patient ID on the image
A7.2 Check for correct use and proper placement of markers
A7.3 Identify anatomy and patient position on the image
A7.4 Verify that required structures are demonstrated
A7.5 Recognize film artifacts and take appropriate action
A7.6 Determine whether the diagnostic quality of the image is acceptable
A7.7 If image is unacceptable, determine the reason
A7.8 Manipulate the digital image
A7.10 Determine corrective action and repeat the procedure, if the image is unacceptable
A7.12 Determine the need for additional views and perform if required

A8 ***Complete post-procedural tasks***
A8.1 Complete the examination within an appropriate time frame
A8.3 Educate the appropriate individual(s) regarding post-procedural activities
A8.4 Dismiss the patient

B1 ***Protect the patient***
B1.1 Question female patients to ascertain possibility of pregnancy
B1.5 Use protective practices to reduce radiation risks
B1.6 Collimate to the area of interest to minimize patient dose
B1.7 Select exposure factors, keeping radiation dose as low as reasonably achievable
B1.8 Use protective devices/apparel to minimize patient dose

B2 ***Protect the technologist***
B2.1 Stand behind protective barriers
B2.2 Wear lead protective apparel
B2.4 Use positioning aids/immobilization devices
B2.6 Collimate to the area of interest to minimize scatter

B4 ***Protect others required to be present during the procedure***
B4.1 Close the doors of the radiation area when in use
B4.2 Instruct people to leave the vicinity during imaging procedure**B5** ***Monitor personal radiation exposure***

B5 ***Monitor personal radiation exposure***
B5.1 Wear radiation monitoring device

C1 ***Ensure patient safety***
C1.2 Provide for the patient's safety needs
C1.3 Use proper patient transfer techniques
C1.4 Use stretcher and wheelchair locks and guardrails
C1.5 Use immobilization devices
C1.6 Use safety measures when obliged to leave a patient

C2 ***Establish patient trust and confidence***
C2.1 Dress in a professional manner
C2.2 Introduce self to patient
C2.3 Communicate at an appropriate level of understanding for the patient
C2.4 Respond to the patient's concerns
C2.5 Avoid inappropriate conversation in the presence of the patient
C2.6 Use reassuring verbal and non-verbal communication techniques
C2.8 Perform tasks in an organized and confident manner

C3 ***Attend to the patient's comfort and needs***
C3.1 Acknowledge and respond to the patient's emotional needs
C3.2 Acknowledge and respond to the patient's physical needs
C3.3 Move patient during procedure, with consideration to patient's physical condition
C3.5 Provide for patient privacy
C3.6 Respect socio-cultural practices and t

C5 ***Assist in the administration of contrast media and other drugs***
C5.1 Obtain the patient's history to determine contraindications to contrast media
C5.2 Inform the patient regarding the possible effects of contrast media
C5.3 Select and prepare contrast media
C5.8 Recognize and respond to changes in the patient's condition following the administration of contrast media and other pharmaceuticals

D1 ***Monitor and maintain processing equipment and facilities***
D1.2 Prepare processing chemicals
D1.3 Perform start-up/shut-down procedures
D1.7 Check solution levels
D1.9 Inspect the safelight filter
D1.10 Monitor the darkroom for light leaks
D1.13 Perform sensitometry
D1.14 Interpret sensitometry results and initiate corrective action

D2 ***Monitor radiographic equipment***
D2.1 Perform visual inspection of cables and equipment
D2.2 Recognize improper functioning of imaging and accessory equipment/devices
D2.4 Document and report equipment malfunctions

D3 ***Perform quality control tasks***
D3.1 Perform quality control tests on imaging and accessory equipment
D3.2 Interpret test results to initiate corrective action

E2 ***Demonstrate professional behaviour***
E2.1 Interact professionally as a member of the health care team
E2.2 Practice effective communication and conflict resolution skills
E2.3 Respect values, beliefs and needs of others
E2.4 Demonstrate responsibility and accountability on clinical practice
E2.5 Demonstrate professional deportment
E2.6 Provide education regarding imaging procedures and issues

v Verification

I verify that the content of this course outline is current.

Authoring Instructor — Date: Dec 14/04

I verify that this course outline has been reviewed.

Program Head/Chief Instructor — Date: Dec 14/04

I verify that this course outline complies with BCIT policy.

Dean/Associate Dean — Date: Dec. 14/04

Note: Should changes be required to the content of this course outline, students will be given reasonable notice.

v Instructor(s)

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and additionally
by appointment

v Learning Resources

Required:

1. *Merrill's Atlas of Radiographic Positions and Radiologic Procedures* — 10th Edition — Volumes 1, 2 & 3.
2. *Medical Radiography Positioning/Laboratory Manual — Level 3.*
3. *Radiographic Critique* — Martenden/McQuillen.

Recommended:

1. *Textbook of Radiographic Positioning and Anatomy* — Bontrager and Anthony.
2. *Radiography of the Skull and Brain* — DuPont.
3. *Skeletal Anatomy* — Bryon.
4. *Joy of Sectioning* – Dowdell.
5. *The Contrast Media Manual* — Katzberg.
6. *Textook of Radiographic Positioning and Related Anatomy* — Bontrager.
7. *Trauma and Mobile Radiography* — Drafke. (on reserve in library)

v Information for Students

(*Information below can be adapted and supplemented as necessary.*)

Assignments: Late assignments, lab reports or projects will **not** be accepted for marking. Assignments must be done on an individual basis unless otherwise specified by the instructor.

Makeup Tests, Exams or Quizzes: There will be **no** makeup tests, exams or quizzes. If you miss a test, exam or quiz, you will receive zero marks. Exceptions may be made for **documented** medical reasons or extenuating circumstances. In such a case, it is the responsibility of the student to inform the instructor **immediately**.

Ethics: BCIT assumes that all students attending the Institute will follow a high standard of ethics. Incidents of cheating or plagiarism may, therefore, result in a grade of zero for the assignment, quiz, test, exam, or project for all parties involved and/or expulsion from the course.

Attendance: The attendance policy as outlined in the current BCIT Calendar will be enforced. Attendance will be taken at the beginning of each session. Students not present at that time will be recorded as absent.

Illness: A doctor's note is required for any illness causing you to miss assignments, quizzes, tests, projects, or exam. At the discretion of the instructor, you may complete the work missed or have the work prorated.

Course Outline Changes: The material or schedule specified in this course outline may be changed by the instructor. If changes are required, they will be announced in class.

v Assignment Details

Video projects have a new importance in Level 3. Skull procedures are not often done in the clinical area and therefore competence in this area of positioning is required prior to attempting it in the clinical area. In order to attempt to ensure competency, stringent regulations and marking have been adapted. The objective of this assignment is to have each student practice his or her positioning skills prior to attempting the video project process.

The production of the video and marking will be as follows:

Video Assignment

- video cannot be repeated, however a new requisition envelope may be requested and a new video completed.
  - prior to receiving a new requisition, a completed self-evaluation form must be submitted on the first video, then a new video project envelope will be issued.
- the envelopes are dated and numbered and must be completed prior to the next positioning lab.
- the procedure must be completed within 30 minutes.
- the requisition envelope must be opened in front of the camera and be recorded .
  - requisition must be completed with patient history, date and signature, etc.
- the camera must be recording from the time the envelope is opened until the conclusion of the video.
  - projects not adhering to this rule are considered ***unacceptable***.
- details such as technique, cassette sizes and screen/film combinations are to be recorded on the requisition – do not talk to the camera, only to the patient
- emphasize that the patient should really "act" the part. This makes it far easier for you to role play as a technologist and makes the video project fun.
- instructor interviews must be booked at the completion of the video (i.e., booking must be done prior to next positioning lab however actual interview can take place anytime during the term).
- interviews can be booked with any instructor involved in MRAD 3316 (check availability of instructors)
- **REMEMBER, DO NOT SPEAK TO THE CAMERA, but rather SPEAK TO THE PATIENT.**

Patient Feedback Form

- forms are to be filled out by the patient at the end of the video, placed in the envelope, sealed and returned to the student.
- please encourage patients to give written, honest and complete feedback, rather than checkmarks.
- envelopes will be opened during the instructor interview and the patient's feedback will be reviewed.

- patient feedback will not be worth any marks.

Evaluation Forms

- forms must be completed, including comprehensive personal feedback prior to instructor review.
  - an X will be levied for incomplete documentation.
- there are no free Xs.
- the marking scheme will be as follows:

PART A – GENERAL SKILLS

- an X will count as 1 mark off of the total mark.
- if an adequate analysis is made of the area receiving an X, only 1/2 mark will be taken off.

PART B

- an X in any one of the 4 areas listed under each projection/view will result in the loss of **all 4 marks** for that entire view.
- if an adequate analysis is made of that view/projection, two marks can be earned back.

PART C

- an X in any one of the areas will result in a loss of marks for that entire section.
- if an adequate analysis is made, half the marks can be earned back.

MEDRAD VIDEO ASSIGNMENT

STUDENT: _____ SET: _____

TOTAL MARK: _____/20

Use the evaluation criteria in your clinical manual as a guideline for acceptable standards for the video.

Watch your videotape carefully. Identify incorrect and correct aspects of the procedure by placing (x) or (√) in the grey shaded boxes in the S (student) column. Justify your decisions on the lines provided. If you recognize your error and provide a correct analysis, you will only lose a ½ mark.

A. GENERAL SKILLS

I	S	
☐	☐	**ROOM PREPARATION**

Prepare room with all necessary supplies.

_____

_____

☐	☐	**PATIENT IDENTIFICATION & COMMUNICATION**

Interpret requisition accurately; correctly identify patient; instruct patient properly.

_____

_____

☐	☐	**PATIENT PREPARATION & DISMISSAL**

Obtain accurate history/assessment; assist patient appropriately (safety, privacy, etc.); remove extraneous items from patient (jewelry, etc.); ascertain probability of pregnancy (as required).

_____

_____

☐	☐	**TECHNICAL FACTORS**

Select suitable technical factors; select appropriate film/screen/grid; indicate appropriate factors and cassette size and type.

_____

_____

☐	☐	**RADIATION PROTECTION**

Collimate beam properly; shield patient appropriately; protection of self and others.

_____

_____

	S	
		INHERENT SKILLS

Select correct SID; utilize markers correctly; perform positioning efficiently (sequence, speed, etc.).

(SECTION A) MARKS /6

B. POSITIONING SKILLS

Identify if the technical aspects were correct for each view/projection by placing (√) or (x) beside each item. Indicate the view/projection on the line provided. Indicate the required CR direction and angulation and correct CP on the lines provided. If any of these aspects are incorrectly performed and would result in a repeat film, there will be a **loss of the full 4 marks** for that view/projection. If a correct analysis is provided, half marks will be assigned for that view/projection.

VIEW PROJECTION 1 _____

- A CORRECT CENTERING POINT
- B UTILIZE CORRECT CR ANGULATION
- C POSITION PATIENT CORRECTLY
- D ALIGNMENT (TUBE/PART/FILM, ETC.)

VIEW PROJECTION 2 _____

- A CORRECT CENTERING POINT
- B UTILIZE CORRECT CR ANGULATION
- C POSITION PATIENT CORRECTLY
- D ALIGNMENT (TUBE/PART/FILM, ETC.)

VIEW PROJECTION 3 _____

- A CORRECT CENTERING POINT
- B UTILIZE CORRECT CR ANGULATION
- C POSITION PATIENT CORRECTLY
- D ALIGNMENT (TUBE/PART/FILM, ETC.)

(SECTION B) MARKS /12

C. COMPREHENSION, EFFICIENCY & ORGANIZATION

An X in any one of the areas will result in a loss of marks for this entire section. If an adequate analysis is made, half the marks can be earned back.

I	S	
		COMPREHENSION

Able to verbalize a ten step film critique of one view of the skull examination performed, randomly chosen by the instructor

		EFFICIENCY & ORGANIZATION

Justification of why views were done the way you did them (i.e., order of views, manner in which views were done).

(SECTION C) MARKS /2

Upon completion and critique of an acceptable video, arrange to review video with an instructor. Hand in completed requisition and sealed patient feedback at this time. The instructor will review the video at that time and provide feedback in the box column marked **I** (Instructor) and through discussion.

Comments:

Junior Video Feedback Assignment

Providing and receiving feedback is an important aspect of any career. Providing informal feedback to peers occurs on a regular basis.

It is important that feedback be given in a helpful manner. It is also important to recognize that for learning to occur, feedback must also contain suggestions for alternate methods of improvement.

The feedback assignment will consist of a Level 3 student providing feedback to a Level 1 student on the Level 1 student's video project. Names will be randomly drawn and the list of partners will be posted outside 4060.

Level 1 students will provide Level 3 students with their video and a feedback form. Level 3 students are to provide feedback in written and verbal form. Level 3 students are also to complete a feedback form on the Level 1 student regarding the interview. This form is on the following page. This form is to be given to an instructor to ensure it is available for the instructor interview with the Level 1 student. Level 1 students are to review both of these completed forms during the instructor interviews.

This assignment mark will be based on your feedback to the Level 1 student.

Junior Video Interview Feedback Regarding Level 1

COMPLETED FORMS TO BE GIVEN DIRECTLY TO THE INSTRUCTOR.

Level 3 Student: _____

Level 1 Student: _____

Check the appropriate box for the statement which best describes your experience in each section. Your comments will not affect the Level 1 student mark. Appropriate specific comments must be provided.

1. ☐ The Level 1 student sought me out for introductions and to make arrangements for the interview.

   ☐ I sought out the Level 1 student to introduce myself and to make arrangements for the interviews.

   Comment: _____

   _____

2. The Level 1 student was:

   ☐ approachable ☐ neutral ☐ unapproachable

   Comment: _____

   _____

3. The Level 1 student:

   Comment: _____

   _____

4. For the interview, the Level 1 student was:

   ☐ punctual ☐ a few minutes late ☐ very late

5. During the interview, the Level 1 student was:

☐ interested ☐ neutral ☐ disinterested

Comment: _____

_____

6. During the interview when alternate suggestions were given, the Level 1 student appeared:

☐ defensive ☐ accepting

Comment: _____

_____

7. How did you feel during the interview session? (You may check more than 1 box.)

☐ comfortable
☐ anticipatory
☐ uncomfortable
☐ humbling
☐ stressed
☐ knowledgeable
☐ bored
☐ Other _____

8. I thought my feedback to the Level 1 was:

☐ valuable
☐ overcritical
☐ not critical enough

Comment: _____

_____

9. I perceived that the Level 1 thought my feedback was:

☐ valuable
☐ overcritical
☐ not critical enough

Comment: _____

_____

Creating a Technique Chart

Each group will create a technique chart for the human body based on a 20 cm container of water or the 3M pelvis phantom. There will be two technique charts made per x-ray room, one for CR and one for film. The procedure will be as follows:

- for the film technique chart use the plastic container filled with water to a specific level of 20 cm (approximately the same measurement as an average abdomen) to produce a film that measures OD 1 plus base plus fog
- For the CR technique chart, use the 3M phantom to obtain a CR image within the correct S3 range
- Assess the image for noise (SNR)
- If acceptable level of noise and within S number range, repeat the image using a higher kV and correspondingly lower mAs (to reduce dose). Assess image again for mottle. If it is still acceptable, repeat this step until the SNR is unacceptable. The previous technique will be the acceptable technique for a 20 cm abdomen
- based on the Dupont Bit system and the AP abdomen technique, create a technique chart for the human body for the areas of:
  - vertebra
  - shoulder girdle
  - thoracic cage
  - chest
  - pelvis/hip
  - abdomen
  - humerus.

Each group will also create a technique chart for extremities based on an initial CR image taken of a wrist and ankle. Check S numbers and noise levels increasing kV and decreasing mAs until dose and noise are optimal.

Once techniques have been calculated, random tests of the phantom should be completed to ascertain accuracy

Please ensure you submit calculations prior to final makeup of the technique chart.

Submission of a completed technique will be worth 10% of the final grade.

Radiographic Evaluation Quizzes

There will be a Rad Eval quiz each week in the film critique labs (Room 4060). In addition to ensuring comprehension of material, the objectives of these quizzes are to ensure practice to promote speed and confidence in your abilities. These are desirable skills in the workplace.

Persons participating in the Rad Eval quiz will be randomly selected each week. **The topic will be from the area studied the previous week.** Persons not selected for the weekly quiz may be asked to prepare an oral presentation.

Quizzes will be done on an individual basis this term.

Rad Eval quizzes will be worth 10% of the final grade.

Applied Lab

The lab will be incorporated into the positioning lab. This lab will alternate with clinics. You will be responsible for making the error radiograph. Please make it so that there is some information on the image.
With your partner position the phantom as indicated on the form in your room. Make one or two deliberate mistakes and expose the image. Move to the next room up. Assume that you are relieving another technologist for coffee. He/she has just exposed the last film of a radiographic series on the patient on the table.

The following set-up will be used:

- machine/equipment will be on
- view/projection will be indicated on the radiographic evaluation form
- phantom will be on the table in the position that it was when the radiograph was taken
- technique that was used for the radiograph will be set on the control panel
- exposed cassette will be in position as it was exposed

You will evaluate the radiograph with your partner using the 10 point radiographic system.

Repeat the radiograph if not all criteria are met. Clinical notebooks may be used. **Only one repeat may be made.** While one person is developing the radiograph, the other person should shut the room down. Complete the 10 point radiographic evaluation for your repeat radiograph.

Students are responsible for ensuring rooms are left neat and tidy.

Radiographs and corresponding rad eval sheets are to be handed in at the end of the lab. 5% of the final grade for this course can be achieved in this lab.

Clinic Cases

During Positioning Lab there will be time to complete "clinic cases." A requisition complete with clinical history will be available along with the appropriate films. Complete the exam using your partner as a patient. Have an instructor check your work before "exposure." The instructor will decide if the case is to be awarded as unassisted or assisted. The student will then complete a "quick" critique of **one film** in the film bag. A quick critique will consist of identification of the part and projection, positioning, structures included and density and contrast. The film bag and the requisition will then be placed on the "completed cases" pile. The case will then be entered into the student exam performance record

Positioning lab

The pocket positioning book is to be completed prior to positioning lab. You will use the pocket positioning book in lab for information on positioning. The MRAD 3316 manual will not be allowed in positioning lab.